EXHIBIT “I”

SCOPE OF SERVICES

The CONSULTANT shall provide the professional, technical, and other personnel resources, equipment, materials and all other things necessary to complete this contract. The contract will look at widening for a center turn lane, improving the intersection of Route K and Notre Dame Drive and adding an additional lane eastbound from County Road 206 to 0.2 miles east of County Road 317 in Cape Girardeau County. The contract would include the development of cost estimates, County, City and SEMPO involvement, development of preliminary plans, ROW plans development and submittal, Final plans and submittal of PS&E along with JSP’s.

This scope of services is intended to be an accurate description of the items and tasks required for completion of the design of this project. However, each project is unique and may require more or less effort in an individual task to complete the design. The following information will explain and define in general terms the major design items of importance relating to this project. All the elements of work that are necessary to satisfactorily complete the design of this project may or may not be listed. The lack of a specific listing of an element or item in the scope of services does not in itself constitute the basis for additional services, supplemental agreements, and/or adjustment in compensation.

A more detailed description of the process and requirements used by MoDOT for completion of the design may be found in the MoDOT Engineering Policy Guide (EPG). The consultant is encouraged to review the appropriate sections as a means to supplement the information contained in the scope of services and provide additional guidance in the requirements and expectations of MoDOT for completion of the design services.

The provisions of the Design Consultant Agreement outlining the responsibilities of the CONSULTANT regarding the quality and accuracy of the deliverables and products shall apply to any decisions regarding determinations of additional services.

Preparation of a supplemental agreement is necessary prior to performance of any work, which is considered as additional services, not included in the original scope of services. The consultant will not be compensated for additional services performed prior to execution of a supplemental agreement. Only additional services, which are required due to changed or unforeseen conditions or are due to a change in the specified end product, will be considered for inclusion in a supplemental agreement.

The CONSULTANT shall prepare all plans through use of a Computer Aided Drafting (CAD) program. The CONSULTANT shall conform to the Missouri Department of Transportation Specifications for Computer Deliverable Contract Plans as referenced in the MoDOT EPG.

The CONSULTANT will be required to produce a conceptual cost estimate for alternatives and “build in place” alternative.

The CONSULTANT upon completion of the “Conceptual Alternatives Report”, will produce a construction cost estimate of the recommended alternative.

The CONSULTANT shall review "as built" plans, aerial photographs, manuscripts, etc. and other information to be provided by the Commission and make the necessary field investigations to assure that there have been no significant changes since the information was recorded or obtained.

The CONSULTANT shall prepare a design criteria memorandum for this entire project, and submit it to the COMMISSION for review and approval prior to starting the preliminary design phase. Any deviations from Commission established procedures for design, construction or materials shall be approved through the MoDOT project manager and documented by the CONSULTANT. This documentation shall include a brief justification for the deviation and the signature of the CONSULTANT project manager.

The consultant shall perform the following services, all in accordance with the standard practice of the Commission and the following:

AASHTO "A Policy on Geometric Design of Highways and Streets" (7th Edition)

AASHTO "Roadside Design Guide" (4th Edition)

AASHTO "LRFD Bridge Design Specifications" (9th Edition)

AASHTO "Highway Drainage Guidelines" (4th Edition)

"Manual on Uniform Traffic Control Devices" (2009 edition)

"Highway Capacity Manual" (6th Edition)

Major task items included in the work include:

I Administration

CONSULTANT shall participate in the following as part of the Administration tasks:

1. Attend Project Core Team Meetings. A total of four (4) core team meetings is assumed for the project. The CONSULTANT will be responsible for preparing meeting agendas with input from MoDOT and preparing meeting minutes for documentation.
2. Develop and implement a Quality Assurance Plan.
3. Hold periodic internal team meetings throughout the development of project.
4. Correspondence (emails, letters, meeting minutes, phone calls)
5. Personnel planning and scheduling control
6. Set up the project and conduct Kick-Off Meeting.
7. Coordination with subconsultants.
8. Participate in Public Meeting or Hearing (if required). Develop handouts and exhibits for meetings.
9. Provide monthly progress reports and invoices and review subconsultants invoices and reports.
10. Provide exhibits, sketches, and back-up data to MoDOT on an as-needed basis.
11. Provide information to support the SE District MoDOT staff in maintaining a public website for the project staff to inform the public and update impacts related to the project including timelines, changes to the project, meetings, comments.

II Public Involvement

The COMMISSION will be the main point of contact for receiving calls from the public. The

CONSULTANT will interact with external agencies and the county commission as required to accomplish the scope of services of this contract.

1. The CONSULTANT shall be required to attend meetings with regulatory agencies, organizations, county officials, local municipalities, property owners and other entities as required. A total of three stakeholder meetings, with various entities, is anticipated for the public involvement on this project.

2. The CONSULTANT shall participate in a planning meeting with MoDOT prior to any public meetings.

3. The CONSULTANT shall provide the COMMISSION a database containing all property owners contiguous to the project area, or within a reasonable distance of the project. The database shall provide contact information available for public involvement and environmental purposes (e.g. mailing addresses, phone numbers, email addresses, etc.) The database shall also designate whether the individual is someone the Commission will need to obtain right of way and/or easements from.

4. The COMMISSION shall advertise for meetings, obtain the meeting location and room and perform mass mailings of notices of meetings or hearings, and newsletters.

5. The CONSULTANT shall prepare the exhibits as requested by COMMISSION for the public meeting or hearing.

6. The CONSULTANT shall produce copies of the handouts.

7. The COMMISSION shall provide the sign-in sheet/equipment and personnel for the sign-in table at each public meeting.

8. The CONSULTANT shall record and prepare the meeting minutes of the public meeting and shall prepare the transcript, if applicable.

9. The CONSULTANT shall complete 3D renderings of the preferred alternative concept.

In the event we are still operating under COVID-19 guidelines the CONSULTANT will be requested to help host any virtual public meetings or hearings and help support the MoDOT project webpage for this project. Further guidance can be found in Section 129.3 of the EPG.

III Survey

CONSULTANT shall obtain topographic survey information required for the preparation of preliminary, right of way, and final roadway plans including:

1. Perform a thorough review of the existing survey provided by MoDOT.
2. Coordinate available survey control and benchmarks with surveyors.
    a. Translate control and benchmarks into sheet drawings to be used in construction plans, per EPG.
3. Complete remaining topographic surveys to develop preliminary plans, right-of-way plans and final roadway plans, including all improvements and existing topography within the limits of the project. Topographic surveys shall consist of all pertinent topographic features including, but not limited to:

a. existing drainage and sanitary structures (pipes, types, flowlines, sizes)
b. trees over 4 inches in diameter
c. additional existing retaining wall shots and type of wall
d. building front elevations and pertinent building features
e. pertinent parking lot features
f. driveway joints, pavement types and profiles
g. existing signal equipment surveys
h. drainage swales
i. sign posts, size, identification and photo log
j. pavement marking type
k. miscellaneous roadside identification and photo log
l. lighting
m. other

4. Field locate visible above ground evidence of utilities located within the project area. “Missouri One Call” and MoDOT will be contacted and a formal request will be submitted for marking the locations of member utilities. In the event that “Missouri One Call” fails to respond, in whole or in part, to the formal request, underground facilities, structures, and utilities will be plotted from surveys and/or available records. The locations of all utilities are to be considered approximate. There may be other utilities, whose existence may not be known at the time of the survey.
5. Surveyors to coordinate with utility engineer on underground utility one-call locates.
6. As-needed punch list surveys due to design updates and/or new development.

CONSULTANT shall perform right-of-way surveys necessary for the preparation of preliminary, right of way and final roadway plans including:

1. Identify at the earliest opportunity, the title reports to be ordered by the COMMISSION. This will be coordinated during the preliminary design phase of the project.
2. Locate existing right of way, property lines and pertinent section lines for the entire project limits.
3. Clearly identify linework in drawing with text (i.e. property lines (PL), section lines, quarter-quarter section lines, existing right-of-way, existing easements, etc.
4. Research impacted parcels. Each of these properties within the project limits shall include property owner name, assessor’s map number, last deed book and page, and existing size of parcel in square feet.
5. All property lines shall have a bearing (to the nearest second) and a length (to the nearest hundredth of a foot) shown and the parcel closed within acceptable tolerances governed by the State of Missouri.
6. Incorporate all easements and identified information from the title work into the existing right-of-way drawing.
7. Provide a reference tie drawing with three-point ties.
8. Establish land corner ties.

IV Utility Coordination

The CONSULTANT shall perform the following utility coordination tasks:

1. Coordinate to obtain One-Call tickets to have utilities located in identified areas of proposed project.
2. Obtain maps from utilities of their known locations and adjust survey limits as needed.
3. Coordinate with surveyor to complete utilities survey and verify completeness and accuracy of utility topographical survey.
4. Coordinate submittal of preliminary plans to utility companies.

5. Coordinate with utility companies on the development of the plan of adjustment and obtain cost estimates for reimbursable utilities for the District Utility Engineer's approval.
6. Show the existing utility facilities and plan of adjustments for proposed utilities facilities in the contract plans. (plans sheets, cross sections, culvert sections)

8 Coordinate relocation of each impacted utility on the project during design and construction.

9 Prepare special utility sheets as necessary (including utility profile and exhibits).

10 Assist District Utility Engineer in the preparation of agreements (includes municipal agreements).

11 Identify locations for power service needs, prepare service request for submittal and coordinate with the power company to obtain estimated costs.

12 Coordinate with MoDOT (PM and District Utility Engineer) and to provide SUE test hole information at critical utility locations.

13 Prepare utility job special provision and information for the preparation of the Utility Status Letter for District Utility Engineer.

14 Provide assistance and answer utility related questions during the construction phase for MoDOT staff and the roadway contractor.

V Geotechnical Investigations

The CONSULTANT will perform all geotechnical work and provide the Preliminary Geotechnical Report and Foundation Investigation Report in accordance with section 320 of the MoDOT Engineering Policy Guide (EPG). Other chapters may be applicable.

In addition to the routine geotechnical tests, the CONSULTANT will perform a fertility test.

The CONSULTANT will provide staking for geotechnical boring locations provided by MoDOT.

VI Conceptual Design of Alternatives

The study area for the intersection of Rte. K and Notre Dame Drive has two options (Roundabout and Signal) to further develop and bring to a public meeting for comment.

The CONSULTANT will develop alternatives based on standard practice and previously listed design guides.

The CONSULTANT will develop up to two geometric alternatives. The project study area is shown in Exhibit A.

- Establish horizontal and vertical geometry of alternatives
- Establish typical section of alternatives
- Estimate area of any R/W needed of alternatives
- Identify potential design exceptions that may be required
- Evaluate constructability of the alternatives

The CONSULTANT will develop a conceptual opinion of probable construction cost for each alternative using current year bid tabulations to formulate an order of magnitude cost for each alternative.

The CONSULTANT will prepare a written draft summarizing the findings of Geometric Concepts, Safety Analysis, and Cost Analysis.

The CONSULTANT will submit an electronic copy of the draft report to MoDOT for review of the proposed recommendations and will finalize the report based on MoDOT comments and/or concurrence.

VII Safety Analysis

The CONSULTANT shall perform the following tasks:

1. Initial Coordination / Scoping Meeting with MoDOT (Discuss limits of Study Area)
2. Conduct a safety analysis utilizing methods described within the latest edition of the Highway Safety Manual (HSM).
    - Safety Analysis (Existing Condition)
    - Safety Analysis (Selected proposed alternative)
3. Prepare conceptual signing plan for the recommended alternative configuration.

VIII Preliminary Roadway Design

The CONSULTANT'S attention is directed to Chapter 235 of the MoDOT Engineering Policy Guide (EPG) for general guidelines and requirements for preliminary design. Other chapters may be applicable for preliminary design preparation.

(A) Upon approval of the design criteria memorandum by COMMISSION, the CONSULTANT shall undertake the following to develop the preliminary design phase:

a. Prepare preliminary plans, as outlined in the MoDOT EPG.
    i. The COMMISSION shall furnish the CONSULTANT traffic information for the construction and design years to be used in the preliminary plans.
    ii. The COMMISSION shall furnish the CONSULTANT the latest accident data and traffic information used to calculate the project accident rate. The COMMISSION shall furnish the CONSULTANT the "statewide accident rate for a similar class of roadway" and any high hazard locations within the project limits.
    iii. The CONSULTANT shall submit the preliminary plans to the COMMISSION for review and approval.

b. The preliminary plans shall be prepared in accordance with the applicable sections of the MoDOT EPG, as to what shall be shown thereon, including proposed design features.
    i. The plan view English scale shall be 1"=50' horizontal (or different scale as determined by MoDOT Project Manager for clarity) and extend 100 feet beyond project limits.
    ii. The profile view English scale shall be 1"=50' horizontal, and 1"=10' vertical.

c. The CONSULTANT may have to review preliminary cross sections sufficiently to make a cost comparison between using retaining walls versus acquiring additional right of way for all proposed wall locations.

d. The CONSULTANT shall prepare the construction estimate. The COMMISSION shall prepare the right of way estimate based on the right of way requirements furnished by the CONSULTANT.
e. The preliminary plans shall be submitted to the COMMISSION for review and approval. A letter of transmittal shall be provided with the preliminary plan submittal. The COMMISSION shall furnish the template for the letter of transmittal. The construction cost estimate shall also be submitted with the preliminary plans.
f. The preliminary plans shall include the tentative additional easement and right of way limits, property lines and ownerships, section lines, township and ranges, any U.S. Surveys, city limits, and a general outline of the construction staging, critical design items and other items as outlined in the EPG.
g. Traffic assignments shall be shown on the respective roadways or on a line sketch of the roadways.
h. Typical sections shall indicate heavy, medium or light duty pavement for new roadways, along with descriptions of the existing roadway types remaining in place.

(B) A Preliminary Field Check will be arranged by the CONSULTANT with the COMMISSION to discuss design features in the project area.

(C) The CONSULTANT upon review of the re-evaluation of the EIS shall provide the COMMISSION with information for proper environmental and cultural clearance including submittal of the preliminary stage RES, right of way stage RES and final stage RES. Items that may need to be addressed include historical buildings, archaeological sites, historic bridges, conversion of farmland, endangered species, wetlands, parklands and historical sites.

(D) The CONSULTANT shall prepare and submit the Bridge Survey Report, Bridge Survey Sheets, and Bridge Survey Checklist.

(E) The CONSULTANT shall set horizontal and vertical control for the project and provide the COMMISSION the combined adjustment factor. All control furnished by the CONSULTANT shall use current datums and adjustments.

(F) The CONSULTANT shall provide all land boundary work to the COMMISSION for review and approval prior to right of way plans submittal.

(G) The COMMISSION shall provide the pavement design and general Job Special Provisions related to the project including any special design elements.

(H) The COMMISSION may hold a public meeting for this project and the CONSULTANT will be required to attend. The CONSULTANT shall provide exhibits for MoDOT public meeting as requested.

(I) The CONSULTANT shall provide a land survey plat at the end of the project that shows the boundary survey for the right of way acquired by MoDOT and that is compliant with the current standards for property boundary surveys to be recorded. The COMMISSION will complete all legal/deed descriptions as defined in Section 236.4.6 of MoDOT's Engineering Policy Guide.

IX Preliminary Bridge Design

(A) Perform the geometric analysis at the proposed bridge site necessary to develop type, size and location drawings consisting of a general plan and elevation plan of the structures, typical roadway sections and roadway profiles. This includes preparation of the Bridge Memorandum & Layout (including the itemized preliminary bridge estimate).

(B) The structure and/or box culvert type and size (if applicable) shall be based on roadway alignments, geometric analysis, hydraulic analysis, spill slope requirements, roadway grades and/or clear zone requirements.

(C) The superstructure type shall be dependent upon site constraints and a detailed cost analysis comparison.

(D) All requirements of the Federal Emergency Management Agency's National Flood Insurance Program shall be met.

(E) Discharges will be estimated using USGS Regression Equations and available stream gauge data.

(F) HEC-RAS shall be used to model of the natural, existing and proposed conditions.

(G) Scour calculations shall be performed in accordance with FHWA Hydraulic Engineering Circular No. 18.

(H) The results of the hydrologic, hydraulic and scour analysis shall be documented in the Bridge Hydraulic and Scour Report.

(I) All requirements outlined in the MoDOT Engineering Policy Guide (EPG) shall be met. The CONSULTANT shall follow MoDOT's "practical design" philosophy and submit any design exceptions as necessary.

(J) Develop final detailed design criteria in the form of Bridge Memorandum and Bridge Design Layout documents.

(K) Surveys as needed to stake bridge soundings.

X Section 404 Corps of Engineers Permit

The CONSULTANT shall provide the following information necessary to allow MoDOT staff to apply for any required Section 404 Corps of Engineer Permits. If the permit is required due to bridge construction, the application data shall be submitted no later than with the T.S.&L. drawings. All information should be provided to the MoDOT Project Manager who will forward the information to Central Office Design.

(A) Provide the amount and type of excavation and material that will be used in streams, lakes, and wetlands below the Corps of Engineers' ordinary high water line (OHL) elevations.

(B) Provide location and quantities of permanent berms and spill fills below OHL.
   a. Earth fill, rock blanket (square feet and cubic yards)
   b. Rock blanket along right descending bank and left descending bank (linear feet)
   c. Rock ditch (square feet)

(C) Provide location, excavation and size of pier below OHL.
   a. Excavation (cubic yards)
   b. Pier (square feet)

(D) Provide channel realignment data.
   a. Existing channel length of section to be modified (feet)
   b. Average channel width of section to be modified (feet)
   c. Realigned section, length and width (feet)

(E) Provide temporary fill amounts in wetlands or below OHL in streams.
   a. Earth fill (square feet and cubic yards)
   b. Class C (square feet and cubic yards)

(F) Provide information about temporary fills and shoring.
   a. Location of temporary fills and shoring
   b. Source of material
   c. Final disposition of removed materials

(G) Provide information about temporary culverts.
   a. Number of culverts
   b. Size (inches)
   c. Length (feet)

(H) Provide information on channel cleanout – excavation below OHL.
   a. Cleanout upstream and downstream of structure (linear feet)
   b. Total quantity of material to be removed below OHL (square feet and cubic yards)

(I) Provide 8 ½-inch by 11-inch copies of any plan or profile sheets required for the permit application.

(J) Provide bridge elevation and plan views with OHL indicated.

XI Right of Way Design

(A) The CONSULTANT shall prepare right of way plans, which may be separate drawings from those used for design and construction details. The right of way plans shall show alignment, geometric design, removal of improvements, drainage facilities, property lines and ownership, sub-division lot lines, other land survey information, street lines and existing right of way and easements. The CONSULTANT should also include any plan details, which will require additional right of way or permanent, temporary or utility easements during the construction phase of the project such as bypasses, temporary erosion control, etc. Right of way plans include title sheet, typical sections, profile sheets, and cross sections of the roadway, entrances and side roads. Areas of new right of way, permanent easements and/or temporary easements required from each individual property owner may be shown in tabular form on the respective sheets.

   a. The CONSULTANT shall finalize any previous review of the roadway cross sections sufficiently to determine the feasibility of constructing retaining walls versus obtaining additional right of way. This final review shall consist of construction estimates versus right of way estimates.

b. Upon completion of the estimates by COMMISSION and CONSULTANT, the CONSULTANT shall recommend to the COMMISSION a choice at the various locations which warrant consideration of the alternate retaining wall versus right of way solutions. The COMMISSION shall make the final determination of purchasing right of way, or constructing retaining walls.

(B) Right of way plans shall be submitted to the COMMISSION for review and approval. The right of way plans shall be at the same scale as the construction plans. The right of way plans shall include any design details that will control the width of right of way and necessary easements.

a. New right of way lines and all easements shall be dimensioned by station and offset distance from the centerline, or cross road centerlines, if necessary. Bearings and distances on the right of way lines may be required.
b. The following minimum design features shall be included on the right of way plans:
    i. Title sheet with appropriate project limits, access note and traffic data completed.
    ii. Typical Sections
    iii. Cross sections at 100' intervals, including additional sections at each entrance with new and existing entrance grades.
    iv. Construction limits (slope lines); drainage facilities; entrances and their reference location, width and type along with their existing and future grade percentage; property owners, with areas of new right of way, easements and remaining property; centerline bearing, ties to legal land corners from centerline stations with notation for corner witness by a registered land surveyor; existing utility locations and easements, including replacement utility easements; horizontal curvature information; and proper right of way symbolization for new right of way (access control) and easements, including areas which may be required to accommodate temporary erosion control.
    v. Township, Range, Section and/or U.S. Survey information broken down t ¼ ¼ section line level on each plan sheet near the title block or appropriate survey/section line.

(C) The CONSULTANT shall provide an updated construction estimate for the Right of Way design stage.

(D) The COMMISSION shall review, approve and certify the right of way plans as completed by the CONSULTANT. The CONSULTANT shall provide one (1) electronic set of fully signed and sealed right of way plans, for the COMMISSION'S use.

(E) The COMMISSION shall provide title insurance information for all parcels with new right of way acquisition and the last deed of record for any parcel with easements.

(F) The COMMISSION will prepare right of way appraisals and secure the necessary right of way by negotiation or condemnation, if necessary, for construction of this project.

(G) The CONSULTANT shall be responsible for staking and re-staking tentative right of way on individual properties, as required by MoDOT staff, during right of way negotiation and acquisition phase of the project. The CONSULTANT shall also set permanent monuments as shown on the recordable land survey.

(H) The CONSULTANT shall be responsible for making all revisions to the right of way and construction plans due to negotiations with the property owners in an effort to acquire right of way.

(I) The COMMISSION shall write legal/deed descriptions for all right of way acquisitions on MoDOT's approved Exhibit A form and submit to CONSULTANT for signature and seal.

(J) The CONSULTANT will provide the COMMISSION with information for proper environmental and cultural clearance including submittal of the Right of Way stage RES. Items that may need to be addressed include historical buildings, archaeological sites, historic bridges, conversion of farmland, endangered species, wetlands, parklands and historical sites, 401 permit and floodplain development permit.

XII Final Roadway Design

(A) The CONSULTANT shall coordinate with the COMMISSION any utility company activities for adjustments required to be included in the final design plans.

(B) The COMMISSION will secure execution of municipal agreements with the cities and/or county agreements. A copy of the executed agreements will be furnished to the CONSULTANT for his information. The CONSULTANT shall conform to all design provisions of these agreements.

(C) A final design field check shall be held with CONSULTANT and COMMISSION representatives prior to completing final design plan quantities. The CONSULTANT shall make any necessary revisions to the final plans as determined by this design field check.

(D) The CONSULTANT shall prepare detailed temporary erosion control plans for review and approval before inclusion in the final design plans.

(E) The CONSULTANT shall prepare computations for all design plan quantities. All plan quantities shall be shown on the Quantity Sheets, by construction stage, if applicable. The format for these sheets shall be furnished by the COMMISSION. Specialty items may have separate sheets for quantity tabulations.

(F) The CONSULTANT shall prepare for review and approval by the COMMISSION all General Job Special Provisions, which are to supersede the Missouri Standard Specification for Highway Construction. A brief reason for the deviation from the standard plans and specifications should also be provided. The CONSULTANT shall prepare only Job Special Provisions related to design elements shown in the plans.

(G) The following list shall be considered the minimum requirements for a complete set of Final Design Plans.

a. Title Sheet
b. Typical Sections
c. Quantity Sheets
d. Plan Sheets at 1”=50’ horizontal (or different scale as determined by MoDOT Project Manager for clarity). Plan sheets shall include all necessary adjustments to signing and proposed pavement marking.
e. Profile Sheets at 1”=50’ horizontal and 1”=10’ vertical
f. Culvert Sections at 1”=10’, if needed
g. Special Sheets for geometrics, referenced points, grading plan, traffic control plan, temporary erosion control plan and any other sheets for special design features.
h. Earthwork Quantities, Cross Sections at 100’ intervals, 1”=10’ (1:100), horizontal and vertical, including entrance sections with existing and proposed grades
i. Tabulation of Quantity Sheets
j. Job Special Provisions in electronic format readable in COMMISSION’S current word processor
k. File with the bid items and quantities as generated by COMMISSION’S Estimate Program
l. Construction Workday Study
m. Transportation Management Plan
n. Final Plans Checklist Form D-12

(H) Additional plans and information may be required to complete the Final Design Plans. With the submittal of the Final Design the CONSULTANT shall also provide the COMMISSION a statement that an internal quality control check has been conducted and to the best of the CONSULTANT’S knowledge the final design plans are free of gross errors, misleading or confusing typos, and includes adequate information to construct the project.

(I) The CONSULTANT shall prepare all plans through the use of a Computer Aided Drafting (CAD) program. The CONSULTANT shall conform to MoDOT’s Specifications for Computer Deliverable Contract Plans as referenced in the MoDOT EPG. The CONSULTANT shall use Microstation and Geopak SS4.

(J) The CONSULTANT shall furnish the COMMISSION the following completed sheets and documents, as applicable, for each separate construction project included in this contract, as follows:

a. Final Plans showing profile grades, geometric data, alignment data, etc.
b. One (1) electronic copy of the location sketch for Commission Approval submitted in electronic format.
c. Draft copy of the job special provisions related to design elements for review. After corrections, the job special provisions shall be furnished in electronic format utilizing the COMMISSION’S latest word processing program.
d. One (1) legible electronic copy of engineering calculations and analysis.
e. One (1) electronic copy of a complete summary of quantities and estimate of construction costs. The estimate shall be prepared using the latest version of MoDOT’s ESTIMATE program.
f. One (1) electronic copy of a workday study showing the estimated number of

workdays required to construct each project.

g. The CONSULTANT shall provide a 3D model of the project exported from Geopak SS4 software for the COMMISSION'S use.

XIII Final Bridge Design

Furnish to the COMMISSION fully checked design plans, job special provisions, design computations, quantity computations, final cost estimate, and a construction work day study for the structure(s). The CONSULTANT is expected to make the COMMISSION aware of more economical design alternatives that may become apparent during the preparation of the final design.

(A) The plans shall be complete and shall cover all parts of the structure they represent. The degree of detail shall be comparable to that furnished on typical plans prepared by the COMMISSION. High resolution final signed and sealed plans, will be submitted in Adobe Acrobat Reader format version 7 or higher. Final signed and sealed plans shall be in pdf full size (34" x 22") format. These deliverables shall use the file naming convention and be in accordance with the "Specifications of Computer Deliverable Contract Plans" requirement outlined in the Commission's Engineering Policy Guide, Section 237.13.3. The electronic plans in Microstation format cannot be signed and sealed. The electronic submittals shall be made in a method suitable to MoDOT.

(B) All construction changes made to the plans during construction of the project shall also be submitted electronically in Adobe Acrobat and Microstation format.

(C) The job special provisions shall be complete and describe all design features, construction procedures, or material requirements in the plans that are deviations from the latest edition of the Missouri Standard Plans for Highway Construction. Typical job special provisions that have been developed by MoDOT for previous jobs are posted on MoDOT's website and are available for use and modification as needed. The job special provisions shall include a table of contents sheet that is signed and sealed by a professional engineer registered in Missouri. The signed and sealed job special provisions shall also be submitted in Adobe Acrobat Reader format, version 7 or higher. Job Special Provisions shall also be submitted in Microstation Word format. The submittal letter shall explain the need for each provision.

(D) The design computations and plans shall be acceptable to, and will become the property of the Commission. The CONSULTANT shall submit design computations in Adobe Acrobat Reader version 7.0 format or greater. The files shall be transferred in a manner acceptable to MoDOT. The design computations shall contain an index file, with electronic links to the files contained within. Submittals shall include a set of design computations for each bridge. The design computations shall not be combined with the Microstation or the Adobe Acrobat Reader submittals.

(E) The final estimate submitted by the CONSULTANT shall include backup material that supports the estimates made for non-standard or lump sum pay items.

(F) The CONSULTANT shall submit the hours and cost summarizing the design effort for each bridge. The summary shall include separate amounts for: Number of Hours for Bridge Preliminary Design, Cost of Bridge Preliminary Design, Number of Hours for Bridge Final

Design, Cost of Bridge Final Design. Generally, the above amounts should include all hours and costs invoiced that are attributable to bridge design and plans preparation up to the point of turning in the signed and sealed plans. It should not include hours attributable to preparing the bridge survey, final construction cost estimate, or workday study.

XIV Construction Support

(A) The CONSULTANT shall be available to the COMMISSION to discuss and interpret plans and specifications during the bidding and construction phase of the project as determined necessary by the Engineer.

(B) The CONSULTANT may be required to attend a pre-construction meeting, and a post construction meeting.

(C) If issues arise during construction, there will be a direct line of communication established between the MoDOT Construction Office and the CONSULTANT. The CONSULTANT will immediately inform the MoDOT Design Division or MoDOT Bridge Division of any recommendations or clarifications made to the Construction Office.

XV Deliverables

The CONSULTANT will furnish the following completed drawings and documents to MoDOT. Electronic deliverables in in pdf format and/or dgn files will be provided.

- Electronic topographic drawings in Microstation .dgn format
- Electronic DTM files created and supplemental surveys
- Electronic field survey data drawings in Microstation .dgn format
- Electronic copy of the Draft Conceptual Alternatives Report
- Electronic copy of the Final Alternatives Report
- Electronic copy of a Design Criteria Table
- Electronic copy of the conceptual opinion of probable construction cost for recommended alternative
- Up to ten (10) special maps/exhibits created for use during stakeholder meetings or for other use by MoDOT
- One (1) full-size hard copy of the current alternatives for each Core Team Meeting

- Two (2) full-size hard copies of the alternatives and preferred alternative, mounted on foam core for MoDOT's use during the Public Information Meeting

- One (1) copy of the project schedule (likely in Microsoft Project Format) and as pdf

- Electronic copy of the project progress report each month in which there is activity on the project. An updated project schedule and budget summary will be included in the report.

XVI Environmental Services

Noise Study

Based on the project understanding, it is anticipated that the following deliverables or tasks will not be part of this scope of services. The project will follow procedures outlined in 23 CFR Part 772 and the COMMISSION's Engineering Policy Guide (EPG) 127.13 *Noise.*

Task 1 – Project Management

The CONSULTANT will coordinate with MoDOT as needed throughout the duration of the project. It is assumed that face to face meetings will be limited to no more than one (1). Day to day project coordination with the COMMISSION will be conducted by phone or email.

Task 2 – Traffic Noise Monitoring

Traffic noise monitoring will be conducted at locations coordinated with MoDOT for purposes of validating the traffic noise model. Short-term noise monitoring will be conducted for up to 30 minutes in each location during a time during or near peak traffic conditions. If time allows, each site will be monitored for two sessions.

Traffic volumes will be counted during the monitoring period along with recording weather data. Additionally, any observations regarding the noise environment will be documented, such as other noise sources. The monitoring results will be provided in the technical memorandum.

Task 3 – Traffic Noise Analysis, Noise Abatement Analysis, and Noise Contours

The FHWA approved Traffic Noise Model (TNM) version 2.5 will be used to evaluate traffic noise for the identified sensitive receptors in the project corridor.

The build alternative (design year) and the existing year (base year/current geometry) will be modeled. Noise levels during peak hourly traffic volumes will be determined using TNM. Traffic noise impacts will be identified based on the build scenario results and the change in traffic noise levels between the existing and build scenario.

Traffic noise abatement will be evaluated for the receptor locations where a traffic noise impact has been identified. For the purposes of the abatement evaluation, traffic noise walls will be analyzed and evaluated against MoDOT's noise policy criteria for feasibility and reasonableness.

Noise levels on undeveloped land not permitted for development will be determined to share with the local officials as required by the FHWA noise regulations (23 CFR 772). An exhibit will be developed showing contoured noise levels on these lands for forwarding to the appropriate local agency with permitting authority. It is anticipated that MoDOT will coordinate this effort with the local officials. Noise abatement will not be evaluated for these locations.

Task 4 – Technical Memorandum

A noise technical memorandum will be prepared to summarize the project areas characteristics, methodologies, receptor characteristics, noise monitoring results, the traffic noise impact analysis, the noise abatement evaluation, if applicable, and noise contours on undeveloped adjacent lands. For purposes of coordination, one draft memorandum will be provided to the COMMISSION. Once the comments are received from the COMMISSION, a final memorandum will be issued.

DELIVERABLES to the COMMISSION

The CONSULTANT shall prepare all noise analysis computations through TNM software. The CONSULTANT shall conform to the MoDOT EPG 127.13 Noise and 23 CFR Part 772. The CONSULTANT shall furnish the COMMISSION the following:

- Noise Study Technical Memorandum (one draft and one final)

STANDARDS

The CONSULTANT shall use the latest version of the following publications as applicable to determine the noise analysis and procedures which will be followed for the development of this project:

- MoDOT "Engineering Policy Guide (EPG)"
- Code of Federal Regulations (CFR) Title 23, Chapter I, Subchapter H, Part 772

SERVICES PROVIDED BY THE COMMISSION

The following data and information will be required for the traffic noise analysis. In addition, the following specific items will be furnished or performed by the COMMISSION:

- Peak-hour traffic volumes broken down by direction, ramps, and cross-streets (existing and build)
- Posted speed limits (existing and build)
- Traffic composition, including automobiles, medium trucks and heavy trucks (existing and build)
- Landowner access letter from the COMMISSION to provide access to private property for purposes of noise monitoring

Consultant CE/CE2/EA Re-evaluation Historic Preservation Studies

Deliverables

- Report on results of survey for SHPO/consulting parties
    - Research Design
    - New and Updated Site Forms
    - Recovered artifacts, archaeological field notes and lab forms, either originals or copies, shall be submitted to MoDOT HP upon acceptance of the final report
- Effects assessment for SHPO/consulting parties
- Adequate mapping for consultation purposes (APE, Project Study Area, Historic Properties, Effects)—presented in a logical and reasonable manner
- Complete descriptions of historic properties for Council notification/invitation (suitable for cut/paste)

Consultation Milestones (NEPA/Section 106)**:**

- Purpose and Need (APE and Survey Methods)
- Public meeting (if there is one at this point consult public about project effects, potential mitigation measures)
- Results of the Survey (Effect assessments on architecture, results of the archaeological survey, development of mitigation measures, if necessary)
- Draft Agreement Document, if necessary; consult with public about mitigation measures
- Draft Section 4(f) Evaluation if necessary
- CE/CE2 Approval (Executed Agreement Document) [also Final Section 4(f) Evaluation if necessary]

Tasks

The results of the built environment (e.g., buildings, bridges, etc.) and archaeological investigations can be presented in single or separate reports. It is recommended that the cultural resources consultant meet with the MoDOT Historic Preservation (HP) staff at the outset of the study to set expectations and discuss issues (e.g., project schedule, notification of potential Section 4(f) issues, current version of built environment methods, consultation and who is responsible for conducting it, etc.). If an agreement document is required (e.g., Memorandum of Agreement or Programmatic Agreement), the consultant shall develop one document to address all adversely affected historic properties.

1) Consult with MoDOT HP to establish the area of potential effects (APE) for the archaeological and architectural surveys. MoDOT HP approval on the APE must be provided before any of the following steps are initiated.

2) Develop a concise historic context early during the project to guide the investigations to identify and evaluate historic properties, or explain their absence, in the study area. The context shall:

    a) Synthesize information from all related disciplines, including history, architectural history, bridge history, and archaeology.

    b) Include a review of archival sources and a summary of existing archaeological, architectural, and bridge records.

    c) Identify types and likelihood of cultural resources.

3) Pre-Survey Work

    a) Submit a written Research Design to MoDOT HP, which will need to be approved before fieldwork is started

    b) Verify that MoDOT HP has drafted a Tribal Notification and that Federal Highway Administration has submitted to interested Tribes.

    c) Work with SHPO to contact identified consulting parties.

    d) Develop a draft consultation plan. Consultation will continue throughout the project and will be driven by the type/number of historic properties and potential effects upon them.

4) The architectural survey will follow the MoDOT Built Environment Resources Methods and will identify and document all architectural resources (i.e., buildings, structures, objects, sites, and districts/landscapes) that are forty or more years of age located within the APE.

    a) Review and summarize the existing architectural records for the study area.

    b) Record the location of cemeteries identified during the architectural investigations.

    c) Develop Evaluations of Eligibility (EOEs) for all architectural resources forty or more years of age recommended as eligible for the National Register of Historic Places (NRHP) within the

APE of each reasonable alternative for the Draft Environmental Document. The characteristics that make the property eligible should be identified to help make effect determinations. An EOE will be based on the evaluation of a resource's significance by the cultural resource consultant and MoDOT staff. The EOE shall include:

i) NRHP criteria

ii) Area(s) of significance

iii) Period(s) of significance

iv) Recommended NRHP boundary

v) Contributing and non-contributing resources within the boundary

vi) An evaluation of all elements within the setting

d) Determine the effect of the project (as defined by 36 CFR 800.5), if any, on the NRHP eligible property or properties, and the nature of the effect.

5) The historic bridge survey will follow the MoDOT Built Environment Resources Methods and will identify and document all bridge resources (i.e., highway, railroad and pedestrian bridges, viaducts and culverts, excluding metal, plastic and reinforced concrete pipes) located within the APE

a) Contact MoDOT's Architectural Historian at the beginning of the investigation as a large amount of data on bridge recourses is already available, including potential NRHP eligibility. A shape file of the project area should be provided to MoDOT so that all bridges within the study area can be identified. Work with MoDOT HP staff to determine if the Interstate Exemption, Program Comment for Post-1945 Concrete and Steel Bridges or if statewide or thematic Programmatic Agreements apply to bridges in the APE.

b) Work with MoDOT staff to develop EOEs for all bridge resources within the APE.

c) Determine the effect of the project (as defined by 36 CFR 800.5), if any, on the NRHP eligible bridge resources.

6) The consultant will complete the archaeological investigation within the APE to identify prehistoric and historic sites. For archaeology, this current scope of services covers only consultant services through the Phase I survey and the subsequent Phase I survey report.

a) Record location of cemeteries identified during the archaeological investigations.

b) Prepare and submit new and updated site forms to MoDOT HP

c) Consult with MoDOT's Archaeologist following the completion of the survey on preliminary NRHP evaluations for each identified archaeological site.

d) For sites determined eligible for the NRHP, either previously or as a result of the current Phase I survey, establish the effect of the project (as defined by 36 CFR 800.5), if any, and the nature of the effect.

e) Draft a proposed Phase II testing plan (i.e., why the site may be NRHP eligible and the methods to test it) for those sites in the APE that are determined to be potentially NRHP eligible.

7) The results of the built environment (e.g., buildings, bridges, etc.) and archaeological investigations including effects on resources eligible for listing on the NRHP, can be presented in single or separate reports. An example of a MoDOT survey report is available. Anticipate two rounds of revisions to the report(s). MoDOT will forward an acceptable Phase I report to the Missouri State Historic Preservation Officer (SHPO) for their concurrence with the recommendations. If MoDOT and the consultant cannot agree upon NRHP eligibility recommendations and/or project effects on historic properties, the report will be submitted with the consultant's recommendations, while MoDOT will present its own recommendations in a cover letter

8) Artifacts (prepared for curation), field notes and photographs, and digital data (e.g., databases, GIS shapefiles) shall be provided to MoDOT HP once SHPO concurs with the findings of the investigations

9) Agreement Document

a) If an agreement document is required (e.g., Memorandum of Agreement or Programmatic Agreement), one document will be drafted to address all adversely affected historic properties.

b) Consult with MoDOT HP and SHPO to identify additional consulting parties. Consultation will continue throughout the project and will be driven by the type/number of historic properties and potential effects upon them.

c) Develop a draft consultation plan.

d) Coordinate with MoDOT HP staff to setup a meeting with the SHPO and consulting parties to establish mitigation measures for adversely affected historic properties.

e) Prepare a draft MOA/PA covering those historic properties affected by the project.

f) A final MOA/PA covering those historic properties affected by the preferred alternative is required for the CE/CE2

10) Section 4(f) Evaluation

a) Prepare a Bridge Programmatic Section 4(f) Evaluation if bridges are the only Section 4(f) resources.

b) If other Section 4(f) resources are present prepare a Section 4(f) Evaluation, with an executed MOA/PA, covering those resources. An individual Section 4(f) evaluation must address all Section 4(f) resources, including parks, recreation areas and wildlife or waterfowl refuges, and *de minimis* uses.

X Preliminary Roadway Design

(A) The Consultant’s attention is directed to Section 200 of the EPG for general guidelines and requirements for preliminary design. Other sections may be applicable for preliminary design preparation.

(B) Upon approval of the design criteria memorandum by the Commission, the Consultant shall undertake the following to develop the preliminary design phase:

(1) Perform design to develop a preliminary design with the plan portion showing existing topography and contours and the profile to show grades. The base drawings for the preliminary plans shall be used later as full-scale base drawings for final design plans.

(2) The preliminary plans shall be prepared in accordance with the applicable sections of the MoDOT EPG, as to what shall be shown thereon, including proposed design features.

(a) The plan view English scale shall be 1"=100' horizontal (or 1”=50’ if deemed necessary by MoDOT Project Manager for clarity) and extend at least 500 feet beyond the project limits.

(b) The profile view English scale shall be 1"=100' horizontal (or 1”=50’ if deemed necessary by MoDOT Project Manager for clarity) and 1"=5' vertical.

(3) The Consultant may have to review preliminary cross sections to sufficiently assess the need for right-of-way or easements and develop a cost analysis for using retaining walls.

(4) The Consultant shall prepare the preliminary construction estimate.

(5) The preliminary plans shall include approximate existing right-of-way limits for the purposes of showing construction limits, property lines and ownerships, section lines, township and ranges, any U.S. Surveys, city limits, and a general outline of the construction staging, critical design items, and other items as outlined in the EPG.

(6) Forecasted traffic data shall be shown on the title sheet. Turning movement volumes, if applicable, shall be shown using a line sketch. The Commission shall furnish the Consultant traffic information for the construction and design years to be used for the preliminary and final design.

(7) Typical sections shall indicate heavy, medium or light duty pavement for new roadways, along with descriptions of the existing roadway types

remaining in place.

(8) The draft preliminary plans and estimate shall be submitted to the Commission for review and approval.

(C) A preliminary field check will be arranged with the Commission to discuss design features in the project area.

(D) The preliminary plans shall be submitted to the Commission for review and approval.

(E) A public meeting may be held after approval of the preliminary plans. If necessary, the Commission will advertise for the public meeting and will set a date, time, and place. The Consultant's representative will be required to brief the Commission's personnel before the meeting, and to participate in the meeting. The Consultant shall provide exhibits and handouts as requested by the Commission. The Consultant will record and prepare the meeting summary and transcript (if applicable).

(F) Right-of-way acquisition, including permanent and temporary easements, may be necessary for this project.

(G) If necessary, the Consultant shall prepare a Soil Survey/Preliminary Geotechnical Report in accordance to MoDOT's EPG.

(H) The Consultant shall prepare Bridge Survey Reports, Grade Separation Reports, and/or Retaining Wall Reports, in accordance with Section 747 of the EPG, for review and approval by the Commission.

XI Right-of-Way Design

(A) The Consultant shall prepare right-of-way plans, which may be separate drawings from those used for design and construction details. The right-of-way plans shall show alignment, geometric design, removal of improvements, drainage facilities, property lines and ownership, other land survey information, street lines and existing right-of-way and easements. The Consultant should also include any plan details, which will require additional right-of-way or easements during the construction phase of the project such as bypasses, temporary erosion control, etc. Right-of-way plans include title sheet, typical sections, profile sheets, and cross sections of the roadway, entrances, and side roads. Areas of new right-of-way, permanent easements and/or temporary easements required from each individual property owner may be shown in tabular form on the respective sheets.

(1) The Consultant shall finalize any previous review of the roadway cross sections sufficiently to determine the feasibility of constructing retaining walls versus obtaining additional right-of-way. This final review shall consist of construction estimates versus right-of-way estimates.

(2) Upon completion of the estimates by the Commission and Consultant, the Consultant shall recommend to the Commission a choice at the various

locations which warrant consideration of the alternate retaining wall versus right-of-way solutions. The Commission shall make the final determination of purchasing right-of-way, or constructing retaining walls.

(B) Right-of-way plans shall be submitted to the Commission for review and approval. The right-of-way plans shall be at the same scale as the construction plans. The right-of-way plans shall include any design details that will control the width of right-of-way and necessary easements.

(1) New right-of-way lines and all easements shall be dimensioned from the centerline, or cross road centerlines, if necessary. Bearings and distances on the right-of-way lines may be required.

(2) The following minimum design features shall be included on the right-of-way plans:

(a) Title sheet with the appropriate project limits, access note and traffic data completed.

(b) Typical sections

(c) Cross sections at <u>50' intervals</u>, 1”=10’ (horizontal and vertical), including additional sections at each entrance with new and existing entrance grades.

(d) Construction limits (slope lines); drainage facilities; entrances and their reference location, width and type; property owners, with areas of new right-of-way, easements and remaining property; centerline bearing, ties to legal land corners from centerline stations with notation for corner witness by a registered land surveyor; existing utility locations and easements, including replacement utility easements; horizontal curvature information; and proper right-of-way symbolization for new right-of-way (access control) and easements, including areas which may be required to accommodate temporary erosion control.

(e) Township, Range, Section and/or U.S. Survey information on each plan sheet near the title block or appropriate survey/section line.

(C) The Commission shall arrange for a design field check to review right-of-way plans with the Consultant and right-of-way personnel prior to completion of the right-of-way plans. The Consultant shall make any necessary revisions to the right-of-way plans as determined by this design field check.

(D) The Commission shall review, approve, and certify the right-of-way plans as completed by the Consultant. The Consultant shall provide one (1) electronic set of fully signed and sealed right-of-way plans, for the Commission’s further use.

(E) The Commission will provide title insurance information, prepare right-of-way appraisals and secure the necessary right-of-way by negotiation or condemnation, if necessary, for construction of this project.

(F) The Consultant shall be responsible for making all revisions to the right-of-way and construction plans due to negotiations with the property owners in an effort to acquire the right-of-way.

XII Final Roadway Design

(A) The Consultant shall prepare storm water drainage and hydraulic studies and detailed drainage plans, including both pavement and crossroad drainage, for review and approval by the Commission before inclusion in the final design plans.

(B) Upon request, the Consultant shall furnish design plans, which show drainage facilities, signing, cross sections and roadway design features, for the Commission’s handling and coordination with the utility companies' existing facilities, and proposed plans of adjustments. The Consultant shall revise plans to adhere to all utility company standards and requirements, and make necessary utility plan revisions as become necessary during final plan design and approvals. The Commission shall coordinate utility company activities for any adjustments required to be included in the final design plans.

(C) The Commission will secure execution of any municipal agreements with the city. A copy of the executed agreements will be furnished to the Consultant for his information. The Consultant shall conform to all design provisions of these agreements.

(D) The design plans shall include a detailed traffic control plan with an outline for construction staging conforming to the requirements of the MUTCD and the MoDOT EPG and as may be supplemented by samples provided by the Commission. The traffic control plan requires submittal to the Commission for review and approval prior to inclusion in the final design plans.

(E) A final design field check and/or meeting shall be held with Consultant and Commission representatives prior to completing final design plan quantities. The Consultant shall make any necessary revisions to the final plans as determined by this design field check.

(F) The Consultant shall prepare detailed temporary erosion control plans for review and approval before inclusion in the final design plans.

(G) The Consultant shall prepare computations for all design plan quantities. All plan quantities shall be shown on the Quantities Sheets, by construction stage, if applicable. The format for these sheets shall be furnished by the Commission. Specialty items may have separate sheets for quantity tabulations.

(H) The Consultant shall prepare for review and approval by the Commission all necessary Job Special Provisions, which are to supersede the Missouri Standard Specifications for Highway Construction. A brief reason for the deviation from the standard plans and specifications should also be provided.

(I) The Consultant shall be responsible for all incidental surveying and staking that is required to gather data or provide control for the detailed design of the project. This shall include, but not be limited to staking for geotechnical investigations.

XIII Plans, Specifications, and Estimate (PS&E)

(A) The plans, specifications, and estimate shall be prepared in accordance with Section 237 of the EPG. The following list shall be considered as the minimum requirements for a complete set of Final Design Plans.

(1) Title Sheet

(2) Typical Sections

(3) Quantities Sheets

(4) Plan-Profile Sheets at 1”=100’ or 1”=50’ horizontal and 1”=10’ or 1”=5’ vertical

(5) Reference Points & Coordinate Points Sheet

(6) Special Sheets (geometrics, staging, design details, etc.)

(7) Traffic Control Sheets

(8) Erosion Control Sheets

(9) Lighting Sheets (including lighting quantity sheets)

(10) Signals Sheets

(11) Signing Sheets (including signing quantity sheets)

(12) Pavement Marking Sheets

(13) Culvert Sections at 1’=10’ horizontal and vertical

(14) Bridge Plans (complete set for each structure)

(15) Cross Sections at 1”=10’ horizontal and vertical (including earthwork quantities and entrance sections with existing/proposed grades)

(16) Job Special Provisions in a format readable in Microsoft Word, and electronic file with the bid items and quantities as generated by Commission’s Bid Tabs Professional

(17) Construction working days study

(B) Additional plans and information may be required to complete the Final Design Plans. With the submittal of the Final Design the Consultant shall also provide the Commission a statement that an internal quality control check has been conducted and to the best of the Consultant’s knowledge the final design plans are free of gross errors, misleading or confusing typos, and includes adequate information to construct the project.

XIV Bidding and Construction Support

(A) After the Final Design Phase of the project is completed the Consultant shall be available to the Commission to discuss and interpret the plans and specifications during the bidding and construction phase of the project as determined necessary by the Engineer. During this phase of the project the Consultant may also be required to attend the pre-construction meeting and post construction meeting. If a partnering meeting is held between the construction contractor and MoDOT personnel, the Consultant may be required to attend.

XV Drawing and Document Deliverables

(A) The Consultant shall prepare all plans through use of a Computer Aided Drafting (CAD) program. Unless otherwise specified, all plan sheets, CAD plots, and other project documents shall be provided to the Commission in electronic format and shall conform to MoDOT's *Specifications for Computer Deliverable Contract Plans* and file naming convention outlined in Section 237 of the EPG.

(B) The Consultant shall furnish the Commission the following completed sheets and documents, as applicable, for each separate construction project included in this contract, as follows:

(C) <u>Roadway Deliverables</u>

(1) Preliminary plans showing profile grades, geometric data, alignment data, etc.

(2) Bridge Survey Report, Grade Separation Report, and/or Retaining Wall Report for each structure, Forms BR 105R, 105 S1, and 105 S2, as necessary.

(3) Field check and core team meeting summaries.

(4) Preliminary roadway plans, culvert and cross sections, and all drainage computations.

(5) Preliminary highway signing layouts for initial review and comments.

(6) Plans for utility review, including culvert sections and cross sections. Additional sets will be required for each utility involved.

(7) Traffic control plan for review and comments.

(8) Job special provisions for review.

(9) Fully checked, original drawings of the final design plans.

(10) Engineering calculations and analysis in a PDF document.

(11) Summary of quantities and estimate of the construction costs. The estimate shall be prepared using the latest version of Bid Tabs Professional program.

(12) Working days study showing the estimated number of workdays required to construct each project.

EXHIBIT "IV"

PERIOD OF SERVICE

The Consultant shall make submittals in accordance with the schedule described below.

Period of Service	J9S3847		
Bridge(Box Culverts)	A3250 & A3251		
Letting	FY 26(Oct. 2025)		
PSE	08/1/2025		
100% Review Plans	07/1/2025		
Final RES	07/1/2025		
TSL Bridge Drawings	4/1/2024		
ROW Plans	8/1/2024		
Bridge Memo	2/1/2024		
Public Meeting Exhibits	10/1/2023		
Preliminary Roadway Plans	2/1/2024		
Preliminary RES	2/1/2024		

PERIOD OF SERVICE – The total period of service including construction services is expected to be completed by December 1st, 2028.

DESIGN DESIGNATION

AADT - 2024 = 13620
AADT - 2044 = 18713
DHV = 50%
T = 4%
V = 45/50/55 MPH
D = 11%

FUNCTIONAL CLASSIFICATION - MAJOR COLLECTOR

NORMAL RIGHT OF WAY

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

PLANS FOR PROPOSED
STATE HIGHWAY

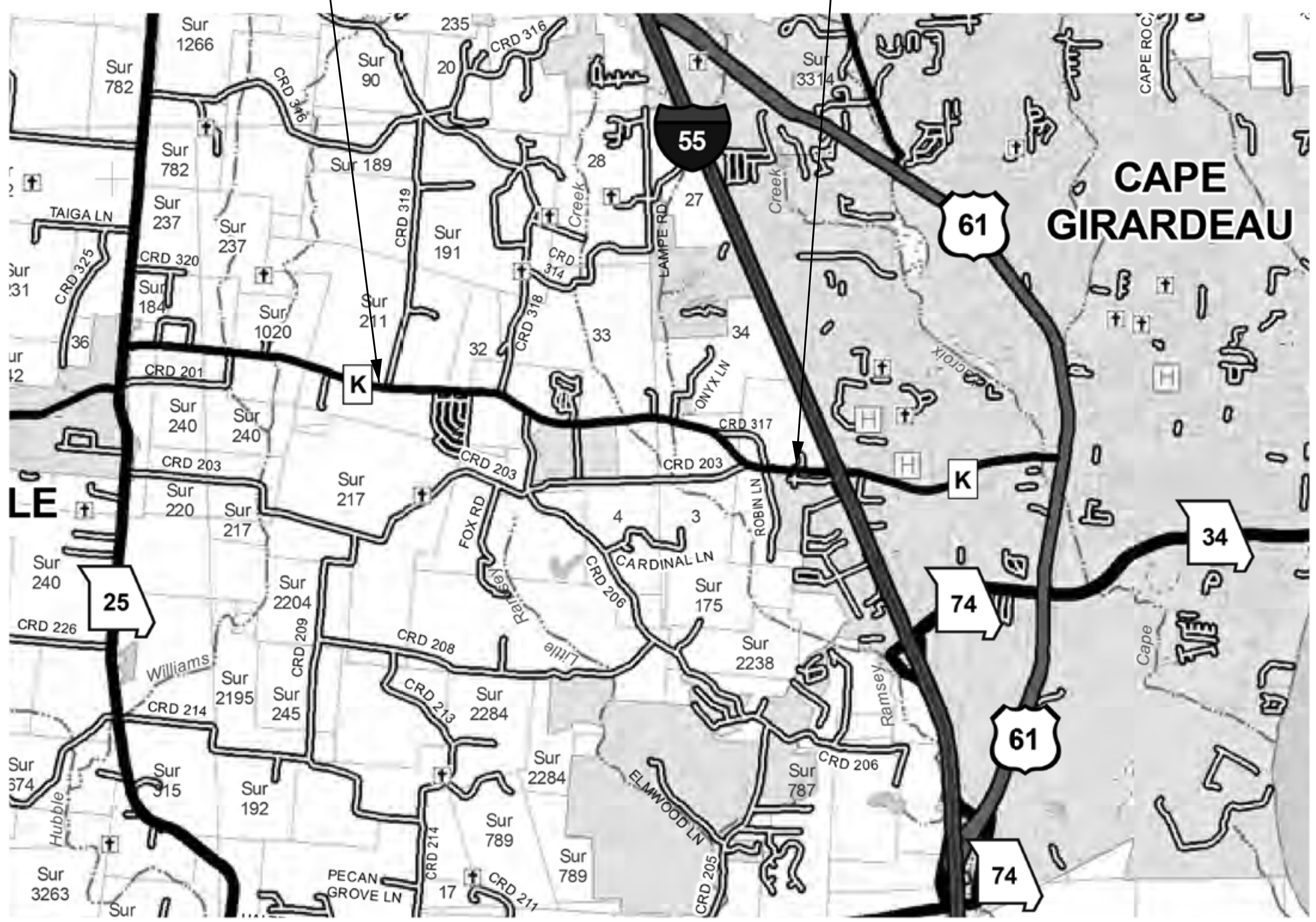
CAPE GIRARDEAU COUNTY
PRELIMINARY PLANS

PROJECT LIMITS
PAVEMENT IMPROVEMENTS

STA 86+60.00

STA 248+50.00

T 31 N
T 30 N



R 13 E

CONVENTIONAL SYMBOLS
(USED IN PLANS)

	EXISTING	NEW
BUILDINGS AND STRUCTURES		
GUARD RAIL		
GUARD CABLE		
CONCRETE RIGHT-OF-WAY MARKER		
STEEL RIGHT-OF-WAY MARKER		
LOCATION SURVEY MARKER		
UTILITIES		
FIBER OPTICS	FO	FO
OVERHEAD CABLE TV	OTV	OTV
UNDERGROUND CABLE TV	UTV	UTV
OVERHEAD TELEPHONE	OT	OT
UNDERGROUND TELEPHONE	UT	UT
OVERHEAD POWER	OE	OE
UNDERGROUND POWER	UE	UE
SANITARY SEWER	S	S
STORM SEWER	SS	SS
GAS	G	G
WATER	W	W
MANHOLE	SAN	
FIRE HYDRANT	HYD	
WATER VALVE	WV	
WATER METER	WM	
DROP INLET	DI	
DITCH BLOCK		
GROUND MOUNTED SIGN	SIGN	
LIGHT POLE		
H-FRAME POWER POLE		
TELEPHONE PEDESTAL	PED	
FENCE		
CHAIN LINK	V	
WOVEN WIRE	X	
GATE POST		
BENCHMARK	BM	

NOTE: DASHED OR OPEN SYMBOLS INDICATE EXISTING FEATURES

THE EXISTENCE AND APPROXIMATE LOCATION OF UTILITY FACILITIES KNOWN TO EXIST, AS SHOWN ON THE PLANS, ARE BASED ON THE BEST INFORMATION AVAILABLE TO THE COMMISSION AT THIS TIME. THIS INFORMATION IS PROVIDED BY THE COMMISSION "AS-IS" AND THE COMMISSION EXPRESSLY DISCLAIMS ANY REPRESENTATION OR WARRANTY AS TO THE COMPLETENESS, ACCURACY, OR SUITABILITY OF THE INFORMATION FOR ANY USE. RELIANCE UPON THIS INFORMATION IS DONE AT THE RISK AND PERIL OF THE USER, AND THE COMMISSION SHALL NOT BE LIABLE FOR ANY DAMAGES THAT MAY ARISE FROM ANY ERROR IN THE INFORMATION. IT IS, THEREFORE, THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE, LOCATION AND STATUS OF ANY FACILITY. SUCH VERIFICATION INCLUDES DIRECT CONTACT WITH THE LISTED UTILITIES.

INDEX OF SHEETS

LENGTH OF PROJECT

BEGINNING OF PROJECT	STA 86+60.00
END OF PROJECT	STA 248+50.00
APPARENT LENGTH	16190.00 FEET

EQUATIONS AND EXCEPTIONS:

NONE

TOTAL CORRECTIONS	0.00 FEET
NET LENGTH OF PROJECT	16190.00 FEET
STATE LENGTH	3.066 MILES

FOR INFORMATION ONLY
ESTIMATED DISTURBED ACRES XX ACRES

DATE PREPARED	8/10/2022
ROUTE	K
STATE	MO
DISTRICT	SE
SHEET NO.	1
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

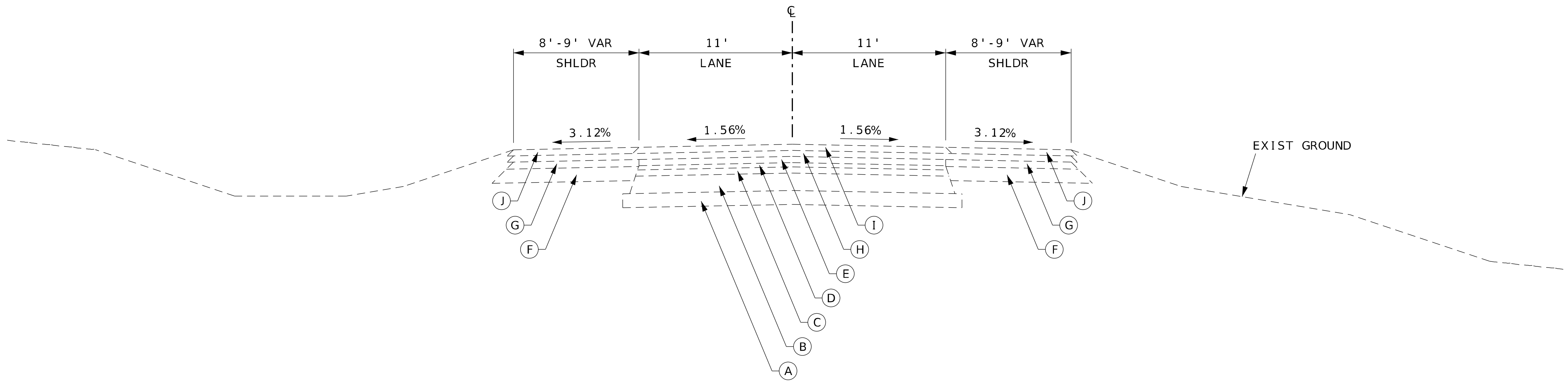
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

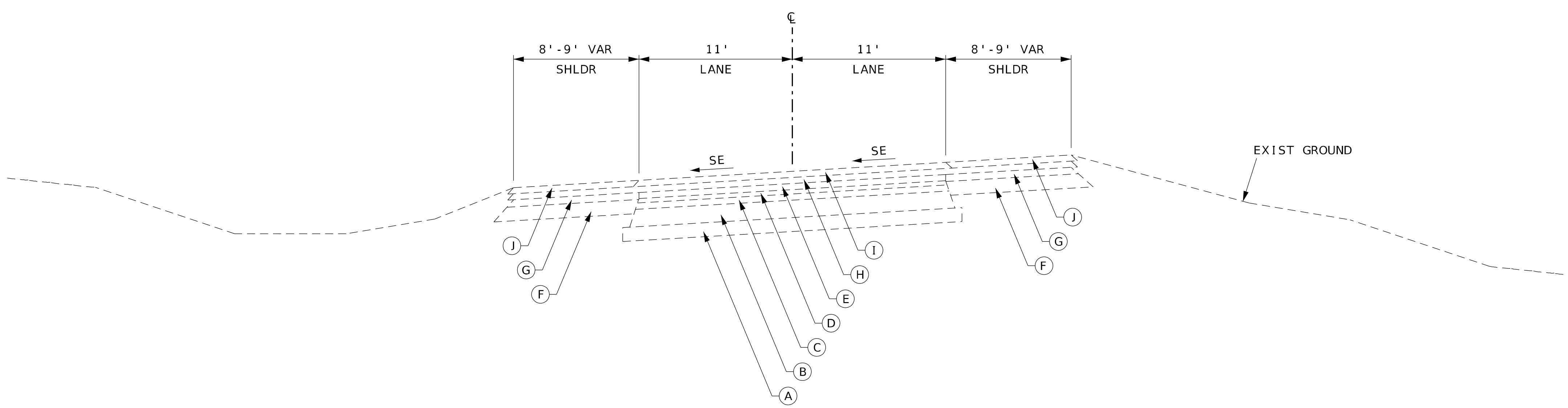
MoDOT

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

A - 4" TYPE 1 OR TYPE 2 AGGR (1976)
B - 5" PMBB (1976)
C - 1.75" TYPE B ASPH (1976)
D - 1.25" TYPE C ASPH (1976)
E - 1.75" TYPE C ASPH (1991)
F - 4" AGGR BASE (1991)
G - 2" TYPE C ASPH (1991)
H - 1.75" SP125C (2008)
I - 1.75" SP125C (2018)
J - 1.75" BP-1 (2018)



EXISTING SECTION ON TANGENT
RTE K
STA 86+60.00 TO STA 156+87.33
STA 175+71.96 TO STA 247+00.00



EXISTING SECTION ON SUPERELEVATED CURVE
RTE K
STA 86+60.00 TO STA 156+87.33
STA 175+71.96 TO STA 247+00.00

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DATE PREPARED 8/10/2022	
ROUTE K	STATE MO
DISTRICT SE	SHEET NO. 2
COUNTY CAPE GIRARDEAU	
JOB NO. J9S3847	
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

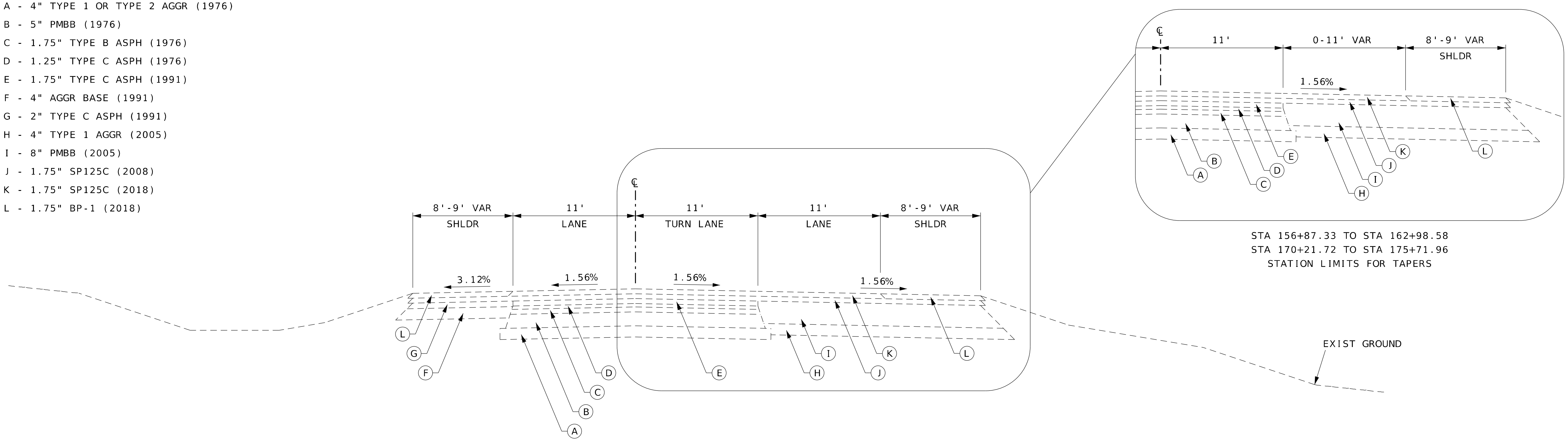
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL SECTIONS
SHEET 1 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

A - 4" TYPE 1 OR TYPE 2 AGGR (1976)
B - 5" PMBB (1976)
C - 1.75" TYPE B ASPH (1976)
D - 1.25" TYPE C ASPH (1976)
E - 1.75" TYPE C ASPH (1991)
F - 4" AGGR BASE (1991)
G - 2" TYPE C ASPH (1991)
H - 4" TYPE 1 AGGR (2005)
I - 8" PMBB (2005)
J - 1.75" SP125C (2008)
K - 1.75" SP125C (2018)
L - 1.75" BP-1 (2018)



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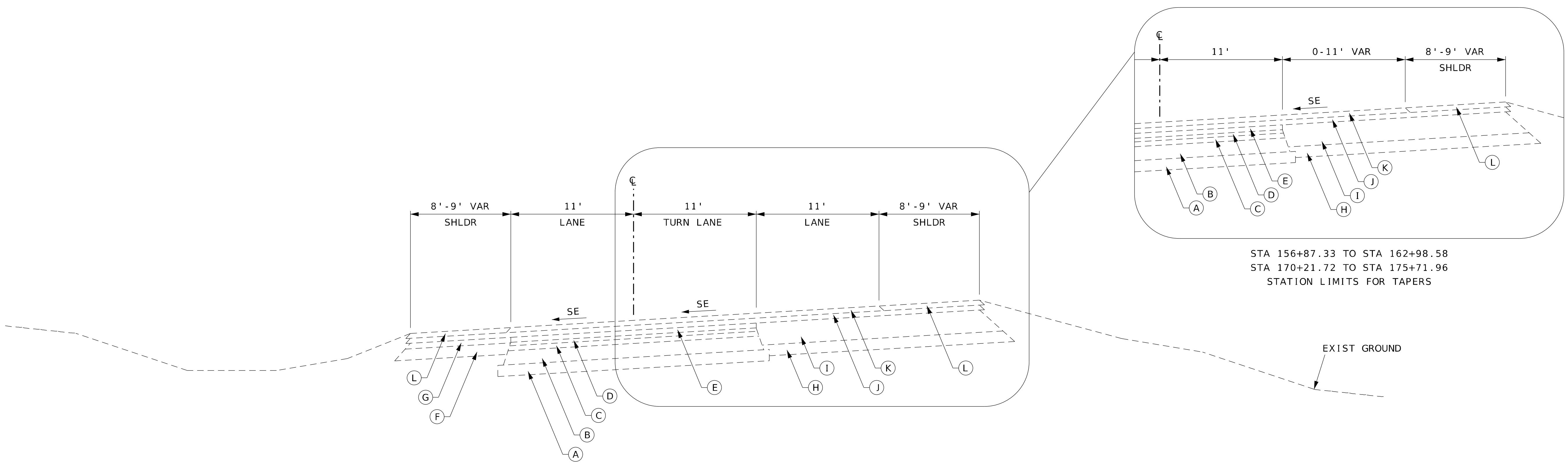

EXISTING SECTION ON SUPERELEVATED CURVE
RTE K
STA 156+87.00 TO STA 175+73.00

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DATE PREPARED	6/15/2022
ROUTE	K
STATE	MO
DISTRICT	SE
SHEET NO.	2
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL SECTIONS
SHEET 2 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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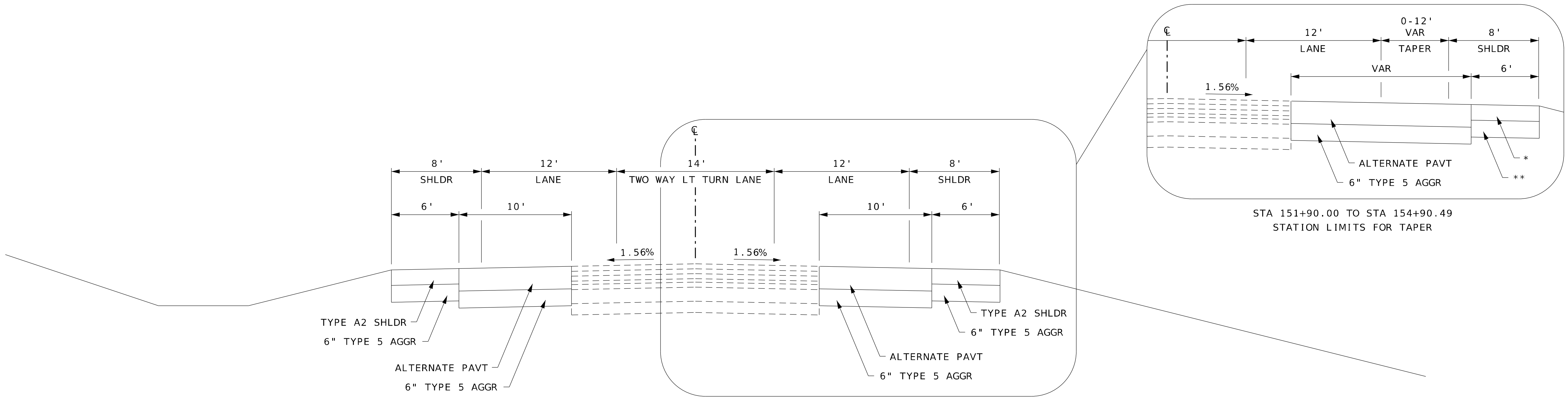
** 6" TYPE 5 AGGR



STA 151+90.00 TO STA 154+90.49
STATION LIMITS FOR TAPER

SECTION ON TANGENT
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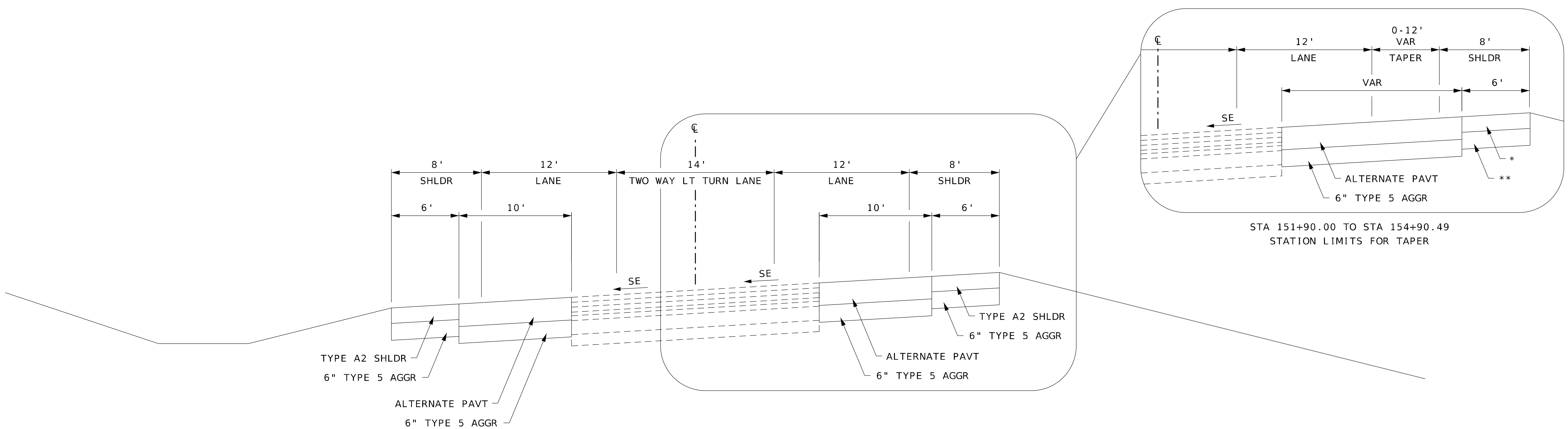
STA 86+60.00 TO STA 151+90.00



STA 151+90.00 TO STA 154+90.49
STATION LIMITS FOR TAPER

SECTION ON SUPERELEVATED CURVE
RTE K
STA 86+60.00 TO STA 151+90.00

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

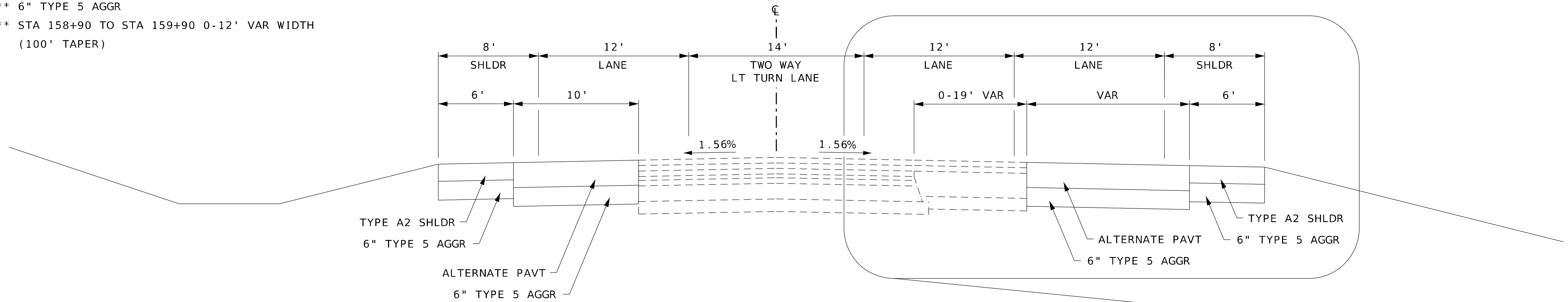
DATE PREPARED	
8/10/2022	
ROUTE: K	STATE: MO
DISTRICT: SE	SHEET NO.: 2
COUNTY: CAPE GIRARDEAU	
JOB NO.: J9S3847	
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL SECTIONS
SHEET 3 OF XX

* TYPE A2 SHLDR
** 6" TYPE 5 AGGR
*** STA 158+90 TO STA 159+90 0-12' VAR WIDTH (100' TAPER)



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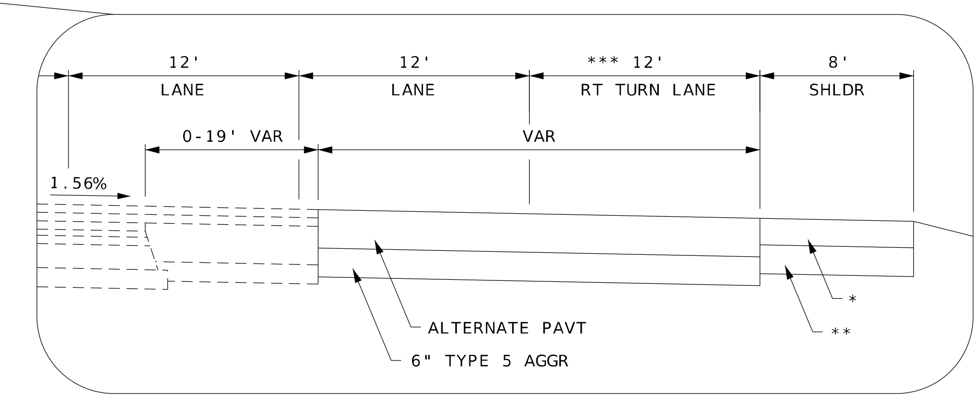
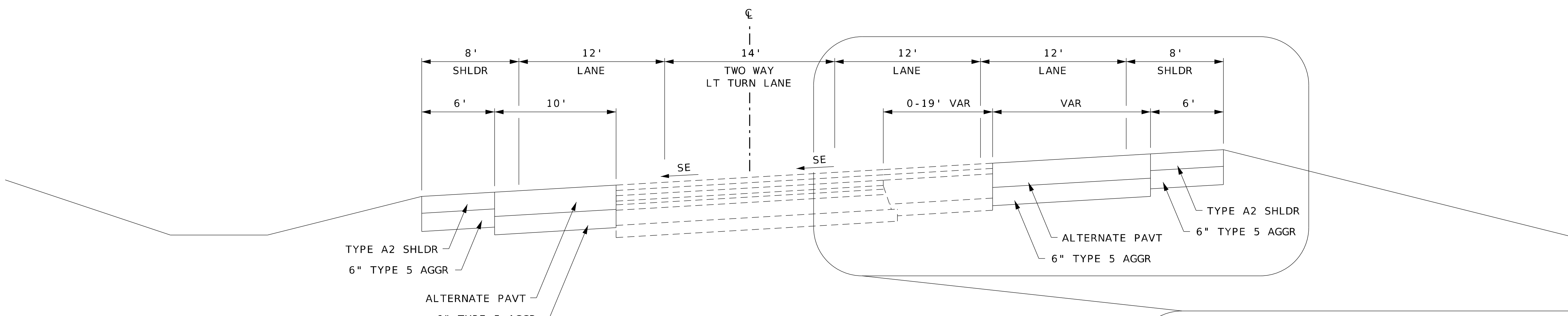


STA 158+90.00 TO STA 163+42.26



SECTION ON SUPERELEVATED CURVE
RTE K
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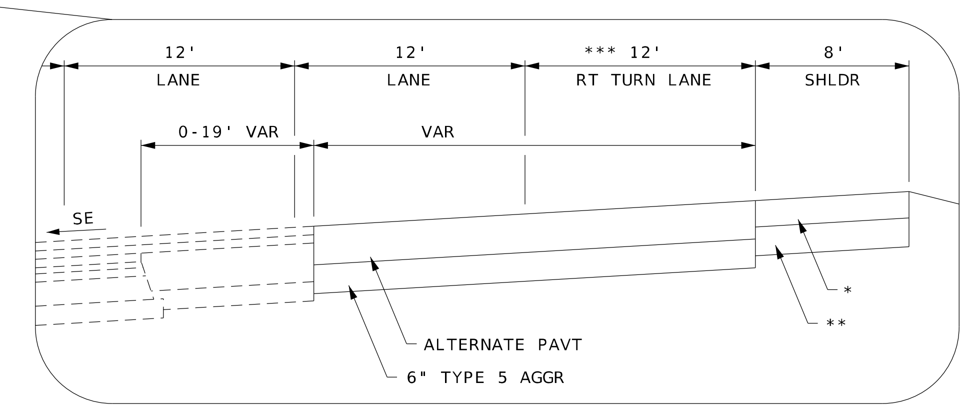

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DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DATE PREPARED	6/16/2022
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STATE	MO
DISTRICT	SE
SHEET NO.	2
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL SECTIONS
SHEET 4 OF XX

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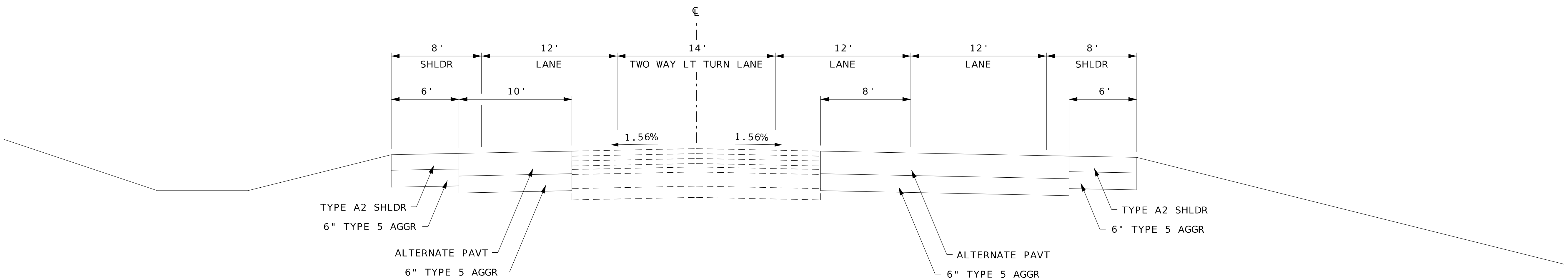

SECTION ON TANGENT

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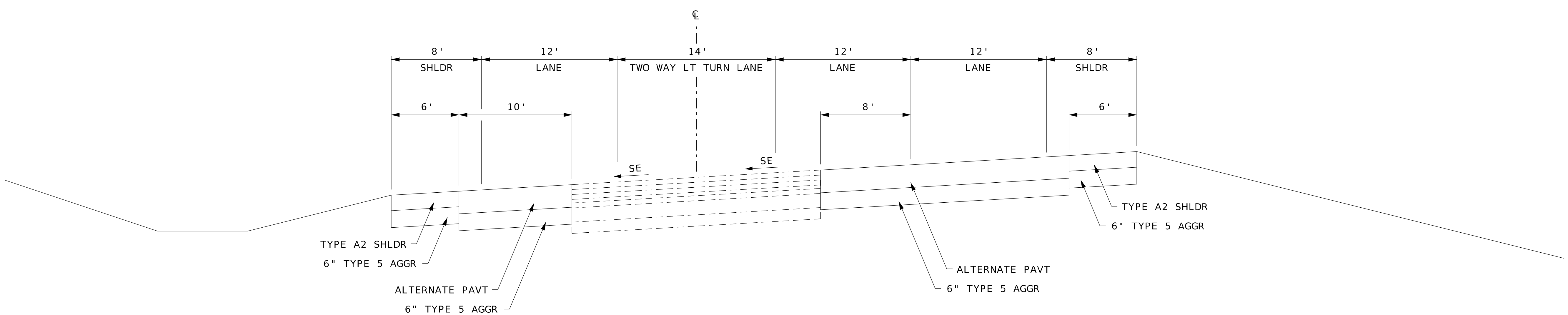
STA 175+71.96 TO STA 247+00.00



SECTION ON SUPERELEVATED CURVE

RTE K

STA 154+90.49 TO STA 156+87.33

STA 175+71.96 TO STA 247+00.00

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DATE PREPARED 6/15/2022	
ROUTE K	STATE MO
DISTRICT SE	SHEET NO. 2
COUNTY CAPE GIRARDEAU	
JOB NO. J9S3847	
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

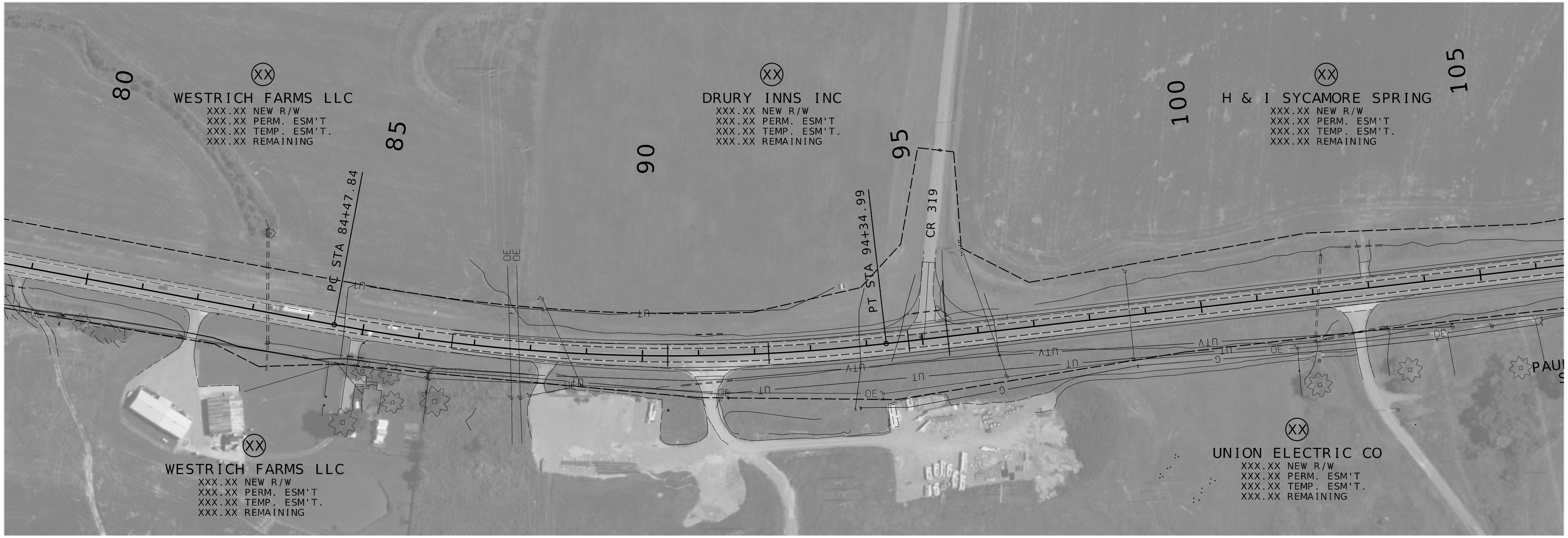
DESCRIPTION

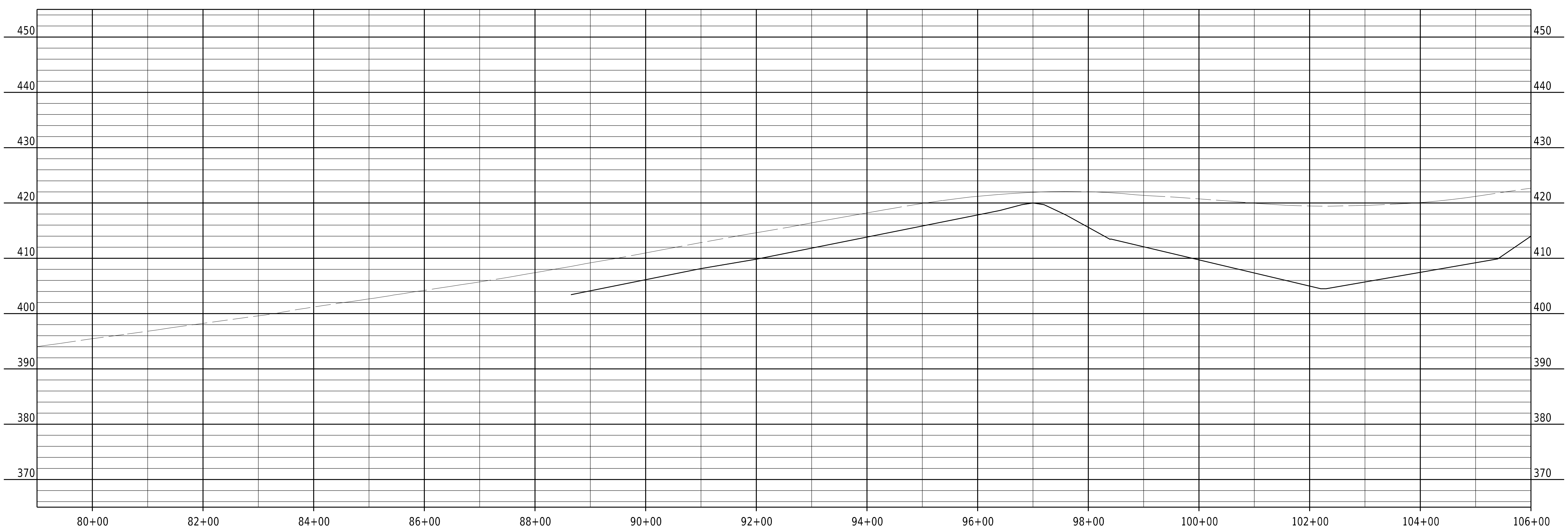
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL SECTIONS
SHEET 5 OF XX





DATE PREPARED	8/10/2022
ROUTE	K
STATE	MO
DISTRICT	SE
SHEET NO.	4
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 1 OF XX

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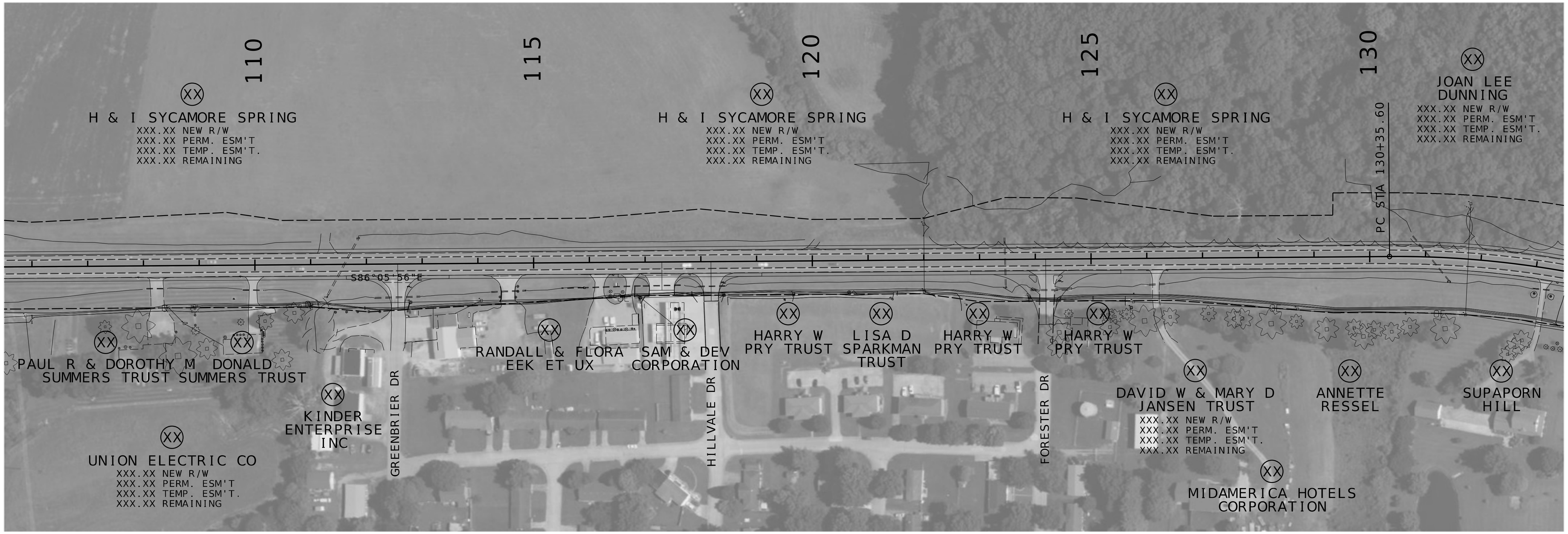
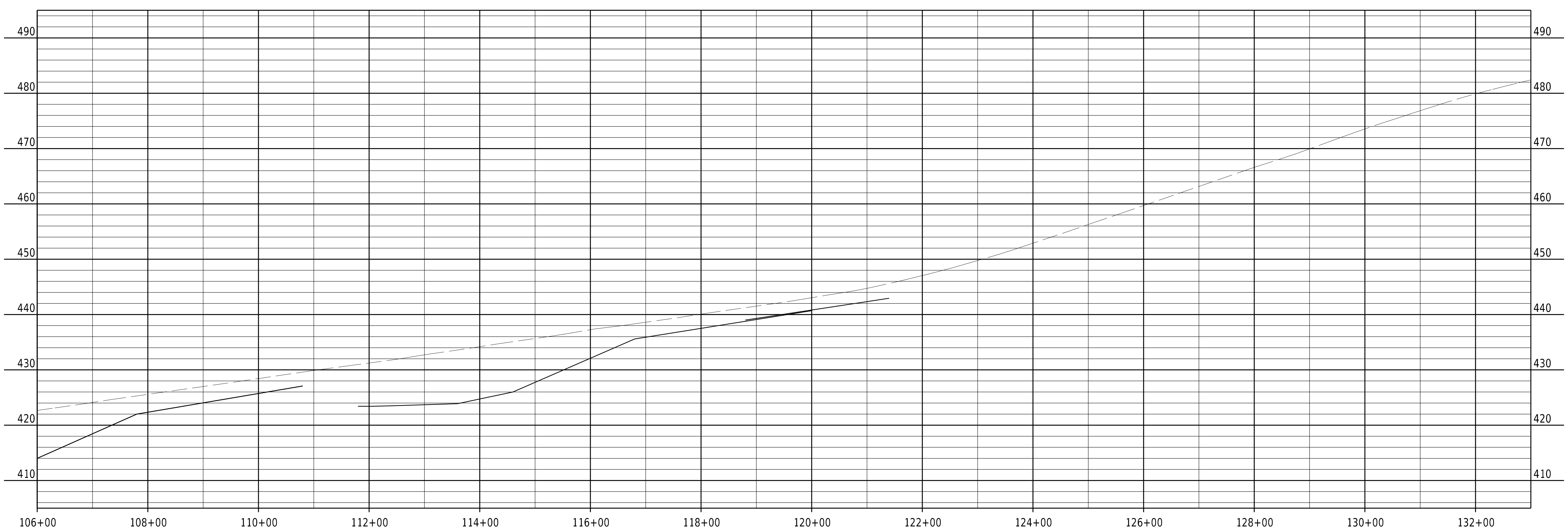




DATE PREPARED
8/10/2022

ROUTE	STATE
K	MO
DISTRICT	SHEET NO.
SE	5

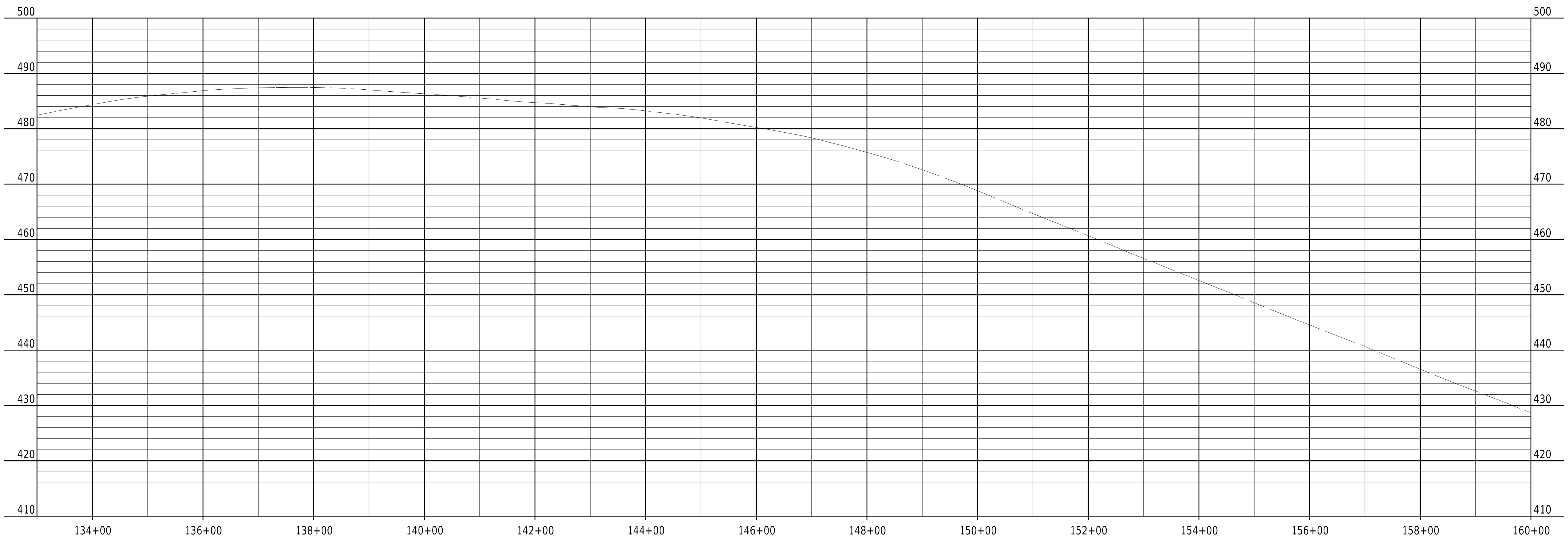
COUNTY
CAPE GIRARDEAU
JOB NO.
J9S3847
CONTRACT ID.
PROJECT NO.
BRIDGE NO.

DESCRIPTION
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 2 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



DATE PREPARED 8/10/2022

ROUTE	STATE
K	MO
DISTRICT	SHEET NO.
SE	6

COUNTY: CAPE GIRARDEAU

JOB NO.: J9S3847

CONTRACT ID.

PROJECT NO.

BRIDGE NO.

DESCRIPTION

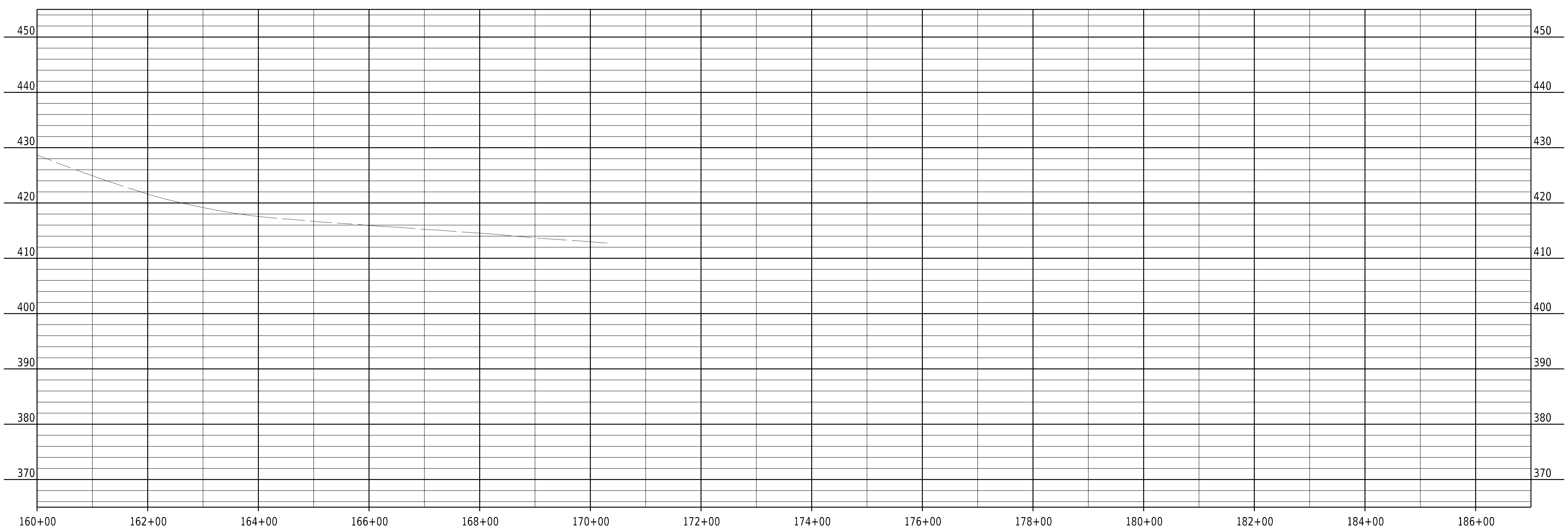
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 3 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



DATE PREPARED	8/10/2022
ROUTE	K
STATE	MO
DISTRICT	SE
SHEET NO.	7
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

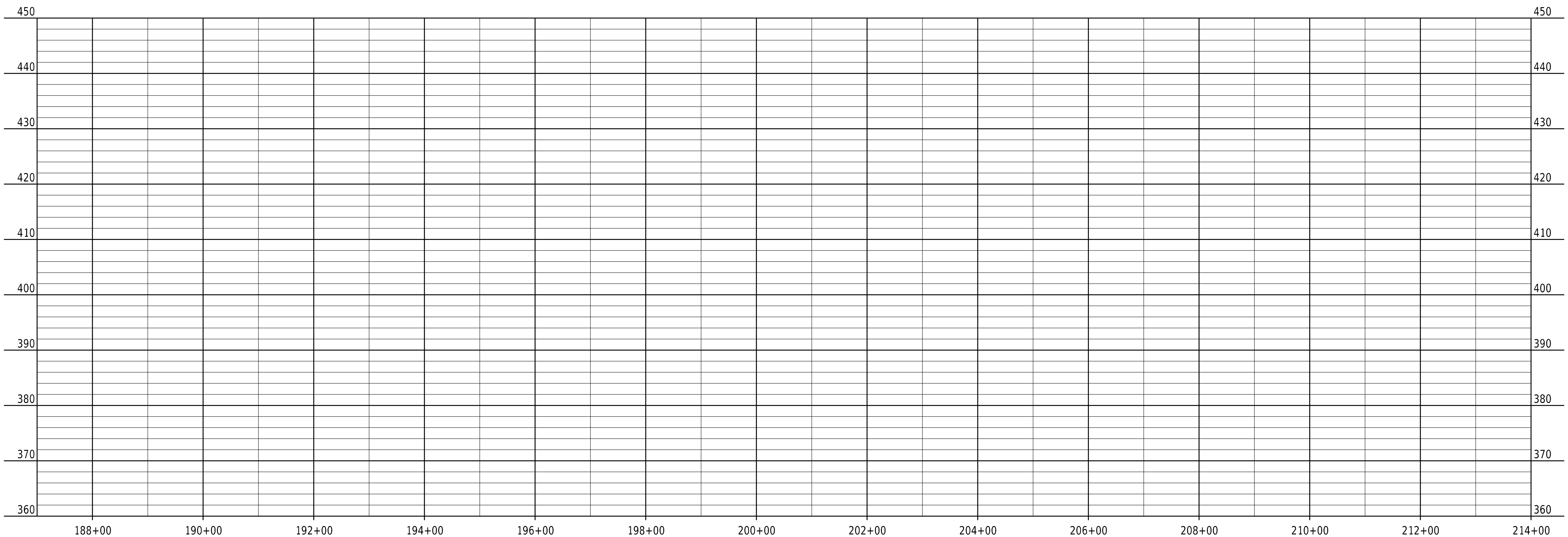
DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 4 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



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DATE PREPARED	
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DISTRICT SE	SHEET NO. 8
COUNTY CAPE GIRARDEAU	
JOB NO. J9S3847	
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

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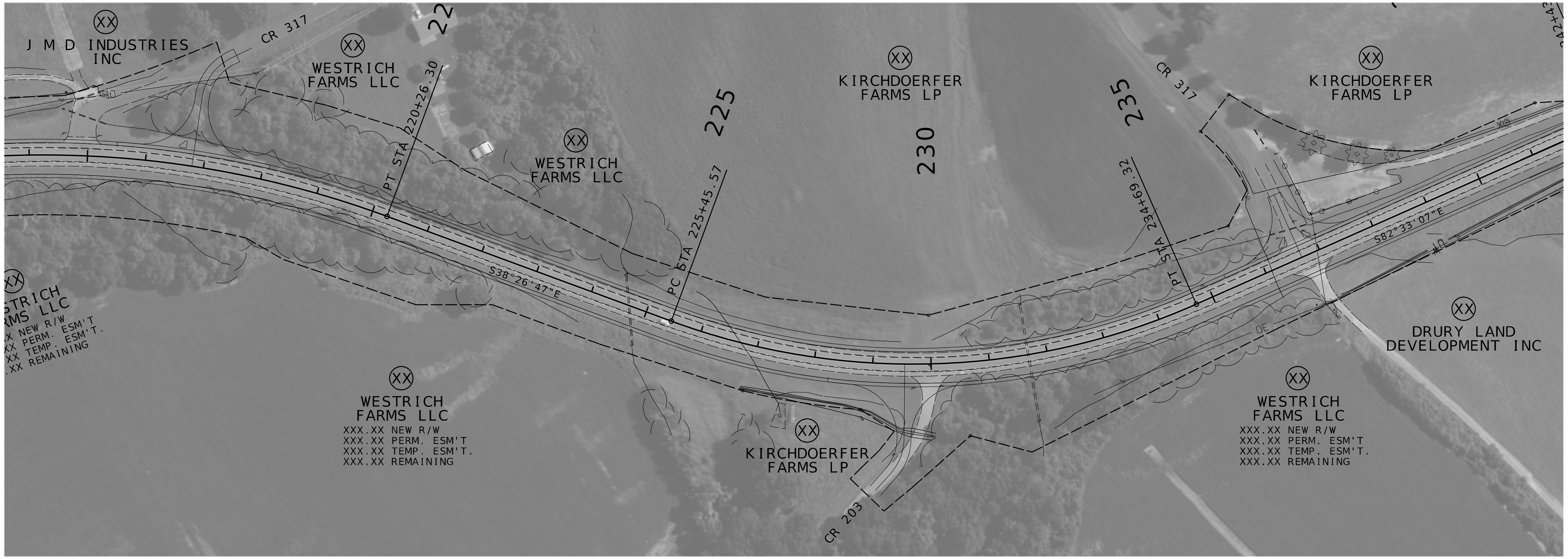
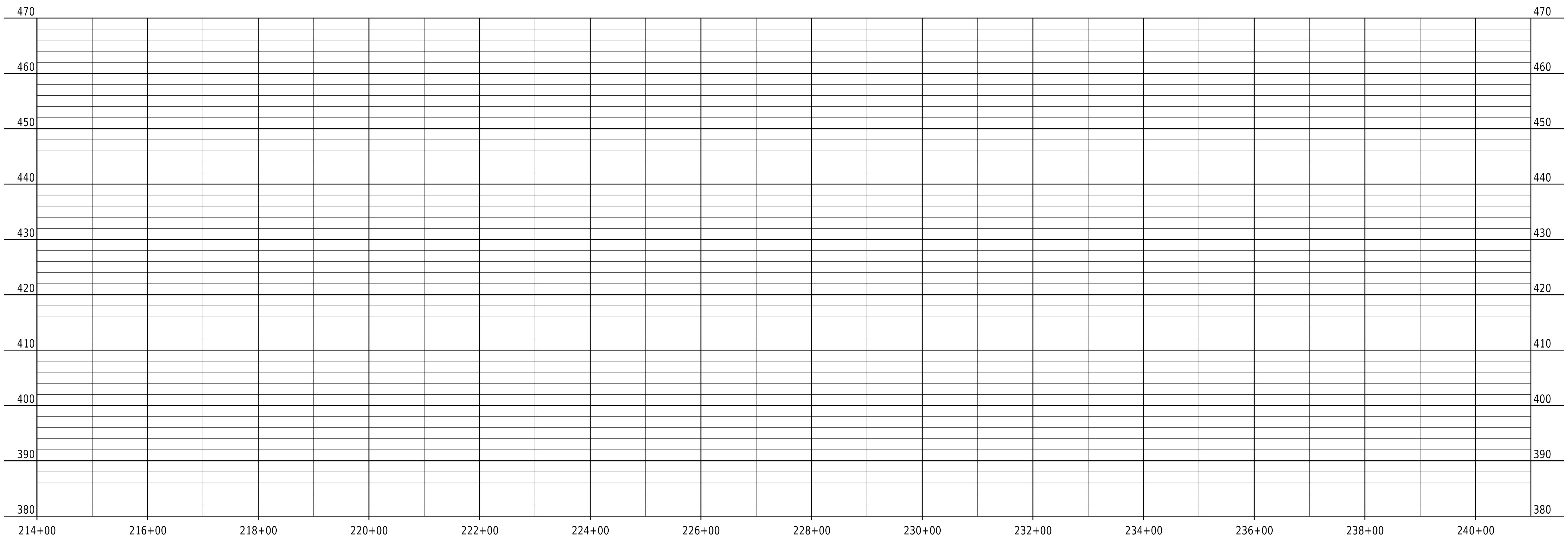
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 5 OF XX





DATE PREPARED 8/10/2022

ROUTE K | STATE MO

DISTRICT SE | SHEET NO. 9

COUNTY CAPE GIRARDEAU

JOB NO. J9S3847

CONTRACT ID.

PROJECT NO.

BRIDGE NO.

DESCRIPTION

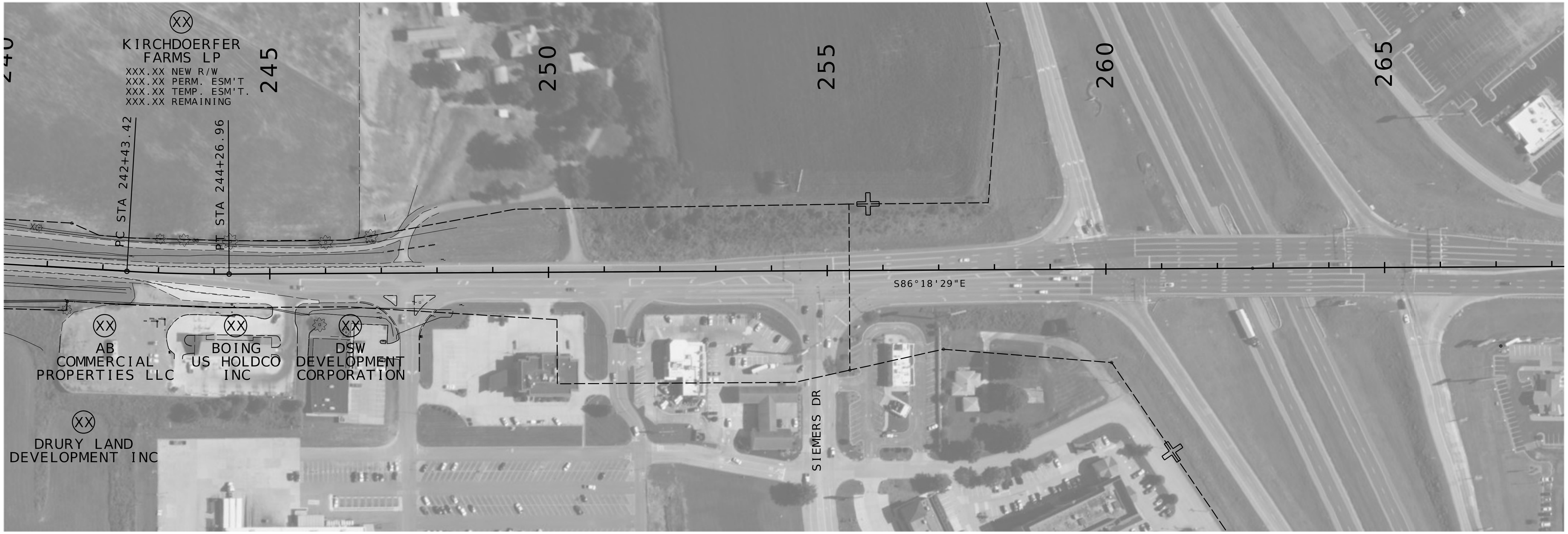
DATE

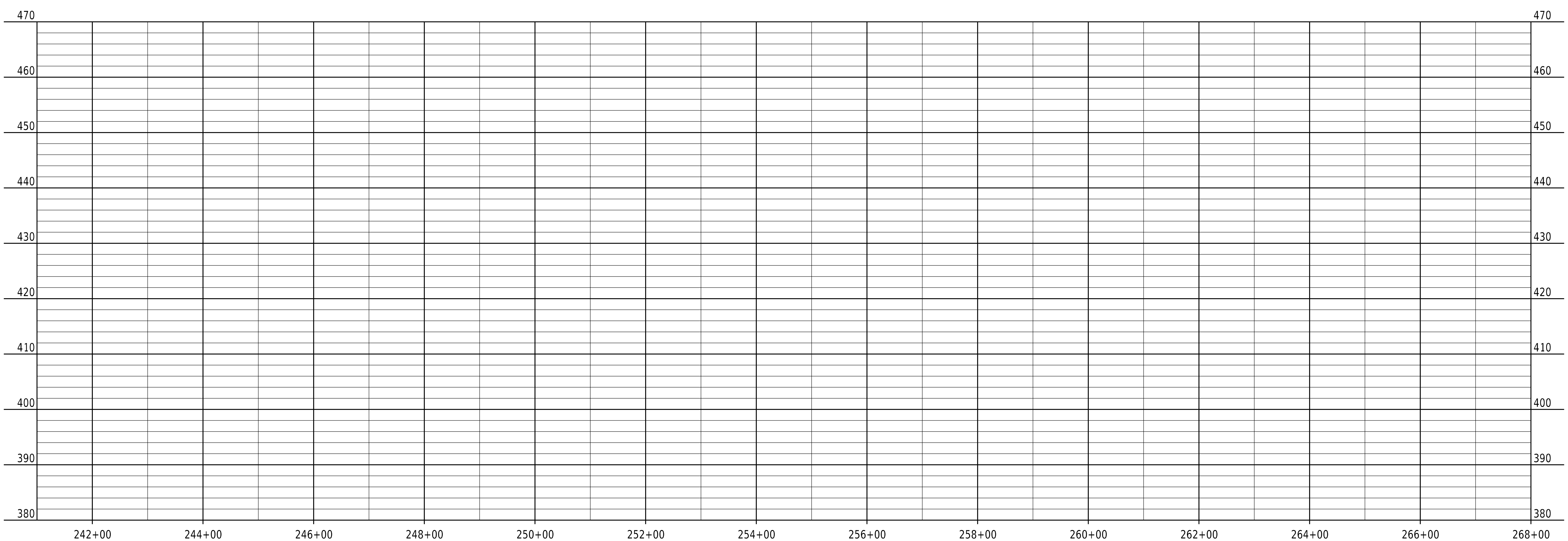
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 6 OF XX

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.





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DATE PREPARED	8/10/2022
ROUTE: K	STATE: MO
DISTRICT: SE	SHEET NO.: 10
COUNTY	CAPE GIRARDEAU
JOB NO.	J9S3847
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

DESCRIPTION

DATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN/PROFILE
SHEET 7 OF XX

May 2022

Route K Traffic Study

Cape Girardeau County, Missouri

Prepared for:

MoDOT Southeast District

2675 North Main

Sikeston, Missouri 63801

Prepared by:

Lochmueller Group

411 N. 10th Street, Suite 200

St. Louis, Missouri 63101

314.621.3395

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Executive Summary

Lochmueller Group prepare the following traffic study to analyze the Route K Corridor starting from City of Cape Girardeau limits west 2.55 miles to Greenbrier Drive, and also intersection improvements at Route K with Route 25. The study intent was to review MoDOT's planned project along the study area and recommend intersection control solutions at Route K with Route 25 and with Notre Dame High School/Parkwood Lake Street.

The study examined existing conditions, particularly capacity analysis at the intersections of Route K with Route 25 and with Notre Dame High School entrance, forecasted future volume for 2045, analyzed future No Build condition, and analyzed alternatives at each intersection location. After reviewing and comparing the alternatives to prior analysis along the corridor that resulted in a preferred alternative, we created a concept plan and prepared a preliminary opinion of probable cost.

The existing cross-section is generally a two-lane roadway along the extents of the project limits. Based on VISSIM analysis results, future No Build findings revealed that both subject intersections will experience significant delay in the future if no improvements are constructed.

The selected preferred alternatives include the following:

- Construct a roundabout at the intersection of Route 25 and Route K, with westbound right and northbound right turn bypass lanes. The bypass lanes would require two receiving lanes on the receiving legs of the intersection, which would then need to transition from two down to the existing single lane leaving the intersection. Along the existing retail sites immediately west of Route 25, a two-way left turn lane should be installed to reduce potential for rear-end crashes. Once east of the retail entrances, transition down to the existing two-lane cross-section.
- Starting at the eastbound approach of Route K to CR 319, widen Route K to install an eastbound left turn bay. Continue the three lane section (one lane each direction with two-way left turn lane) east until approximately 1,000 feet west of Notre Dame High School entrance, where the cross-section expands to accommodate a second eastbound through lane. An eastbound right turn bay is also recommended at the high school's entrance. Parkwood Avenue should be extended to Route K and existing Parkwood Lake Street sever its connection to Route K and terminate in a cul-de-sac. East of the school entrance, it is anticipated that two eastbound through lanes will be needed to accommodate vehicle demand by 2045. The road improvements to be built should accommodate the full future section in terms of right-of-way and grading.
    - To reduce near term maintenance obligations, MoDOT may choose to transition the two eastbound lanes down to one lane approximately 1,000 feet east of the new signal at Notre Dame Drive and use the second lane as a full depth wide shoulder that can be converted to a travel lane later. This effectively creates a three-lane cross section from 1,000 feet east of Notre Dame Drive to the Walmart entrance in Cape Girardeau.

All improvements are anticipated to improve traffic flow to an acceptable LOS C or better in 2045 and reduce the potential for crashes. Concept plans and an opinion of probable cost were created reflecting the preferred scenario. The total opinion of probable cost for the project is approximately $12.8M.

Introduction

Lochmueller Group prepare the following traffic study to analyze the Route K Corridor starting from City of Cape Girardeau limits west 2.55 miles to Greenbrier Drive, and also intersection improvements at Route K with Route 25. The study intent was to review MoDOT's planned project along the study area and recommend intersection control solutions at Route K with Route 25 and with Notre Dame High School/Parkwood Lake Street.

To achieve this, the project consisted of two parts: 1) prepare traffic analysis for the intersections of Route K with Route 25 and with Notre Dame High School, and 2) perform a peer review of MoDOT's "Rte. K Cape Girardeau County West Corridor Safety Study" (January 7, 2020) of the 2.55 mile corridor to confirm and comment on the recommendations. A copy of this study is included in Appendix A. Figure 1 shows the study area for the Route K analysis.

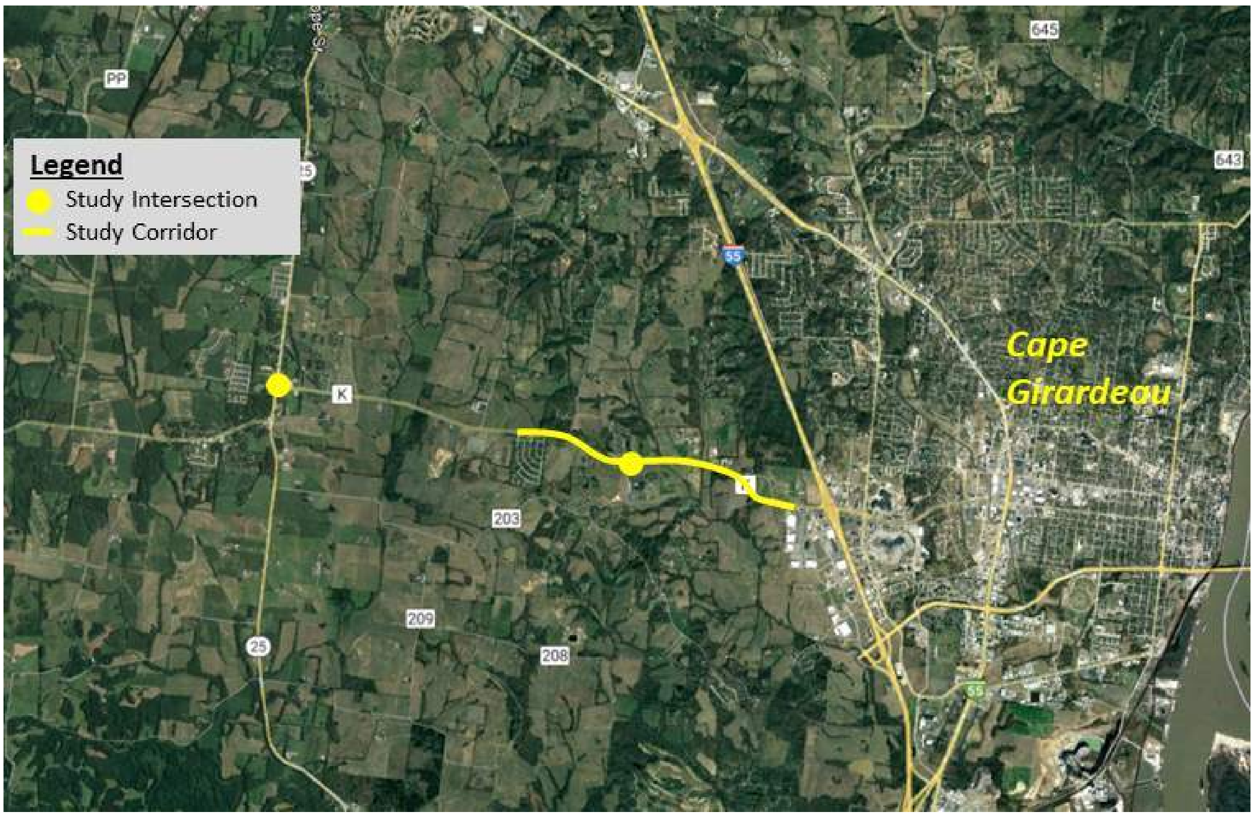

Figure 1. Route K Study Area

This study evaluates traffic conditions during the morning and afternoon peak periods of a typical weekday, as these periods represent the busiest times for the study area roadways.

The following scenarios were included in the study:

- Baseline (2016/2017)
- 2025 No Build
- 2025 Build
- 2045 No Build
- 2045 Build

Roadway Network & Land Use Context

The study area road system was inventoried to identify existing roadway types, lane configurations, functional classifications, posted speeds, access provisions, and intersection control. The existing lane configuration and traffic control at the study area intersections are shown in **Figures 2** and **3**.

Route K is a MoDOT owned and maintained east-west major collector with a posted speed limit of 55 miles per hour (mph). Near the study limits, it connects the City of Gordonville to the west with the City of Cape Girardeau and I-55 to the east. Route K currently serves Notre Dame High School, Eagle Ridge Christian School, a few isolated commercial business and subdivisions, otherwise land along the corridor is generally undeveloped. MoDOT historical volumes denotes that this section of Route K serves approximately 12,900 vehicles per day (vpd) in 2021.

Route 25 is a MoDOT owned and maintained north-south major collector with a posted speed limit of 55 mph. Near the study limits, it is the major connection between the City of Jackson to the north and the City of Gordonville to the south. Route 25 has a high density of direct driveway connections to both residential and commercial driveways in the vicinity of Route K. North of Route K, Route 25 serves approximately 6,100 vpd in 2021, dropping to 4,250 vpd south of Route K.

Parkwood Lake Street is a local street accessing a mobile home residential neighborhood and is situated approximately 150’ west of the Notre Dame High School entrance.

Traffic Volumes

Baseline Traffic Volumes

Traffic volumes were provided by MoDOT for this project to ensure there was an appropriate comparison between the results of their January 2020 traffic study prepared internally at MoDOT and the results from this study effort contained herein. This included a 12-hour count (6AM to 6PM) at the intersection of Route K with Notre Dame High School and Parkwood Lake Street from September 7 and 8, 2016, and a 12-hour (6AM to 6PM) count at the intersection of Route K with Route 25 from November 5, 2017. From the counts, it was determined that the peak hours of traffic flow occurred from 7:00 to 8:00 AM and from 3:00 to 4:00 p.m. The baseline traffic volumes are summarized in **Figures 2** and **3.**

Forecasted 2025 and 2045 Volumes

The Construction Year for the improvements was assumed to be 2025 with a planning horizon looking at 20 years beyond construction for a 2045 Design Year. Growth rates were coordinated with MoDOT and determined to be 1.4% and 0.5% annual growth rate along Route K and Route 25, respectively. The method and assumptions that went into determining these growth rates are summarized in Appendix C. The annual growth rate was applied to the baseline traffic volumes to calculate the forecasted 2025 and 2045 traffic volumes, which are summarized in **Figures 2** and **3**. Growth was not applied to either Parkwood Lake Street or the Notre Dame High School driveway, as these are not affected by general regional growth in the area as compared to arterials or collectors like Route K and Route 25.

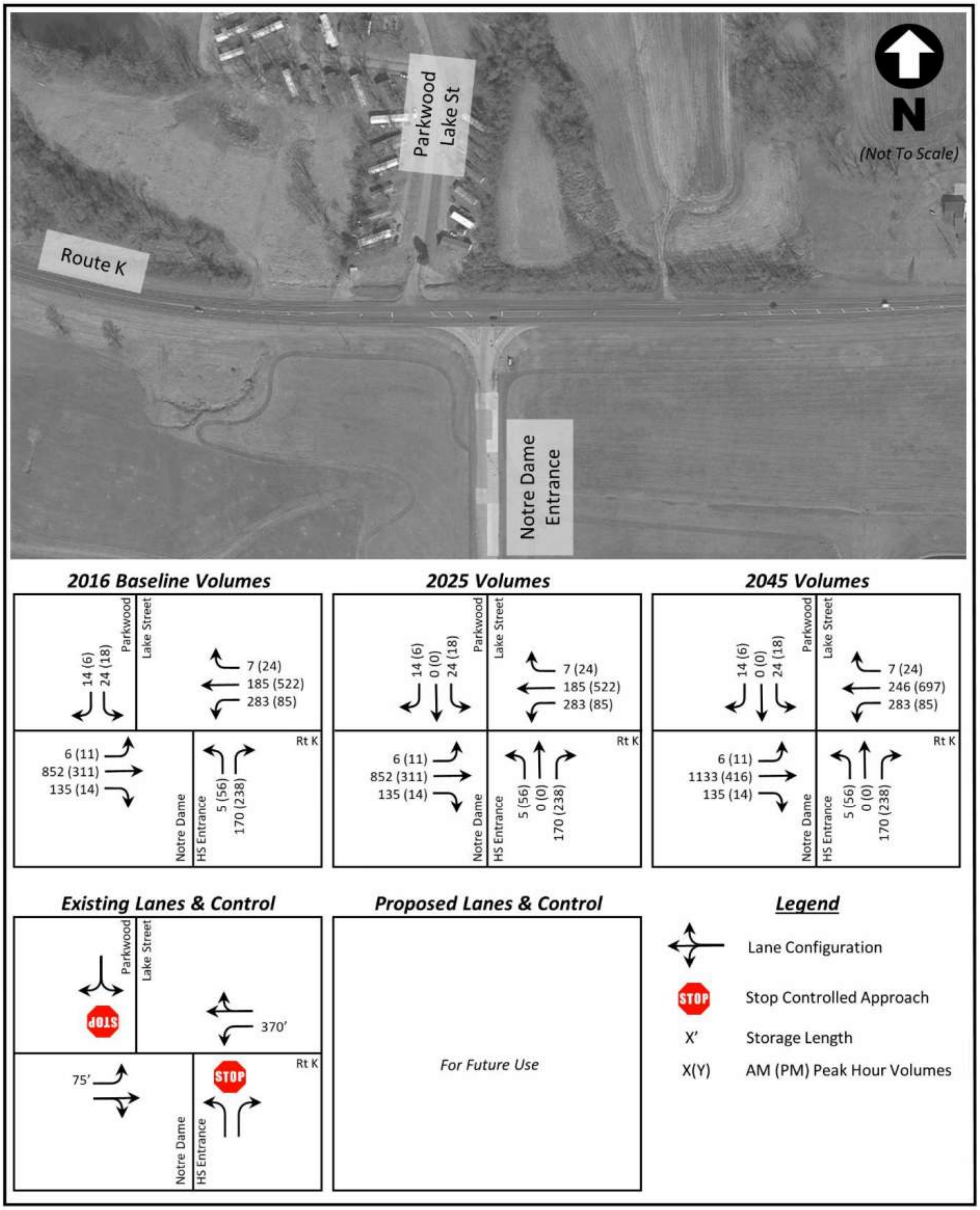

Figure 2. Route K & Notre Dame HS Entrance/Parkwood Lake St Volume and Lane Configuration

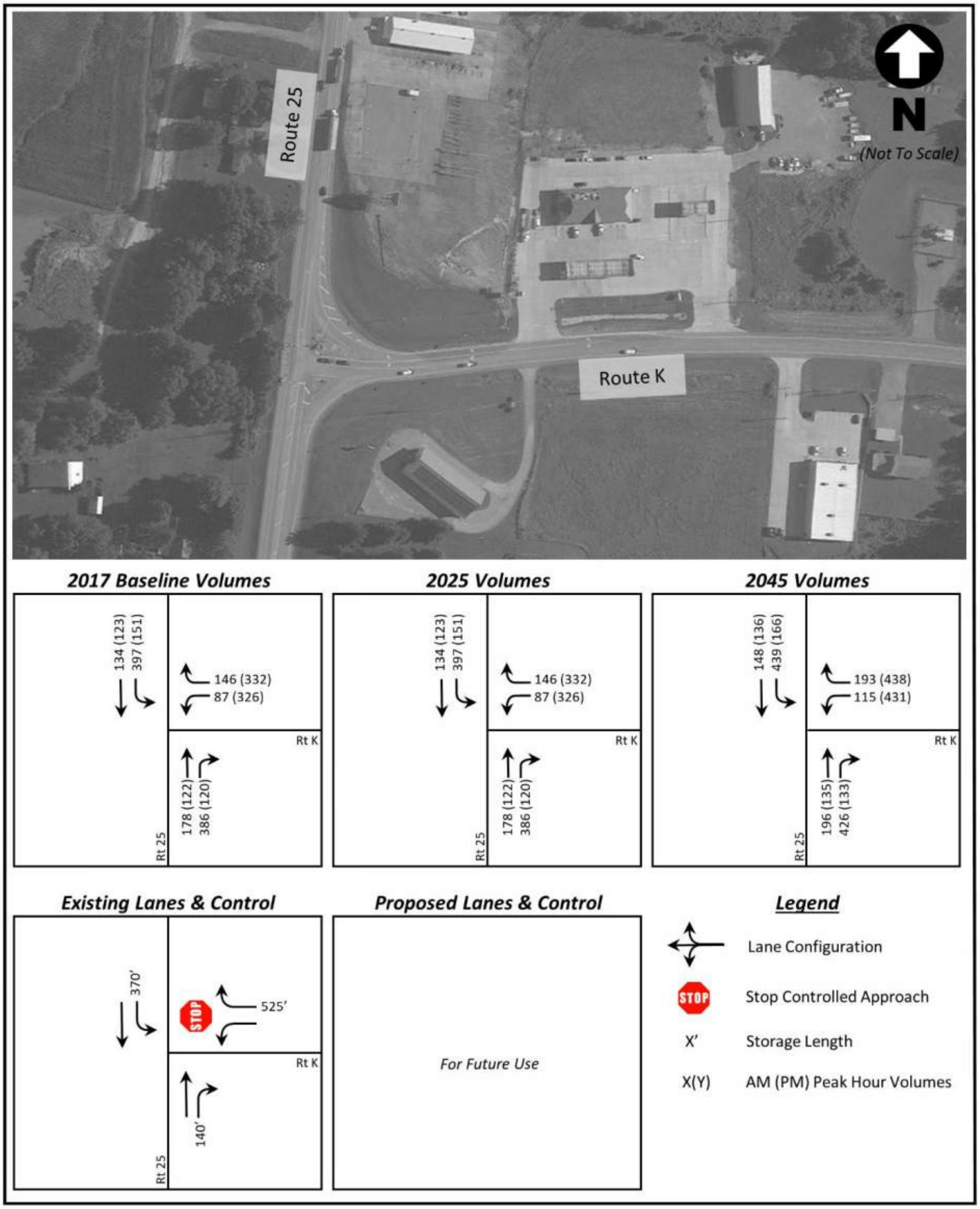

Figure 3. Route K & Route 25 Volume and Lane Configuration

Operational Analysis

Model Creation

VISSIM simulation modeling was completed for the two study intersections. VISSIM is a microsimulation tool that accurately replicates individual vehicles and their interactions within complex traffic streams. In particular, this tool was chosen as the best way to granularly model the interactions between the offset intersections of Notre Dame High School and Parkwood Lake Street.

The VISSIM traffic simulation model calibration process begins with the development of a base model, which aims to replicate existing study area conditions. The first step in base model development involved coding the roadway geometry (number of approach lanes, departure lanes and link lengths) with links and connectors. Once the basic network was established, free-flow speed distributions were created. For the approaches to the intersections, the distributions were informed by posted speed limits along Route K and Route 25. In addition to free-flow speeds, reduced speed zones were established for turn lanes to match the typical intersection approach speeds. Driver behavior, yielding characteristics, and gap times for vehicles entering the side street stop-controlled intersections were also given particular attention during the base model creation in an attempt to replicate expected field conditions. Since our baseline conditions were using the provided 2016 and 2017 data, a Synchro model was created, which applies a more theoretical approach to capacity analysis, along with MoDOT's January 2020 traffic study results, to try and calibrate the model by comparing results from the various sources.

Traffic volumes are represented in VISSIM as an origin-destination matrix estimated from turning movement counts. The matrix specifies the model's traffic patterns and the routes vehicles take to traverse the model network. Traffic entering the model network was coded using static vehicle inputs, which is straightforward for individual intersections. Vehicle inputs specify traffic volumes and vehicle compositions, which were grouped into passenger vehicles, trucks, and buses.

Since VISSIM starts running its simulation with zero vehicles on the network, a warm-up period is needed to initialize the model with traffic prior to capturing data. The warm-up period is known as the seeding period and its length and volume characteristics were selected as part of the model calibration process. A 30-minute seeding period was used to fully establish background traffic before recording results.

Given the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers are required for each scenario and the reported model results were averaged across runs. Based on the characteristics of this model network, it was determined that 10 simulation runs were sufficient to obtain a reasonable level of confidence in the results.

Capacity Analysis Results

Intersection performance or traffic operations were quantified by six Levels of Service (LOS), which range from LOS A ("Free Flow") to LOS F ("Fully Saturated"). LOS C is normally used for design purposes and represents a roadway with volumes ranging from 70% to 80% of its capacity. LOS D is generally considered acceptable for peak period conditions in urban and suburban areas and would be an appropriate benchmark of acceptable traffic for the study area road system. For purposes of this study, a goal was set to achieve a LOS C for the 2025 Construction Year and a LOS D for the 2045 Design Year.

Levels of service for intersections are determined based on the average delay experienced by motorists. Specifically, the average control delay per vehicle is quantified for each movement and then aggregated for each approach and the intersection as a whole. The thresholds for each level of service vary based upon the type of control to reflect different driver expectations. Signalized intersections reflect higher delay tolerances as compared to unsignalized intersections because motorists are accustomed to and accepting of longer delays. Table 1 summarizes the criterion for both signalized and unsignalized intersections, as defined by the "Highway Capacity Manual" (HCM) published by the Transportation Research Board.

Table 1. Intersection Level of Service Thresholds

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

The measures of effectiveness (MOEs) used in this study include LOS, delay, and maximum queue. Unlike other capacity programs which calculate 95th percentile queue, VISSIM outputs a maximum queue, which only needs to occur once to be recorded, and therefore can be considered a worst-case condition. The results for the Baseline, 2025 No Build, and 2045 No Build conditions are presented in Tables 2 and 3 for the two study intersections. Movements or results that exceed LOS C for 2025 and LOS D for 2045 are highlighted in red.

Table 2. Capacity Analysis Results – Route K & Notre Dame/Parkwood Lake Street

Intersection/Approach	LOS (Delay in sec/veh) [Max Queue Length, feet]		
	Baseline Condition	2025 No Build	2045 No Build
AM PEAK HOUR			
Overall Intersection	**B (16.4)**	**D (39.7)**	**F (102.3)**
Eastbound Left	A (1.5) [21.1]	A (1.4) [27.8]	A (1.7) [73.7]
Eastbound Right	A (2.7) [24.9]	A (2.8) [23.0]	A (2.8) [79.5]
Eastbound Approach	*A (2.6)*	*A (2.9)*	*A (4.0)*
Westbound Left	D (54.0) [481.0]	F (154.0) [1014.1]	F (517.6) [1683.0]
Westbound Approach	*C (34.6)*	*F (102.9)*	*F (342.3)*
Northbound Left	F (399.1) [206.4]	F (1896.8) [305.9]	F (N/A) [N/A]*
Northbound Right	C (25.0) [246.5]	D (43.1) [346.2]	F (524.1) [753.1]
Northbound Approach	*D (37.8)*	*F (85.5)*	*F (524.1)*
Southbound Left	B (11.0) [58.2]	B (14.2) [59.5]	C (32.1) [80.9]
Southbound Right	A (5.2) [60.2]	A (5.8) [64.3]	A (9.7) [86.1]
Southbound Approach	*A (8.9)*	*B (11.1)*	*C (23.8)*
PM PEAK HOUR			
Overall Intersection	**A (2.6)**	**A (3.5)**	**A (4.0)**
Eastbound Left	A (2.1) [19.7]	A (2.7) [25.9]	A (4.9) [33.1]
Eastbound Right	A (1.1) [0.0]	A (1.0) [0.0]	A (1.0) [18.4]
Eastbound Approach	*A (1.0)*	*A (1.1)*	*A (1.1)*
Westbound Left	A (2.7) [59.1]	A (4.0) [61.9]	A (3.8) [63.6]
Westbound Approach	*A (1.1)*	*A (1.6)*	*A (1.7)*
Northbound Left	B (18.0) [114.6]	C (29.9) [132.0]	D (44.6) [179.8]
Northbound Right	A (4.1) [138.7]	A (5.8) [162.0]	A (6.4) [198.3]
Northbound Approach	*A (6.9)*	*B (10.6)*	*B (14.0)*
Southbound Left	A (7.3) [37.3]	A (8.4) [39.1]	A (9.3) [37.1]
Southbound Right	A (5.1) [39.2]	A (6.4) [44.9]	A (6.3) [42.9]
Southbound Approach	*A (6.7)*	*A (7.9)*	*A (8.5)*

Baseline Conditions: All approaches at the intersection with Notre Dame High School and Parkwood Lake Street operate with LOS C or better except the northbound approach exiting Notre Dame High School during the morning peak hour. The northbound left movement operates with a LOS F and a maximum queue extending 206' during the AM peak hour. While the volume making this movement is very low at only 5 vehicles per hour, there are virtually no gaps in the heavy eastbound through and westbound left movements. This creates a dangerous situation where vehicles making a northbound left must make a risky turn to make a small gap in the traffic.

It should be noted that all major delay and congestion at this intersection occurs during the morning peak hour. No issues were identified during the afternoon peak, even in the 2045 No Build scenario.

***2025 No Build results**:* With the additional traffic growth and no planned improvements, the analysis shows that by 2025, this intersection will continue to degrade, resulting in multiple approaches in the AM peak hour exceeding acceptable levels of delay and queue and reducing the overall intersection a LOS D. The westbound approach is a LOS F reflects the high delay for the westbound left movement due to lack of gaps in the eastbound through movement. Additionally, the queue significantly exceeds its turn bay length, capsizing into the through lane and creating a significant safety issue between queued westbound left turns and drivers wanting to continue westbound through.

2045 No Build results: With continued regional traffic growth, the Route K and Notre Dame/Parkwood Lake Street intersection will continue to degrade. By 2045, with no improvements, the overall intersection will operate at a LOS F, with the westbound left turn queue extending more than 0.3 miles, impeding all westbound through traffic. It would basically be impossible for a motorist to make a northbound right from the school onto Route K westbound, and even the channelized northbound right turn would have over 500 seconds of delay per vehicle and a 750-foot queue during the AM peak hour.

Table 3. Capacity Analysis Results – Route K & Route 25

Intersection/Approach	LOS (Delay in sec/veh) [Max Queue Length, feet]		
	Baseline Condition	2025 No Build	2045 No Build
AM PEAK HOUR			
Overall Intersection	**A (4.5)**	**A (5.7)**	**B (15.7)**
Westbound Left	C (33.6) [146.3]	D (44.7) [189.0]	F (149.2) [488.2]
Westbound Right	A (1.0) [56.9]	A (1.0) [70.5]	A (1.7) [243.2]
Westbound Approach	*B (13.3)*	*B (18.0)*	*E (59.0)*
Northbound Right	A (4.8) [198.6]	A (5.1) [204.5]	A (7.3) [238.0]
Northbound Approach	*A (3.4)*	*A (3.6)*	*A (5.3)*
Southbound Left	A (2.7) [128.5]	A (3.0) [141.4]	A (3.9) [214.9]
Southbound Approach	*A (2.1)*	*A (2.3)*	*A (3.0)*
PM PEAK HOUR			
Overall Intersection	**B (14.6)**	**C (27.2)**	**D (46.6)**
Westbound Left	D (50.9) [536.7]	F (86.3) [885.7]	F (173.5) [1695.1]
Westbound Right	A (1.6) [182.9]	A (2.1) [229.9]	A (4.7) [1684.5]
Westbound Approach	*C (26.0)*	*D (43.5)*	*F (88.1)*
Northbound Right	A (0.9) [53.5]	A (0.8) [51.7]	A (1.0) [65.7]
Northbound Approach	*A (0.6)*	*A (0.5)*	*A (0.6)*
Southbound Left	A (1.6) [51.9]	A (1.3) [36.0]	A (1.7) [52.3]
Southbound Approach	*A (1.2)*	*A (1.2)*	*A (1.4)*

Baseline Results: The westbound left movement at the intersection of Route K and Route 25 experiences a LOS D and long queues during the PM peak hour. The maximum queue extends 537 feet, blocking the west access drive of the Winks gas station in the northeast corner of the intersection.

2025 and 2045 No Build results: With continued regional traffic growth, the westbound approach will continue to degrade, turn into a LOS F for the movement in 2025 and for the approach in 2045. By 2045, the westbound left turn queue extends to over 0.3 miles.

Proposed Mitigation Alternatives

Route K & Notre Dame/Parkwood Lake Street

The proposed alternatives must address several issues which severely hinder operational and safety procedures along Route K. The offset configuration and side street stop control of the intersection of Route K and Notre Dame Drive/Parkwood Lake Street prevents vehicles from safely entering and exiting Notre Dame Drive and Parkwood Lake Drive in an efficient manner.

Additionally, consideration for the eastbound capacity must be addressed as removal of the constant free flow for the eastbound through movement will prove difficult with the existing single lane configuration. The morning peak hour is the critical time period, as eastbound Route K carries traffic destinated for two schools and commuter traffic to Cape Girardeau. The afternoon peak is not as critical since the schools have a different peak than commuters, so the traffic load is spread out over a longer time period. Therefore, there may be a situation where a second eastbound through lane is needed in the morning peak, but a second westbound through is not needed to handle the reverse traffic in the afternoon.

Three alternatives for the intersection of Route K and Notre Dame Drive/Parkwood Lake Street were considered, with analysis results presented in Table 4:

Alternative A-1: No Realignment with Signalization

Alternative A-1 maintains the offset intersection and implements traffic signal intersection control of Route K and Notre Dame Drive. This alternative would not require ROW acquisition for realignment but poses several issues:

- In its current location, Parkwood Lake Street could not be incorporated into the signal as its proximity to Notre Dame Drive would require inefficient split phasing of the minor approaches and abnormally long clearance intervals for all phases. This would elongate the time needed for side street phases which in turn would take away from the eastbound through and westbound left phases causing them to fail.
- In the No Build VISSIM analysis, southbound traffic exiting Parkwood Lake Street had difficulty finding a gap in traffic. Maintaining the side street stop control for Parkwood Lake St would raise safety concerns with the new signal 150 feet away. Vehicles making a southbound left need to be cognizant of gaps in the westbound through, northbound left, and eastbound through movements while also tracking the eastbound through queue at the signal. This may cause drivers to miss an approaching vehicle or get caught halfway through the turn if the eastbound through movement has queued more than 150 feet, which the model shows the eastbound queue exceeding. This concern lessens if there were greater distance between the signal and Parkwood Lake Street.

For these reasons, Alternative A-1 was not taken through VISSIM analysis and not recommended for implementation.

Alternative A-2: Realignment of Notre Dame Drive or Parkwood Lake Street with a Signal

Realignment of a side street and signalization of the intersection accommodates the operational and safety issues currently experienced and forecasted at the site location. Alternative A-2 would require ROW acquisition in either the southwest or northeast corners dependent on the side street realigned. In modeling this alternative in VISSIM, it was found that a second eastbound through lane was needed to accommodate the morning commuter traffic heading to Cape Girardeau. A separate eastbound right turn was assumed to serve students and buses headed to Notre Dame High School.

Alternative A-3: Install a Roundabout

A roundabout was modeled in VISSIM, as generally roundabouts have better performance in reducing crashes than traffic signals. However, roundabouts also perform ideally in situations where traffic is not dominant in only one or two directions but rather dispersed evenly in all directions. At this intersection, the direction of traffic flow has two dominant movements in the morning, with the westbound left causing delay for the eastbound through traffic so that in order to achieve acceptable LOS and queuing, a second eastbound through lane approaching and circulating through the south side of the roundabout would be required. By 2045, the volume of eastbound traffic would make merging these two eastbound lanes into a single lane east of the roundabout difficult without causing congestion at the merge point. This merge congestion is similar to the situation for Alternative A-2, where an interim merge from two to one lane can work in an interim, but ultimately will require two lanes to extend all the way to Cape Girardeau by 2045.

Route K & Route 25

At Route K & Route 25, the side street stop control hinders westbound traffic turning onto Route 25 to the point of extended queues. The long westbound queues cause additional safety issues as drivers may drive aggressively to get onto Route 25, and vehicles stopped on Route K will cause unsafe conditions for vehicles exiting the gas station and other nearby commercial sites.

Two alternatives for the intersection of Route K and Route 25 were considered, with results in Table 5:

B-1. Install traffic signal intersection control

VISSIM analysis of converting the side-street stop to a signal shows the intersection will work well with the number of lanes currently on each approach. Installing a traffic signal would be simple to construct with the current geometry. It would be recommended, though, that with the increased traffic in the region that a separate eastbound left turn bay be provided for the businesses immediately east of the intersection. This widening of the road is believed to fit within existing right-of-way, and should extend approximately 1,250 feet to provide the separated left turn for all businesses approaching Route 25.

B-2. Install a roundabout

Installation of a roundabout will achieve the desired operational results, similar to Alternative B-1, but has the added safety benefit of a higher crash reduction factor than a traffic signal. In order to work, the roundabout needed a separate westbound right turn bypass lane and northbound right turn bypass lane. Similar to Alternative B-1, a separate left-turn bay on Route K would be recommended for left-turn access into the businesses within 0.25-miles east of Route 25.

Table 4. Mitigated Capacity Analysis Results – Route K & Notre Dame/Parkwood Lake Street

Intersection Approach	LOS (Delay in sec/veh) [Max Queue Length, feet]			
	Alternative A-2 (Signal)		Alternative A-3 (Roundabout)	
	2025	2045	2025	2045
AM				
Overall Intersection	**B (11.4)**	**B (13.5)**	**A (4.0)**	**A (5.6)**
Eastbound Left	A (5.7) [272]	A (7.4) [401]	A (3.7) [166]	A (4.6) [254]
Eastbound Through	B (12.8) [272]	B (14.2) [400]	A (3.7) [166]	A (5.0) [254]
Eastbound Right	A (5.9) [295]	A (7.4) [424]	A (3.5) [166]	A (4.6) [254]
Eastbound Approach	*B (11.8) [295]*	*B (13.4) [424]*	*A (3.7) [166]*	*A (5) [254]*
Westbound Left	B (15.3) [220]	C (21.9) [265]	A (3) [154]	A (3.2) [203]
Westbound Through	A (3.5) [220]	A (3.5) [265]	A (3) [154]	A (3.3) [203]
Westbound Approach	*B (10.4) [220]*	*B (14.3) [265]*	*A (3) [154]*	*A (3.2) [203]*
Northbound Left	C (31.8) [134]	C (31.8) [154]	B (15.3) [160]	C (28) [218]
Northbound Right	A (8.5) [147]	A (9.3) [168]	A (8.5) [160]	B (16.5) [218]
Northbound Approach	*A (9.3) [147]*	*B (10) [168]*	*A (8.8) [160]*	*B (16.9) [218]*
Southbound Left	C (33.6) [84]	C (33.4) [84]	A (5.5) [48]	A (6.1) [48]
Southbound Right	A (9.4) [96]	A (9.3) [96]	A (5.1) [48]	A (5.2) [48]
Southbound Approach	*C (24.6) [96]*	*C (24.5) [96]*	*A (5.4) [48]*	*A (5.8) [48]*
PM				
Overall Intersection	**A (7.0)**	**A (7.2)**	**A (3.7)**	**A (4.7)**
Eastbound Left	A (8.5) [112]	A (9.1) [118]	A (3.0) [79]	A (3.7) [80]
Eastbound Through	A (5.9) [112]	A (6.1) [117]	A (2.2) [79]	A (2.4) [80]
Eastbound Right	A (2.2) [135]	A (2.2) [141]	A (1.5) [79]	A (1.9) [80]
Eastbound Approach	*A (5.8) [135]*	*A (6.1) [141]*	*A (2.2) [79]*	*A (2.4) [80]*
Westbound Left	A (5) [242]	A (4.8) [303]	A (6.1) [182]	A (7.4) [442]
Westbound Through	A (5.2) [242]	A (5.9) [303]	A (3.4) [182]	A (5.1) [442]
Westbound Approach	*A (5.1) [242]*	*A (5.7) [303]*	*A (3.7) [182]*	*A (5.3) [442]*
Northbound Left	C (29.4) [158]	C (29.9) [162]	A (9.7) [180]	A (9.8) [196]
Northbound Right	A (7.2) [172]	A (7.2) [176]	A (4.2) [180]	A (4.4) [196]
Northbound Approach	*B (11.7) [172]*	*B (11.8) [176]*	*A (5.3) [180]*	*A (5.5) [196]*
Southbound Left	C (25.5) [58]	C (25.4) [58]	B (10.7) [47]	B (17.9) [48]
Southbound Right	A (7.2) [69]	A (8.2) [69]	B (10.6) [47]	B (15.8) [48]
Southbound Approach	*C (20.8) [69]*	*C (20.9) [69]*	*B (10.7) [47]*	*B (17.3) [48]*

Table 5. Mitigated Capacity Analysis Results – Route K & Route 25

Intersection Approach	LOS (Delay in sec/veh) [Max Queue Length, feet]			
	Alternative B-1 (Signal)		Alternative B-2 (Roundabout)	
	2025	2045	2025	2045
AM PEAK HOUR				
Overall Intersection	**A (7.6)**	**A (9.4)**	**A (2.4)**	**A (3.0)**
Westbound Left	D (36.9) [162]	D (36.3) [187]	A (2.6) [58]	A (2.7) [58]
Westbound Right	A (1.3) [76]	A (1.7) [90]	A (0.3) [58]	A (0.4) [58]
Westbound Approach	*B (15) [162]*	*B (15.1) [187]*	*A (1.2) [58]*	*A (1.3) [58]*
Northbound Through	B (10.3) [148]	B (13.5) [186]	A (5.5) [109]	A (6.2) [116]
Northbound Right	A (4.8) [205]	A (7) [261]	A (0.7) [109]	A (0.7) [116]
Northbound Approach	*A (6.5) [205]*	*A (9) [261]*	*A (2.2) [109]*	*A (2.4) [116]*
Southbound Left	A (6.2) [220]	A (7.8) [248]	A (3.2) [223]	A (4.4) [303]
Southbound Through	A (3) [221]	A (3.8) [249]	A (2.9) [223]	A (3.9) [303]
Southbound Approach	*A (5.4) [221]*	*A (6.8) [249]*	*A (3.1) [223]*	*A (4.2) [303]*
PM PEAK HOUR				
Overall Intersection	**B (13.2)**	**B (14.3)**	**A (2.7)**	**A (4.0)**
Westbound Left	C (31) [404]	C (29.8) [450]	A (2.4) [134]	A (3.6) [160]
Westbound Right	A (1.8) [221]	A (3.3) [375]	A (0.8) [134]	A (0.9) [160]
Westbound Approach	*B (16.3) [404]*	*B (16.5) [450]*	*A (1.6) [134]*	*A (2.2) [160]*
Northbound Through	B (15.1) [125]	B (19) [168]	A (2.2) [58]	A (2.5) [65]
Northbound Right	A (1) [59]	A (1.2) [88]	A (0.4) [58]	A (0.4) [65]
Northbound Approach	*A (8.3) [125]*	*B (10.4) [168]*	*A (1.3) [58]*	*A (1.5) [65]*
Southbound Left	A (9) [152]	B (11.8) [166]	A (5.9) [195]	B (11) [284]
Southbound Through	A (7.7) [152]	B (10.7) [166]	A (5.7) [195]	B (10.7) [284]
Southbound Approach	*A (8.5) [152]*	*B (11.3) [166]*	*A (5.8) [195]*	*B (10.8) [284]*

Alternative Selection

ROUTE K & NOTRE DAME HIGH SCHOOL

Alternative A-2 significantly decreases the amount of delay and queue length experienced at the intersection of Route K and Notre Dame Dr/Parkwood Lake Street as compared to the No Build condition. The realignment of the side streets allows for a simplified intersection with far less safety concerns than the existing configuration. As shown, all movements operate at LOS C or better with many operating at LOS A and B under both 2025 and 2045 conditions in both the morning and evening peak hours. The overall intersection produces a LOS B in the morning and LOS A in the evening for both the 2025 and 2045 scenarios. The signalized Alternative A-2 allows for more control over the flow of traffic through the intersection while also allowing consistent and safe passage for side street traffic. This can be beneficial to the school in allowing traffic from large events at the school, such as football games, to disperse efficiently from the school site.

Alternative A-3 also produces very favorable operational results at the intersection of Route K and Notre Dame Dr/Parkwood Lake Street. All movements operate with LOS C or better during the morning and evening peak hours of both the 2025 and 2045 scenarios. The length of the queues is also dramatically reduced from the No Build Scenarios. A roundabout does pose several concerns despite the favorable metrics shown in Table 4. The eastbound approach is very sensitive and can quickly grow a significant queue if there is a prolonged platoon of westbound left vehicles. It should also be noted the peak hour factor of the eastbound and westbound movements is low meaning traffic is not spread evenly throughout the hour. Sidra analysis was completed to account for the peak hour factor adjustment, and the eastbound approach was found to have significantly longer queue than shown in VISSIM. The roundabout also does not allow for as much control over intersection operations as the signalizing shown in Alternative A-2, and a roundabout leaves little room for geometric modification in future years.

Therefore, Alternative A-2 was selected for its flexibility to respond to growth in the corridor. The geometry of the intersection was reviewed since the spacing between the Notre Dame High School and Parkwood Lake Street is not ideal. The driving force behind a signal is access to the school. Options of realigning the entrances to create a four-legged intersection was explored, and ultimately decided that two 'T'-intersections, created by the extension of Parkwood Avenue approximately 660' west of the Notre Dame High School driveway and termination of Parkwood Lake Street in a cul-de-sac, would result in the best operations along the corridor. The location of Parkwood Avenue connection should meet MoDOT Access Management guidelines and all sight distance requirements. In this recommendation, Notre Dame High School entrance would remain in its current location. A Synchro analysis was performed to reflect two 'T'-intersections, with 2045 results presented in Table 6.

If an unforeseen condition prohibits the extension of Parkwood Avenue and an alternate recommendation becomes necessary, it would be to relocate the Notre Dame High School entrance across from the existing Parkwood Lake Street to create a signalized four-legged intersection.

Table 6. 2045 Mitigated Capacity Analysis Results – Rte K & Notre Dame, Rte K & Parkwood Ave

Intersection Approach	LOS (Delay in sec/veh) [95th % Queue Length, feet]			
	Rt K & Parkwood Avenue		Rt K & Notre Dame Entrance	
	AM	PM	AM	PM
Overall Intersection	**--**	**--**	**C (22.9)**	**B (16.9)**
Eastbound Left	A (8.0) [0]	A (0.7) [3]	n/a	n/a
Eastbound Through	--	--	C (27.2) [438]	B (13.9) [110]
Eastbound Right	--	--	A (3.3) [26]	A (7.1) [10]
Eastbound Approach	--	--	*C (24.7)*	*B (13.7)*
Westbound Left	--	--	D (38.4) [197]	A (7.4) [34]
Westbound Through	--	--	A (3.8) [71]	B (15.4) [370]
Westbound Approach	--	--	*C (22.1)*	*B (14.5)*
Northbound Left	n/a	n/a	C (35.0) [12]	C (24.7) [39]
Northbound Right	n/a	n/a	B (13.9) [0]	C (22.6) [0]
Northbound Approach	*n/a*	*n/a*	*B (14.5)*	*C (23.0)*
Southbound Approach	*C (15.5) [10]*	*C (16.8) [8]*	*n/a*	*n/a*

ROUTE K & ROUTE 25

Alternative B-1 produces acceptable levels of service and reduced queue lengths. Signalization of the intersection allows for consistent and predictable flow of traffic and dramatically increases the efficiency of the intersection. All approaches operate at LOS B or better with the overall intersection operating with LOS A and B for the morning and evening peak hours under 2025 and 2045 conditions.

Alternative B-2 produces highly efficient operations with the roundabout configuration. The volume distribution at the intersection of Route K and 25 is favorable to a roundabout as evident by the efficient levels of service and low queue lengths shown in Table 5. The queue lengths are further reduced under Alternative B-2 as all approaches are under 300', approximately 12 vehicles, in the 2045 scenario. All movements operate with LOS B or better under both 2025 and 2045 conditions with many operating at LOS A. Because of the more even distribution, a roundabout would result in less delay during non-peak hours since there is continual movement through the intersection.

Therefore, for congestion reduction, safety, and traffic calming reasons, Alternative B-2 was selected as the preferred alternative at Route 25 and Route K.

Peer Review

A peer review was performed for MoDOT's "Rte. K Cape Girardeau County West Corridor Safety Study" (January 7, 2020) ("MoDOT Study"). This review focused on the safety aspects of the study, as the capacity results were reanalyzed using the VISSIM modeling presented in the previous sections.

The MoDOT Study reviewed crash data from January 1, 2014 to December 31, 2018 for the Route K corridor extending from Route 25 in the west to the City of Cape Girardeau limits in the east. In summary, the MoDOT safety analysis resulted in the following recommendations:

- Installation of a roundabout at Route K and Route 25
- Install a continuous left turn lane from Greenbrier Drive to Elite Car Wash

- Realign either Parkwood Lake Street or Notre Dame Drive to be a four-legged intersection and install a traffic signal

The MoDOT Study determined that the section from Winks Gas Station to Greenbrier Drive would not result in a positive Benefit-Cost ratio, and therefore no improvements were recommended along that section.

As mentioned in the previous section, our analysis supports the first bullet and agrees that a roundabout should be installed at Route K and Route 25. Regarding the third bullet above, the analysis supports a signal at Notre Dame Drive, but would prefer Parkwood Avenue to be extended to Route K with Parkwood Lake Street terminating in a cul-de-sac. A four-legged signalized intersection would be acceptable, but would be a secondary solution to this issue in the event Parkwood Avenue extension is not feasible or cannot meet MoDOT design requirements.

Crash data was gathered for the years subsequent to the MoDOT Study. Several crashes were noted at the intersection of CR 319 that would not have appeared in the data set used in the MoDOT Study. These crashes were of a type that could also benefit from extension of the three-lane section. It is recommended that the three lane section be extended from the prior terminus of Greenbrier Drive, and instead move the project's terminus of the three lane section to just west of CR 319, so that an eastbound left turn lane can be provided at CR 319. The section from Wink's Gas Station to CR 319 would remain as the existing two-lane cross-section.

Concept and Cost

A concept plan was created reflecting the selected preferred alternatives. Along the section of Route K from CR 319 to Cape Girardeau, the north edge of existing shoulder was held, and improvements were assumed to be added on the south side of the road. The concept reflects the extension of Parkwood Avenue to Route K and the termination of Parkwood Lake Street in a cul-de-sac.

An interim condition could be considered along Route K between Notre Dame Drive and the city limits that reduces the eastbound lanes back to a three-lane cross-section (removing the second eastbound through lane) approximately 1,000 feet past the school's entrance. This could be helpful to reduce MoDOT's pavement maintenance responsibilities while traffic growth occurs over the next 10 -15 years. However, it is anticipated this second lane will need to be operational by 2045. If this interim condition is chosen by MoDOT, it is recommended that the ultimate four-lane section be graded and any required right-of-way obtained now, and the future second eastbound lane be constructed with a full depth base but act as a wide shoulder during the interim phase.

A preliminary opinion of probable cost was created for the concept plan. The concept plan used aerial imagery and assumptions regarding quantity of items such as earthwork. The cost does not account for obtaining right-of-way, utility relocation, assumes 4% inflation due to current high cost of construction materials, and assumes a 30% contingency due to current lack of survey and topographic information. The cost was also split in two sections for the Route 25 intersection and associated improvements, and the Route K widening from CR 319 to the Walmart entrance including the intersection improvements at Notre Dame High School. The opinion of probable cost resulted in the following:

Route K and Route 25: $4,148,000

Route K from CR 319 to west of Notre Dame HS entrance (3-lane section): $2,474,000

Route K from Notre Dame HS entrance (start of 4-lane section) to Walmart entrance: $6,149,000

Total project cost (both sections): $12,770,000

The final concept plan is presented in Appendix D, with a breakdown of the associated opinion of probable cost in Appendix E.

Conclusions

Lochmueller Group prepared this traffic study to analyze the Route K Corridor starting from City of Cape Girardeau limits west 2.55 miles to Greenbrier Drive, and also intersection improvements at Route K with Route 25. The study intent was to review MoDOT's planned project along the study area and recommend intersection control solutions at Route K with Route 25 and with Notre Dame High School/Parkwood Lake Street.

The study examined existing conditions, particularly capacity analysis at the intersections of Route K with Route 25 and with Notre Dame High School entrance, forecasted future volume for 2045, analyzed future No Build condition, and analyzed alternatives at each intersection location. After reviewing and comparing the alternatives to prior analysis along the corridor that resulted in a preferred alternative, we created a concept plan and prepared a preliminary opinion of probable cost.

The existing cross-section is generally a two-lane roadway along the extents of the project limits. Based on VISSIM analysis results, future No Build findings revealed that both subject intersections will experience significant delay in the future if no improvements are constructed.

The selected preferred alternatives include the following:

- Construct a roundabout at the intersection of Route 25 and Route K, with westbound right and northbound right turn bypass lanes. The bypass lanes would require two receiving lanes on the receiving legs of the intersection, which would then need to transition from two down to the existing single lane leaving the intersection. Along the existing retail sites immediately west of Route 25, a two-way left turn lane should be installed to reduce potential for rear-end crashes. Once east of the retail entrances, transition down to the existing two-lane cross-section.
- Starting at the eastbound approach of Route K to CR 319, widen Route K to install an eastbound left turn bay. Continue the three lane section (one lane each direction with two-way left turn lane) east until approximately 1,000 feet west of Notre Dame High School entrance, where the cross-section expands to accommodate a second eastbound through lane. An eastbound right turn bay is also recommended at the high school's entrance. Parkwood Avenue should be extended to Route K and existing Parkwood Lake Street sever its connection to Route K and terminate in a cul-de-sac. East of the school entrance, it is anticipated that two eastbound through lanes will be needed to accommodate vehicle demand by 2045. The road improvements to be built should accommodate the full future section in terms of right-of-way and grading.
    - To reduce near term maintenance obligations, MoDOT may choose to transition the two eastbound lanes down to one lane approximately 1,000 feet east of the new signal at

Notre Dame Drive and use the second lane as a full depth wide shoulder that can be converted to a travel lane later. This effectively creates a three-lane cross section from 1,000 feet east of Notre Dame Drive to the Walmart entrance in Cape Girardeau.

All improvements are anticipated to improve traffic flow to an acceptable LOS C or better in 2045 and reduce the potential for crashes. Concept plans and an opinion of probable cost were created reflecting the preferred scenario. The total opinion of probable cost for the project is approximately $12.8M.

Appendix

Appendix A – MoDOT “Rte. K Cape Girardeau County West Corridor Safety Study” (January 7, 2020)

Appendix B – 2016 & 2017 Traffic Volumes received from MoDOT

Appendix C – Traffic Volume Forecasting Background & Assumptions Memorandum (December 29, 2021)

Appendix D – Concept Plans

Appendix E – Opinion of Probable Cost

Appendix A: MoDOT "Rte. K Cape Girardeau County West Corridor Safety Study" (January 7, 2020)

MoDOT

Southeast District
Mark Shelton, District Engineer

Missouri Department of Transportation

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TO: Craig Compas, District Traffic Engineer

FROM: Jake Butler, Senior Traffic Studies Specialist

DATE: January 7, 2020

SUBJECT: Rte. K Cape Girardeau County West Corridor Safety Study

I have completed a traffic study evaluating the current safety conditions on Rte. K in Cape Girardeau County from the intersection of MO 25 to just east of the Commuter Lot.

The safety study limits are near the city limits of both Cape Girardeau and Gordonville in Cape Girardeau County Missouri.

Current traffic data, crash history, and other factors were taken into consideration when evaluating how the limits of this study are currently operating from a safety standpoint and its proposed safety countermeasures.

The results of the study show that the work being proposed for project J9I3125 will provide positive safety improvements throughout its project limits.

Please find attached study summarizing the support for this decision.

Cc: Steve Hoernig, Traffic Operations Engineer

RTE. K CAPE GIRARDEAU COUNTY
WEST CORRIDOR SAFETY STUDY

PURPOSE

An engineering study of traffic conditions, crash frequency, and physical characteristics was performed to determine what if any safety countermeasures are currently warranted along the Rte. K Corridor from MO 25 to just West of Siemers Dr.

CURRENT COORIDOR DESCRIPTION

This study covers all of Rte. K from the intersection of MO 25 to just east of the Commuter Lot where the pavement changes from a two lane roadway to a three lane section. Currently Rte. K west of Siemers Dr. is a two lane roadway with 12' wide lanes and a 8' shoulder on each side and has an AADT of roughly 12,762 and at certain times of day is operating at or above capacity.

At this time Rte. K has some additional safety measures in place mainly in two separate locations besides the 8' shoulders. The first location is at the intersection of MO 25 were there are right turn channelizing islands, flashing stop sign and transverse rumbles in place. The other location is at the intersection of Notre Dame Drive where there is a 400' turn lane at Notre Dame Dr. for left turn storage for the vehicles into the Notre Dame High School. With the recent asphalt overlay in the summer of 2019 edgline rumble stripe were installed from the Cape Girardeau City Limits west. The posted speed limit on Rte. K is stair-stepped as you travel east, from MO 25 to the City limits of Cape Girardeau it is 55 mph and it changes to 50 mph at the City limits and at County Road (CRD) 203 it changes again to 45 mph.

Image 1: Aerial image of Rte. K Cape Girardeau County, MO

DATA COLLECTION

All crash data was queried from the time frame of January 1, 2014 – December 31, 2018. The current year's accidents were reviewed but cannot be considered a total because the year is not compete and not all of the crash reports for the year 2019 have been filed and available for review.

Intersection turning movement counts were conducted for previous studies for MO 25 and Rte. K (9/17/2017) and Rte. K in Notre Dame Dr. (4/19/2015).

SAFETY ANALYSIS

INTERSECTION OF MO 25 AND RTE. K

The intersection of MO 25 and Rte. K is a T-intersection with Rte. K having the stop control. A traffic study was conducted in March of 2019 analyzing the current safety performance of the intersection (shown as Exhibit 1 in the Appendix). The study showed that from 2013 to 2017 the accident rate was 9.4 accidents per year or 47 accidents in a five year period when it is expected to see 0.628 accidents per year or 3 to 4 accidents in a five year period.

This study showed that from 2013 to 2017 57% of the intersections accidents were Right turn rear end collisions where a vehicle in the right turn lane was following another vehicle and assumed that they already found a gap and traveled north on MO 25 and ran into the back of that vehicle. 28% of the accidents that occurred were more severe right angle collisions occurring from a vehicle turning left onto Rte. K from MO 25 in front of a vehicle traveling north on MO 25. The study indicated that the installation of a Roundabout and its reduction in right angle type crashes would have a Benefit/Cost ratio of 6.16:1 and was recommended to be installed.

Since this study was completed there have been 11 Right turn rear end collisions and 7 right angle collisions occurring from a vehicle turning left onto Rte. K from MO 25 in front of a vehicle traveling north on MO 25. These 7 left turn collisions are more than half the number of what occurred from 2013 to 2017 so the frequency of these collisions is increasing. With that being said the benefit/cost ratio will only increase and provide more justification for the cost of installing a Roundabout at this intersection.

Currently we are in the process of extending the right turn lane for Rte. K at this intersection to increase capacity of the intersection in preparation for the lane closures at the US 61/IS-55 interchange at Exit 99. Also we will restripe the left turn lane on MO 25 SB to increase storage capacity there as well. While this work is being done, we have also reangled the right turn to make it easier for drivers to see oncoming traffic from NB MO 25 as well as the car in front of them making a right turn in hopes to reduce rear end collisions.

WINKS GAS STATION TO CRD 319

From just east of MO 25 intersection to CRD 319 is approximately 1.77 miles and has seen 22 accidents for the period of 2014 to 2018. Roughly half of the accidents in this segment involve situations which are difficult to counteract with roadway improvements such as deer, objects in the roadway, or due weather-related conditions. This segment of Rte. K does have Rte. K's only fatal accident which occurred when a vehicle left the roadway on the left side and went into the creek to the east of CRD 201.

Near the intersection of MO 25 and Rte. K there has be some recent commercial development including a Dollar General Store on the south side and a Winks Gas Station on the North side. With these developments there have been 3 rear end crashes caused by someone waiting to make a left turn into the Dollar General and one rear end crash caused by someone waiting to make a left turn into the Winks Gas Station. At this time safety improvements are not warranted here due to the small number of accidents that have occurred in this area. A potential solution here would be to install a center turn lane. However, it is not being recommended for this section of Rte. K because cost would outweigh the benefit.

Currently this section of Rte. K has an accident rate of approximately 53.36 accidents per 100 million vehicle miles traveled which is well below the statewide average of 193 accidents per 100 million vehicle miles traveled for a Super two-lane highway. With this being said this segment of Rte. K is not recommended to have any safety improvements because it is performing below the statewide average.

GREENBRIER DRIVE TO FORRESTER DRIVE

The section of Rte. K from Greenbrier Drive to Forrester Drive is just east of CRD 319 and is roughly 0.22 miles long. This segment has three subdivision entrances within it and a small gas station all on the south side of the road. These entrances provide access to the Hillcrest Subdivision that has a little over 200 houses in it as well as five apartment complexes. There have been 14 accidents that occurred from 2014 to 2018 seven of which occurred when a vehicle stopped in traffic waiting to make a left turn into an entrance and was rear ended or was waiting on another vehicle to make a left turn and was rear ended. The majority of these crashes were more severe rear end crashes (three minor injury and one disabling injury) because vehicles traveling on Rte. K aren't expecting traffic to stop and hit a stopped vehicle at a higher rate of speed. Currently in the year 2019 preliminary reports in this section show there have been four additional crashes two of which were this type of rear end collision with one being minor injury.

For this section it is recommended for safety purposes that a continuous left turn lane be installed for all three entrances into the subdivision to the south side of the road. This will allow vehicles attempting to make a left turn to separate from through traffic and wait for a gap in opposing traffic to make a safe left turn movement. Although traffic data has not been collected at these entrances with the amount of houses, they provide access to they will most likely have enough traffic volume to warrant the installation of a left turn lane for a few hours of the day.

CRD 318 TO CRD 206

The section of Rte. K from CRD 318 to CRD 206 is just east of Forrester Drive and is roughly 0.42 miles long with 0.2 miles between the county roads. Although data has not been collected on either of these CRD intersections they receive a significant amount of traffic on and off of Rte. K. CRD 318 provides access to a number of residents but also provides access to MO 25 just south of Jackson as well as other county roads that provide a back way into Hopper Road in the City of Cape Girardeau and Old Orchard Road in the City of Jackson. CRD 206 provides access to several residents as well as provides access to Bloomfield Road in the City of Cape Girardeau.

There have been 25 accidents that occurred from 2014 to 2018, 16 of which occurred when a vehicle was stopped in traffic waiting to make a left turn into an entrance and was rear ended or was waiting on another vehicle to make a left turn and was rear ended. The majority (14 of the 16) of these crashes occurred at the intersection of Rte. K and CRD 206 because it is on the south side of the road and WB traffic coming up the hill from Notre Dame Dr. and vehicles traveling WB aren't expecting traffic to stop and hit a stopped vehicle.

For this section it is recommend for safety purposes that a continuous left turn lane be installed for all three entrances into the subdivision to the south side of the road. This will allow vehicles attempting to make a left turn to separate from through traffic and wait for a gap in opposing traffic to make a safe left turn movement.

NOTRE DAME DRIVE

The intersection of Rte. K and Notre Dame Drive is a T-intersection with Notre Dame Drive having the stop control. A traffic study was conducted in September of 2015 to determine whether or not the intersection warranted being upgraded to a signalized intersection (shown as Exhibit 2 in the Appendix). The study showed the intersection under normal circumstances did not meet any of the nine signal warrants but when you considered the Rte. K WB left turning volume as a separate minor street it met Warrant 3 for one hour of the day. With this intersection meeting only one signal warrant under special circumstances the intersection was not recommended to be signalized and the Notre Dame School was given the option to pay for the signal if they wanted to.

When this study was completed the accident data that was reviewed was from 2010 to 2014 and showed seven accidents. Of these seven accidents two were left turn right angle collisions, four were rear ends and one struck a deer. The two left turn right angle collisions would be eliminated by signalizing the intersection but were not enough to meet the Crash Experience Warrant, Warrant 7. Since that study was completed there have been six accidents five of which occurred in 2015. Four of these six accidents have been property damage rear end collisions in the vicinity of the channelized right turn. The other two involved a head on collisions where the driver was either driving erratically or lost control and then collided with a WB vehicle.

With no real changes being observed at this intersection since the 2015 traffic study was completed the recommendations of this intersection are still recommended. Typically, the installation of signalized intersection at a school or private entrance would be solely on entity to pay for it with MoDOT's permission because it solely benefits them. If the either the School or the City would want to signalize the intersection MoDOT would allow them to do so at their own cost. If the intersection was signalized it is recommended that the Parkwood Lake St. be connected to the intersection to make a four-legged intersection and not have a street in the functional area of a signalized intersection.

SCHABBING LANE TO CRD 203

The section of Rte. K from Schabbing Lane to CRD 203 is just east of Notre Dame Drive and is roughly 0.82 miles long. This section has nine entrances. All but CRD 203 are on the north side of Rte. K. Of these nine access point there is a Private K-12 school (Eagle Ridge Christian School), School bus facility (Robinson Transportation), two CRD access points (CRD 317 and CRD 203), two access points to local farms and two access points to some commercial property that is currently vacant.

There have been 32 accidents that occurred from 2014 to 2018, 15 of which occurred when a vehicle was stopped in traffic waiting to make a left turn into an entrance and was rear ended or was waiting on another vehicle to make a left turn and was rear ended. The majority (10 of the 15) of these crashes occurred at the intersection of Rte. K and the entrance to Eagle Ridge Christian School because it is on the north side of the road and EB traffic from Notre Dame Dr. aren't expecting traffic to stop and hit the last stopped vehicle in the queue.

After receiving a customer concern, a study was conducted in September 2019 to determine what the Benefit/Cost Ratio would be to install a left turn lane for the Eagle Ridge Christian School Entrance (shown as Exhibit 3 in the Appendix). The results of the study showed that installation of a left turn lane for the Eagle Ridge Christian School Entrance had a positive benefit/cost ratio of 3.54:1. However, with the installation of a left turn lane solely benefiting the Eagle Ridge School the left turn lane would need to be installed by the School and not MoDOT.

In the summer of 2019 MoDOT was informed by the Cape Girardeau County Special Road District, that maintains CRD 203, that they in the near future would be connecting the entrance from the back of the Notre Dame School property to CRD 203. With the completion of this connection, traffic patterns could potentially change as some vehicles could use CRD 203 to access the Notre Dame School instead of using the entrance off of Rte. K. Without a dedicated left turn lane for CRD 203 it is reasonable to conclude t that the same type of rear end collisions that already occur on Rte. K where a vehicle is waiting to make a left turn and a traffic queue forms will occur here as well. At the time the Special Road District was receptive to paying for a portion of the cost to install the left turn lane, but it was too late to be included with the 2019 overlay of Rte. K.

For this section it is recommend for safety purposes that a continuous center turn lane be installed for the entire segment from Schabbing Lane to CRD 203. This will allow vehicles attempting to make a left turn to separate from through traffic and wait for a gap in opposing traffic to make a safe left turn movement. With this being a shared center turn lane it will provide safer access to future developments to the south side of Rte. K as well.

SUMMARY

Upon completion of the study, it is my recommendation that if funds become available, a Roundabout be installed at the intersection of MO 25 and Rte. K to improve safety as well as improve the level of service for all legs of the intersections.

Also, I recommend that a continuous left turn lane be installed from Greenbrier Drive to the new Elite Car Wash left turn lane and at some locations be a center turn lane. This will provide a great safety benefit for this part of the corridor and will also provide better mobility for Rte. K through traffic as well. Without a continuous left turn lane from Greenbrier Drive to the new Elite Car Wash and a separate left turn lane were installed at every intersection from Greenbrier Drive to CRD 203 Rte. K would be very inconsistent and by the time the roadway was tapered back to a two lane roadway it would start widening out again for the next left turn lane because of how close the intersection are to one another. With a continuous left turn lane Rte. K will be a 3-lane roadway and will essentially maintain its current alignment and be widened on both sides.

For the intersection of Notre Dame Drive the recommendation from the 2015 intersection study is recommended because there have been no changes since then. The only change from the study would be that if the intersection is signalized, then either Notre Dame Drive or Parkwood Lake St. be realigned to make a 4-legged intersection.

APPENDIX

EXHIBIT 1

MoDOT

Southeast District
Mark Shelton, District Engineer

Missouri Department of Transportation

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1.888.ASK MODOT (275.6636)

TO: File

FROM: Jake Butler, Senior Traffic Studies Specialist

DATE: March 25, 2019

SUBJECT: MO 25 and Rte. K Intersection – Roundabout Study

I have completed a traffic study evaluating the intersection of MO 25 and Rte. K in the City of Gordonville.

Current traffic data, crash history, intersection performance, and other factors were taken into consideration when evaluating this intersection for a possible countermeasure. Results of this study indicate that a Roundabout would be the safest as well as most efficient form of traffic control for this particular intersection and is therefore recommended.

Please find attached a study summarizing the support for this decision.

Cc: Craig Compas, District Traffic Engineer and Steve Hoernig Traffic Operations Engineer

PURPOSE

An engineering study of traffic conditions, accident frequency, and physical characteristics of the location was performed to determine whether installation of a Roundabout would be cost efficient at the intersection of MO 25 and Rte. K in the City of Gordonville in Cape Girardeau County Missouri

INTERSECTION DESCRIPTION

The intersection of MO 25 and Rte. K is a rural 3-legged intersection that currently has Rte. K with the stop condition. The posted speed limit on MO 25 is 45 mph and on Rte. K it is posted at 45 mph.

DATA COLLETCTION

An intersection turning movement count was conducted for this intersection on September 19, 2017. (See Table 4 in Appendix)

POTENTIAL TRAFFIC CONTROL OPTIONS

The intersection of MO 25 and Rte. K is currently a Two-way stop control intersection with Rte. K. This intersection has potentially three different traffic control configurations that could potentially increase safety for all movements. The intersection could be converted to an All-way Stop, Signalized intersection, or a Roundabout.

An All-way Stop would eliminate the current potential for a higher speed type right angle collision by requiring every movement to come to a complete stop. This would provide all legs of the intersection with the Right of Way and give better service to Rte. K than it currently does. But this could create backup issues for all legs of the intersection because all legs have to come to a complete stop and yield to the vehicle that has Right of Way and then make their movement.

Signalizing the intersection would also potentially eliminate a high speed type right angle collision by serving non conflicting movements at the same time but. Signalized intersections are known to increase rear-end type collisions but reduce the severity of accidents at an intersection. For the installation of a signal to be justified one or more of the Signal Warrants in the Manual for Uniform Traffic Control Devices would need to be met. All 9 Signal Warrants were evaluated for this intersection and none of the warrants were met for the 12 hours that were evaluated. With none of the Signal Warrants being met a signal is not recommend to be installed at this intersection and could potentially cause more harm than good.

A Roundabout would completely eliminate the potential for a high speed type of right angle collision and would also greatly reduce the right turn rear-end collisions that currently occur at this intersection. A Roundabout would reduce conflict points at this intersection from 11 to 6 and have zero of the more severe right angle type conflict points. This type of traffic control requires all legs of the intersection to yield to traffic currently inside the Roundabout and provide a better level of service to all movements at this intersection.

INTERSECTION PROFORMANCE ANALYSIS

This intersection was evaluated for three different types of traffic control devices; the existing Two-Way Stop Control, an All-Way Stop Control condition, and a Roundabout to determine which performed best in terms of LOS and actual delay. LOS (Level of Service) is a letter designation that describes a range of operating conditions on a particular type of facility and represents a range of delay values. Six levels of service are defined, using the letters A through F. LOS A represents the best level of service, and generally describes operation of free flow and very low delay. LOS F represents the worst operating conditions. LOS and actual delay was determined for the three different types of traffic control using Highway Capacity Software 2010 (HCS 2010) and also confirmed with the program Synchro 10.

Traffic Control Device used		Intersection approach leg –Level of Service(LOS) and Delay time (sec) given from Synchro 2010 using Highway Capacity Manual 6th Edition								
		MO 25 SB Through		MO 25 SB Left Turn		MO 25 NB Through		RTE K WB Left Turn		Intersection LOS
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	
AM PEAK	Two-way Stop	A	0.00	A	6.5	A	0.00	D	26.1	C
	All-way Stop	B	10.6	D	26.3	B	11.6	B	12.2	C
	Roundabout	A	7.4	A	7.4	C	15.2	A	5.1	B
PM Peak	Two-way Stop	A	0.00	A	4.4	A	0.00	D	26.6	C
	All-way Stop	B	11.9	B	14	B	12.2	C	19	B
	Roundabout	A	7.0	A	7.0	A	5.4	A	9.8	A

Table 1: Level of Service and delay comparison of each different intersection control countermeasure for each approach leg of this intersection from the program Synchro 10 using the 2017 turning movement count.

Traffic Control Device used		Intersection approach leg –Level of Service(LOS) and Delay time (sec) given from Synchro 2010 using Highway Capacity Manual 6th Edition								
		MO 25 SB Through		MO 25 SB Left Turn		MO 25 NB Through		RTE K WB Left Turn		Intersection LOS
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	
AM PEAK	Two-way Stop	A	0.00	B	10.315	A	0.00	F	304.9	F
	All-way Stop	B	14.5	F	167.1	C	17.6	C	15.3	F
	Roundabout	B	12.9	B	12.9	F	131.2	A	6.9	F
PM Peak	Two-way Stop	A	0.00	A	4.7	A	0.00	F	243.5	F
	All-way Stop	C	16.5	C	22.8	C	17.6	F	69.4	E
	Roundabout	A	9.7	A	9.7	A	6.5	D	28.2	C

Table 2: Level of Service and delay comparison of each different intersection control countermeasure for each approach leg of this intersection from the program Synchro 10 using the Projected 2037 manual turning movement count.

As shown in Table 1 by using the program Synchro 10 the best LOS is achieved for all approaches of the intersection by using a Roundabout. Table 2 shows that in the year 2037, expected life of the Roundabout project, the projected traffic volumes for the PM peaks of the day a Roundabout is the only type of traffic control that maintains a passing LOS. Since LOS is based on a range of delay values, Table 1 and 2 further show that a roundabout provides the lowest delay times of the evaluated traffic control countermeasures with like LOS values. If in the year 2037 a right turn by pass lane was built for NB MO 25 the LOS would be considerably higher because the entire right turn volume would not enter the roundabout and have a free flowing movement. Also with the volumes on Rte. K being so high in the year 2037 it will be over capacity for a two-lane roadway so it could potentially be widened to a four-lane roadway and the MO 25 NB right turn volume would be turning into its own lane on Rte. K instead of merging into a signal lane.

SAFETY AND BENEFIT/COST ANALYSIS

SAFETY

The crash rate at the intersection of MO 25 and Rte. K near the City of Gordonville is higher than would be expected for an intersection of its characteristics. By using the Predictive Method from the Highway Safety Manual (HSM) this intersection should see approximately 0.628 accidents per year or around 3 to 4 accidents in a five year period. But when reviewing the observed accidents in a five year period from 2013 to 2017 the accident rate was actually 9.4 accidents per year or 47 accidents in a five year period. The actual accident rate is ten times the expected amount for this type of intersection which shows that the current intersection configuration warrants investigation.

57% of this intersection’s crash types are a rear end that occurred at the right turn lane on Rte. K to MO 25 NB where the vehicle behind the first vehicle pulls forward thinking the vehicle in front has already gone and has a “fender-bender”, or PDO type crash. 28% are a more severe right angle collision occurring from a vehicle turning left onto Rte. K from MO 25 SB. The installation of a Roundabout would theoretically eliminate all right angle collisions because vehicles enter the intersection at a skew and not at a 90° angle causing less severe collisions. Also the right-turn rear end collisions would be considerably less because all vehicles would be sent through the Roundabout and not by-pass it and then have to turn their head so far to see oncoming traffic. An All-Way Stop would have less severe right angle collisions because all vehicles would be moving at a slower rate of speed but would not eliminate the possibility of a right angle collision. With the installation of an All-Way Stop control there will still be a chance of traffic running the stop sign at a high rate of speed and having the potential of a more sever right angle collision. With the installation of a Roundabout this possibility would be eliminated.

BENEFIT/COST

The estimated cost of proposed improvement was determined by the district Design department while crash costs were drawn from established values of crash cost by severity (See Table 3 in Appendix). When comparing the annualized cost of the installation of a Roundabout to the annualized dollar amount realized from the projected reduction in crash numbers the ratio came to be 6.16:1. This means that for every $1 invested in installing a roundabout $6.16 will be saved in prevented accidents. Accident costs were determined by accident severity. (See Table 3 in Appendix)

Roundabout Benefit Cost Summary	
Designed Service Life	20 Years
Estimated Project Cost	$605,000
Annualized Project Cost	$38,727
Annualized Crash Benefit with Roundabout	$220,498

Table 3: Benefit Cost Summary for the installation of a Roundabout

SUMMARY

Upon completion of the study, it is my recommendation to have a Roundabout installed at the intersection of MO 25 and Rte. K near the City of Gordonville. A Roundabout at this location would not only be beneficial for safety reasons but also would increase the performance of the intersection. The benefit/cost ratio of 6.16:1 makes the installation of a Roundabout an effective use of funds.

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio[a] v/c ≤ 1.0	v/c > 1.0
0-10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

Note: [a]For approaches and intersectionwide assessment, LOS is defined solely by control delay

Table 4: Exhibit 19-1, Exhibit 20-1, and Exhibit 21-1 LOS criteria from the Highway Capacity Manual 2010

Crash Cost by severity	
Crash Type	Individual Crash Cost
Property Damage Only Crash	$4,565.00
Minor Injury Crash	$81,606.00
Disabling Injury Crash	$313,869.00
Fatal Injury Crash	$5,021,902.00

Table 5: Crash cost by severity

Missouri Department of Transportation												
15 MINUTE TURNING MOVEMENT COUNTS (ALL VEHICLES)												
Date: 11/5/2017					City: Gordonville							
Location: MO 25 and Rte. K					County: Cape Girardeau							
	MO 25							Rte. K				
Time	Southbound		Total	Northbound		Total	N/S	Westbound		Total	E/W	Grand Total
	L	T		T	R		Total	L	R		Total	
6:00 AM	28	16	**44**	13	7	**20**	64	7	8	**15**	**15**	**79**
6:15 AM	23	19	**42**	26	8	**34**	76	14	10	**24**	**24**	**100**
6:30 AM	41	22	**63**	34	13	**47**	110	17	14	**31**	**31**	**141**
6:45 AM	55	24	**79**	32	11	**43**	122	15	12	**27**	**27**	**149**
Total	**147**	**81**	**228**	**105**	**39**	**144**	**372**	**53**	**44**	**97**	**97**	**469**
7:00 AM	65	24	**89**	30	20	**50**	139	19	22	**41**	**41**	**180**
7:15 AM	79	31	**110**	47	35	**82**	192	21	36	**57**	**57**	**249**
7:30 AM	125	34	**159**	47	38	**85**	244	21	39	**60**	**60**	**304**
7:45 AM	111	39	**150**	46	30	**76**	226	16	32	**48**	**48**	**274**
Total	**380**	**128**	**508**	**170**	**123**	**293**	**801**	**77**	**129**	**206**	**206**	**1007**
8:00 AM	69	31	**100**	11	13	**24**	124	18	13	**31**	**31**	**155**
8:15 AM	44	21	**65**	26	21	**47**	112	17	20	**37**	**37**	**149**
8:30 AM	38	17	**55**	17	11	**28**	83	22	12	**34**	**34**	**117**
8:45 AM	41	24	**65**	16	12	**28**	93	11	14	**25**	**25**	**118**
Total	**192**	**93**	**285**	**70**	**57**	**127**	**412**	**68**	**59**	**127**	**127**	**539**
9:00 AM	28	16	**44**	10	14	**24**	68	14	16	**30**	**30**	**98**
9:15 AM	30	16	**46**	18	17	**35**	81	29	16	**45**	**45**	**126**
9:30 AM	30	23	**53**	20	24	**44**	97	27	27	**54**	**54**	**151**
9:45 AM	24	7	**31**	16	21	**37**	68	24	23	**47**	**47**	**115**
Total	**112**	**62**	**174**	**64**	**76**	**140**	**314**	**94**	**82**	**176**	**176**	**490**
10:00 AM	22	9	**31**	11	21	**32**	63	24	22	**46**	**46**	**109**
10:15 AM	24	14	**38**	12	22	**34**	72	23	23	**46**	**46**	**118**
10:30 AM	16	13	**29**	17	28	**45**	74	19	29	**48**	**48**	**122**
10:45 AM	27	19	**46**	15	18	**33**	79	26	19	**45**	**45**	**124**
Total	**89**	**55**	**144**	**55**	**89**	**144**	**288**	**92**	**93**	**185**	**185**	**473**
11:00 AM	27	18	**45**	20	21	**41**	86	23	22	**45**	**45**	**131**
11:15 AM	36	16	**52**	17	27	**44**	96	27	28	**55**	**55**	**151**
11:30 AM	30	19	**49**	17	27	**44**	93	30	26	**56**	**56**	**149**
11:45 AM	29	17	**46**	18	26	**44**	90	22	29	**51**	**51**	**141**
Total	**122**	**70**	**192**	**72**	**101**	**173**	**365**	**102**	**105**	**207**	**207**	**572**
12:00 PM	23	26	**49**	15	32	**47**	96	32	31	**63**	**63**	**159**
12:15 PM	30	12	**42**	14	22	**36**	78	33	24	**57**	**57**	**135**
12:30 PM	45	21	**66**	21	23	**44**	110	36	26	**62**	**62**	**172**
12:45 PM	28	14	**42**	28	35	**63**	105	32	35	**67**	**67**	**172**
Total	**126**	**73**	**199**	**78**	**112**	**190**	**389**	**133**	**116**	**249**	**249**	**638**
1:00 PM	31	17	**48**	18	29	**47**	95	28	29	**57**	**57**	**152**
1:15 PM	19	18	**37**	27	40	**67**	104	38	39	**77**	**77**	**181**
1:30 PM	25	19	**44**	14	30	**44**	88	26	33	**59**	**59**	**147**
1:45 PM	17	13	**30**	13	22	**35**	65	41	21	**62**	**62**	**127**
Total	**92**	**67**	**159**	**72**	**121**	**193**	**352**	**133**	**122**	**255**	**255**	**607**
2:00 PM	32	17	**49**	20	32	**52**	101	38	35	**73**	**73**	**174**
2:15 PM	20	26	**46**	21	33	**54**	100	45	33	**78**	**78**	**178**
2:30 PM	33	18	**51**	20	47	**67**	118	34	49	**83**	**83**	**201**
2:45 PM	23	20	**43**	22	25	**47**	90	38	25	**63**	**63**	**153**
Total	**108**	**81**	**189**	**83**	**137**	**220**	**409**	**155**	**142**	**297**	**297**	**706**
3:00 PM	31	37	**68**	35	55	**90**	158	45	55	**100**	**100**	**258**
3:15 PM	50	42	**92**	31	40	**71**	163	48	41	**89**	**89**	**252**
3:30 PM	37	45	**82**	27	56	**83**	165	67	56	**123**	**123**	**288**
3:45 PM	41	42	**83**	22	61	**83**	166	63	57	**120**	**120**	**286**
Total	**159**	**166**	**325**	**115**	**212**	**327**	**652**	**223**	**209**	**432**	**432**	**1084**
4:00 PM	30	26	**56**	27	50	**77**	133	55	52	**107**	**107**	**240**
4:15 PM	23	28	**51**	31	53	**84**	135	66	52	**118**	**118**	**253**
4:30 PM	51	21	**72**	29	71	**100**	172	58	73	**131**	**131**	**303**
4:45 PM	43	36	**79**	35	74	**109**	188	74	74	**148**	**148**	**336**
Total	**147**	**111**	**258**	**122**	**248**	**370**	**628**	**253**	**251**	**504**	**504**	**1132**
5:00 PM	41	34	**75**	41	85	**126**	201	64	86	**150**	**150**	**351**
5:15 PM	26	34	**60**	26	78	**104**	164	96	79	**175**	**175**	**339**
5:30 PM	38	20	**58**	33	63	**96**	154	68	64	**132**	**132**	**286**
5:45 PM	39	30	**69**	17	63	**80**	149	60	64	**124**	**124**	**273**
Total	**144**	**118**	**262**	**117**	**289**	**406**	**668**	**288**	**293**	**581**	**581**	**1249**

Table 6: Turning movement count recorded on 11/5/2017

Missouri Department of Transportation

15 MINUTE TURNING MOVEMENT COUNTS (ALL VEHICLES)

2037 ESTIMATED VOLUME — City: Gordonville

Location: MO 25 and Rte. K — County: Cape Girardeau

Time	MO 25							Rte. K				Grand Total
	Southbound		Total	Northbound		Total	N/S Total	Westbound		Total	E/W Total	
	L	T		T	R			L	R			
6:00 AM	42	24	**65**	19	33	**52**	117	10	12	**22**	**22**	**140**
6:15 AM	34	28	**62**	39	71	**110**	172	21	15	**36**	**36**	**208**
6:30 AM	61	33	**94**	51	111	**162**	256	25	21	**46**	**46**	**302**
6:45 AM	82	36	**117**	48	97	**144**	262	22	18	**40**	**40**	**302**
Total	**218**	**120**	**339**	**156**	**312**	**468**	**807**	**78.8**	**65.4**	**144**	**144**	**951**
7:00 AM	97	36	**132**	45	116	**160**	293	28	33	**61**	**61**	**354**
7:15 AM	117	46	**163**	70	138	**208**	371	31	53	**85**	**85**	**456**
7:30 AM	186	51	**236**	70	163	**233**	470	31	58	**89**	**89**	**559**
7:45 AM	165	58	**223**	68	131	**199**	422	24	48	**71**	**71**	**493**
Total	**565**	**190**	**755**	**253**	**548**	**801**	**1556**	**114**	**192**	**306**	**306**	**1862**
8:00 AM	103	46	**149**	16	82	**98**	247	27	19	**46**	**46**	**293**
8:15 AM	65	31	**96.6**	39	83	**122**	218	25	30	**55**	**55**	**273**
8:30 AM	56	25	**81.7**	25	49	**74**	156	33	18	**51**	**51**	**207**
8:45 AM	61	36	**96.6**	24	56	**80**	177	16	21	**37**	**37**	**214**
Total	**285**	**138**	**423**	**104**	**270**	**374**	**798**	**101**	**87.7**	**189**	**189**	**987**
9:00 AM	42	24	**65**	15	42	**56**	122	21	24	**45**	**45**	**166**
9:15 AM	45	24	**68**	27	40	**67**	135	43	24	**67**	**67**	**202**
9:30 AM	45	34	**79**	30	49	**79**	158	40	40	**80**	**80**	**238**
9:45 AM	36	10	**46**	24	55	**79**	125	36	34	**70**	**70**	**195**
Total	**166**	**92.1**	**259**	**95.1**	**186**	**281**	**539**	**140**	**122**	**262**	**262**	**801**
10:00 AM	33	13	**46**	16	40	**56**	103	36	33	**68**	**68**	**171**
10:15 AM	36	21	**56**	18	45	**62**	119	34	34	**68**	**68**	**187**
10:30 AM	24	19	**43**	25	42	**67**	110	28	43	**71**	**71**	**181**
10:45 AM	40	28	**68**	22	34	**56**	125	39	28	**67**	**67**	**192**
Total	**132**	**81.7**	**214**	**82**	**160**	**242**	**456**	**137**	**138**	**275**	**275**	**731**
11:00 AM	40	27	**67**	30	58	**88**	155	34	33	**67**	**67**	**221**
11:15 AM	53	24	**77**	25	45	**70**	147	40	42	**82**	**82**	**229**
11:30 AM	45	28	**73**	25	28	**53**	126	45	39	**83**	**83**	**210**
11:45 AM	43	25	**68**	27	61	**88**	156	33	43	**76**	**76**	**232**
Total	**181**	**104**	**285**	**107**	**192**	**299**	**584**	**152**	**156**	**308**	**308**	**892**
12:00 PM	34	39	**73**	22	37	**59**	132	48	46	**94**	**94**	**226**
12:15 PM	45	18	**62**	21	40	**61**	123	49	36	**85**	**85**	**208**
12:30 PM	67	31	**98**	31	51	**82**	180	53	39	**92**	**92**	**272**
12:45 PM	42	21	**62**	42	40	**82**	144	48	52	**100**	**100**	**244**
Total	**187**	**108**	**296**	**115.9**	**168**	**284**	**580**	**198**	**172**	**370**	**370**	**950**
1:00 PM	46	25	**71**	27	39	**65**	137	42	43	**85**	**85**	**221**
1:15 PM	28	27	**55**	40	49	**89**	144	56	58	**114**	**114**	**259**
1:30 PM	37	28	**65**	21	43	**64**	129	39	49	**88**	**88**	**217**
1:45 PM	25	19	**45**	19	39	**58**	103	61	31	**92**	**92**	**195**
Total	**137**	**99.6**	**236**	**107**	**169.4**	**276**	**513**	**198**	**181**	**379**	**379**	**892**
2:00 PM	48	25	**73**	30	25	**55**	128	56	52	**108**	**108**	**236**
2:15 PM	30	39	**68**	31	34	**65**	134	67	49	**116**	**116**	**250**
2:30 PM	49	27	**76**	30	36	**65**	141	51	73	**123**	**123**	**264**
2:45 PM	34	30	**64**	33	24	**56**	120	56	37	**94**	**94**	**214**
Total	**160**	**120**	**281**	**123**	**119**	**242**	**523**	**230**	**211**	**441**	**441**	**964**
3:00 PM	46	55	**101**	52	36	**88**	189	67	82	**149**	**149**	**337**
3:15 PM	74	62	**137**	46	43	**89**	226	71	61	**132**	**132**	**358**
3:30 PM	55	67	**122**	40	40	**80**	202	100	83	**183**	**183**	**385**
3:45 PM	61	62	**123**	33	59	**92**	215	94	85	**178**	**178**	**394**
Total	**236**	**247**	**483**	**171**	**178**	**349**	**832**	**331**	**311**	**642**	**642**	**1474**
4:00 PM	45	39	**83**	40	51	**91**	174	82	77	**159**	**159**	**333**
4:15 PM	34	42	**76**	46	56	**103**	178	98	77	**175**	**175**	**354**
4:30 PM	76	31	**107**	43	43	**86**	193	86	108	**195**	**195**	**388**
4:45 PM	64	53	**117**	52	49	**101**	218	110	110	**220**	**220**	**438**
Total	**218**	**165**	**383**	**181**	**199**	**380**	**764**	**376**	**373**	**749**	**749**	**1513**
5:00 PM	61	51	**111**	61	43	**104**	215	95	128	**223**	**223**	**438**
5:15 PM	39	51	**89**	39	39	**77**	166	143	117	**260**	**260**	**426**
5:30 PM	56	30	**86**	49	49	**98**	184	101	95	**196**	**196**	**380**
5:45 PM	58	45	**103**	25	40	**65**	168	89	95	**184**	**184**	**352**
Total	**214**	**175**	**389**	**173.9**	**171**	**345**	**734**	**428**	**435**	**863**	**863**	**1597**

Table 7: Project turning movement count for 2037 using a 2% growth rate

EXHIBIT 2

TRAFFIC CONTROL SIGNAL NEEDS STUDY: RTE. K & NOTRE DAME DRIVE IN CAPE GIRARDEAU COUNTY

PURPOSE

An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is warranted due to increased development of Norte Dame Drive in the City of Cape Girardeau in Cape Girardeau County Missouri

INTERSECTION DESCRIPTION

The intersection of Rte. K and Notre Dame Dr. is a 3-legged intersection with an entrance to a mobile home park west of the intersection on the opposite side of Rte. K. The posted speed limit on Rte. K is 50 mph. The intersection lies 1.70 Miles west of the intersection of Rte. K and Siemers Dr. which is currently signalized.

DATA COLLETCTION

An intersection turning movement count was conducted for this intersection on Wednesday April 29, 2015.

SIGNAL WARRANTS

According to federal standards stated in the Manual on Uniform Traffic Control Devices (MUTCD) the investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection near a Grade Crossing

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal. The volume warrants will be evaluated using the existing traffic counts as well as an adjusted traffic count reflecting new trips generated by the new development.

TRAFFIC VOLUME ADJUSTMENT

In order to account for right turning traffic on the minor-street that would be otherwise hindered by the installation of a signal, the Eastbound Route K right turn volumes have been adjusted according to MoDOT standards for a free right turn without an adequate approach lane. Refer to Table 1 below. The existing traffic volumes and the adjusted volumes can be found in tables 5 of the appendix. The volumes with the adjusted minor street right turns will be used for the vehicular volume sections of the warrant study.

For this study the right turning traffic volume from Notre Dame Drive will not be included because there will be adequate space for a right turn lane if the need for a signalized intersection ever arose.

TABLE 1. NUMBER OF RIGHT TURNS TO INCLUDE IN A WARRANT ANALYSIS – EPG 902.3.1

Proposed Right Turn Condition	Right Turn Percentage (Right Turn Volume/Total Approach Volume)	Percent Right Turn Used in Warrant Analysis
Free Right With Adequate Lane	Any	0
Signal Control or Free Right Without Adequate Approach	0 to 25	100
	25 to 50	75
	50 to 75	50
	75 to 100	25
RTOR Restricted	Any	100

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME (MUTCD SECTION 4C.02)

The eight-hour vehicular volume warrant is met if any 8 hours of average daily traffic exceed the minimum vehicle volumes listed in table 1. The volumes were compared against the 70% factor minimum volumes due to the major-street, Rte. K, exceeding 40 mph.

Table 2: MUTCD Warrant 1, Eight-Hour Volume

Condition A—Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Table 3A: Warrant 1, Eight-Hour volume Calulations – EXISTING traffic VOLUMES excluding Notre dame drive right turn traffic

Hour Beginning At:	Hours of volume data	Major Rd Volume (sum of both approaches)			Minor Rd Volume (high volume approach)			Meets Warrant 1A Criteria?		Meets Warrant 1B Criteria?		Both Major and Minor Roads Meet Criteria?	
		East	West	Total	South	North	High	Major ≥350	Minor ≥105	Major ≥525	Minor ≥53	1A	1B
6:00 AM	1	338	128	466		0	0	YES	NO	NO	NO		
7:00 AM	2	819	427	1246		7	7	YES	NO	YES	NO		
8:00 AM	3	424	158	582		2	2	YES	NO	YES	NO		
9:00 AM	4	306	200	506		4	4	YES	NO	NO	NO		
10:00 AM	5	258	175	433		2	2	YES	NO	NO	NO		
11:00 AM	6	235	239	474		0	0	YES	NO	NO	NO		
12:00 PM	7	240	298	538		2	2	YES	NO	YES	NO		
1:00 PM	8	253	315	568		12	12	YES	NO	YES	NO		
2:00 PM	9	236	388	624		10	10	YES	NO	YES	NO		
3:00 PM	10	357	649	1006		49	49	YES	NO	YES	NO		
4:00 PM	11	338	726	1064		36	36	YES	NO	YES	NO		
5:00 PM	12	316	663	979		34	34	YES	NO	YES	NO		

TABLE 3B**:** Warrant 1, Eight-Hour volume Calculations – traffic Volume Using westbound Rte. k left turn volume as a minor street

Hour Beginning At:	Hours of volume data	Major Rd Volume (sum of both approaches)			Minor Rd Volume (high volume approach)			Meets Warrant 1A Criteria?		Meets Warrant 1B Criteria?		Both Major and Minor Roads Meet Criteria?	
		East	West	Total	West	North	High	Major	Minor	Major	Minor		
								≥350	≥105	≥525	≥53	1A	1B
6:00 AM	1	338		338	22		22	NO	NO	NO	NO		
7:00 AM	2	819		819	289		289	YES	YES	YES	YES	YES	YES
8:00 AM	3	424		424	10		10	YES	NO	NO	NO		
9:00 AM	4	306		306	21		21	NO	NO	NO	NO		
10:00 AM	5	258		258	6		6	NO	NO	NO	NO		
11:00 AM	6	235		235	4		4	NO	NO	NO	NO		
12:00 PM	7	240		240	16		16	NO	NO	NO	NO		
1:00 PM	8	253		253	30		30	NO	NO	NO	NO		
2:00 PM	9	236		236	53		53	NO	NO	NO	YES		
3:00 PM	10	357		357	192		192	YES	YES	NO	YES	YES	
4:00 PM	11	338		338	187		187	NO	YES	NO	YES		
5:00 PM	12	316		316	83		83	NO	NO	NO	YES		

Evaluation: Neither warrants 1A or 1B is met when evaluating the existing traffic volumes. After evaluating the traffic volumes considering the Westbound left turn on Rte. K, warrants 1A and 1B were still not met for more than eight hours.

WARRANT 2, FOUR-HOUR VEHICULAR VOLUME (MUTCD SECTION 4C.03)

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve shown below for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

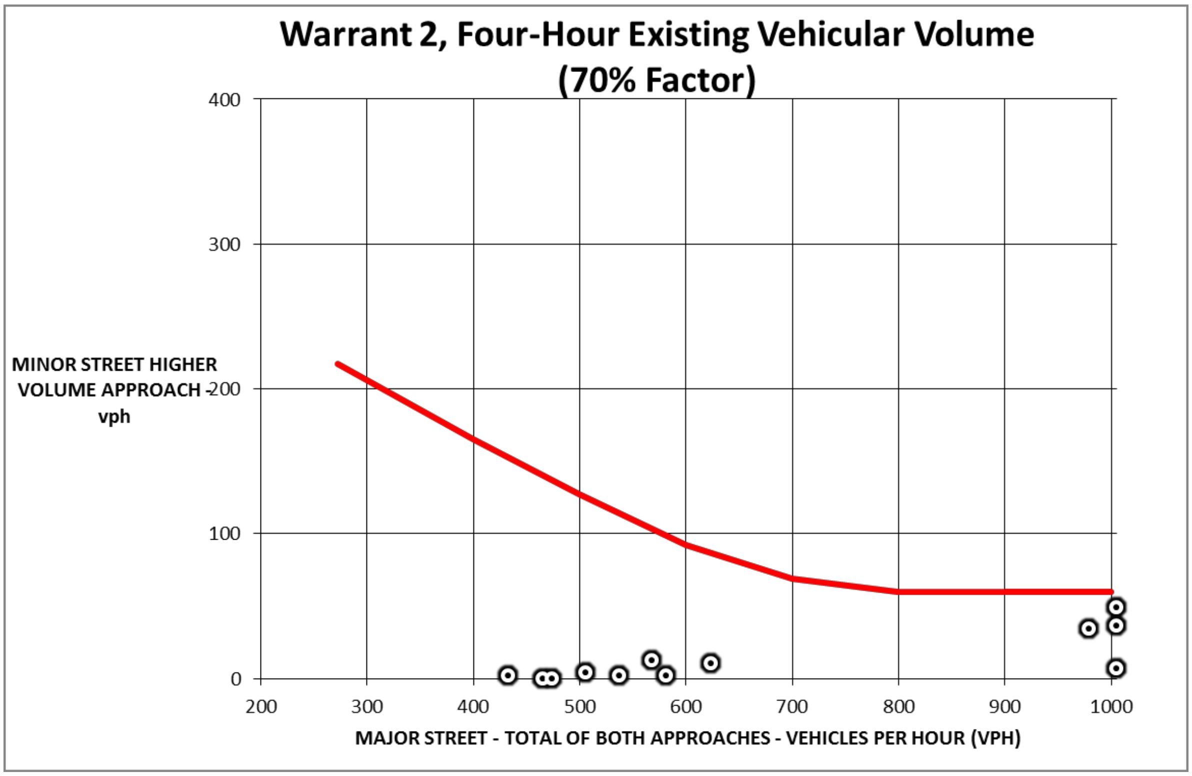


FIGURE 1A: WARRANT 2, FOUR-HOUR VEHICULAR EXISTING VOLUMES (MINUS NOTRE DAME DRIVE RIGHT TURN VOLUM) PLOTTED ON THE MUTCD STANDARD CURVE CORRESPONDING TO APPROACH LANES AND ADJUSTEMENT FACTOR.

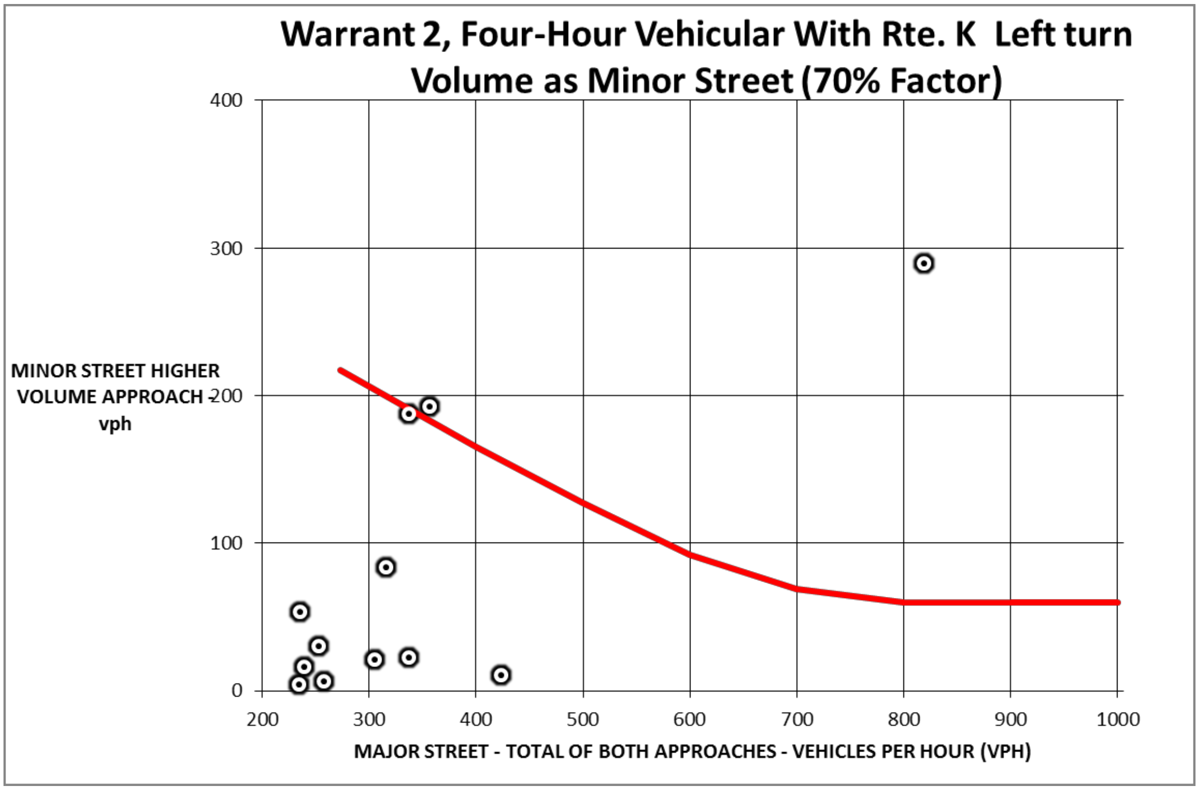


FIGURE 1B: WARRANT 2, FOUR-HOUR RTE. K WESTBOUND LEFT TURN USED AS A MINOR STREET VEHICULAR VOLUMES PLOTTED ON THE MUTCD STANDARD CURVE CORRESPONDING TO APPROACH LANES AND ADJUSTEMENT FACTOR.

Evaluation: Warrant 2 for existing traffic volumes are not met since none of the twelve hours were greater than the plotted threshold. Warrant 2 for the volumes considering Rte. K left turning moment as a separate minor street is met with only 2 of the 12 hours exceeding the volume curve so this warrant is not met.

WARRANT 3, PEAK HOUR

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

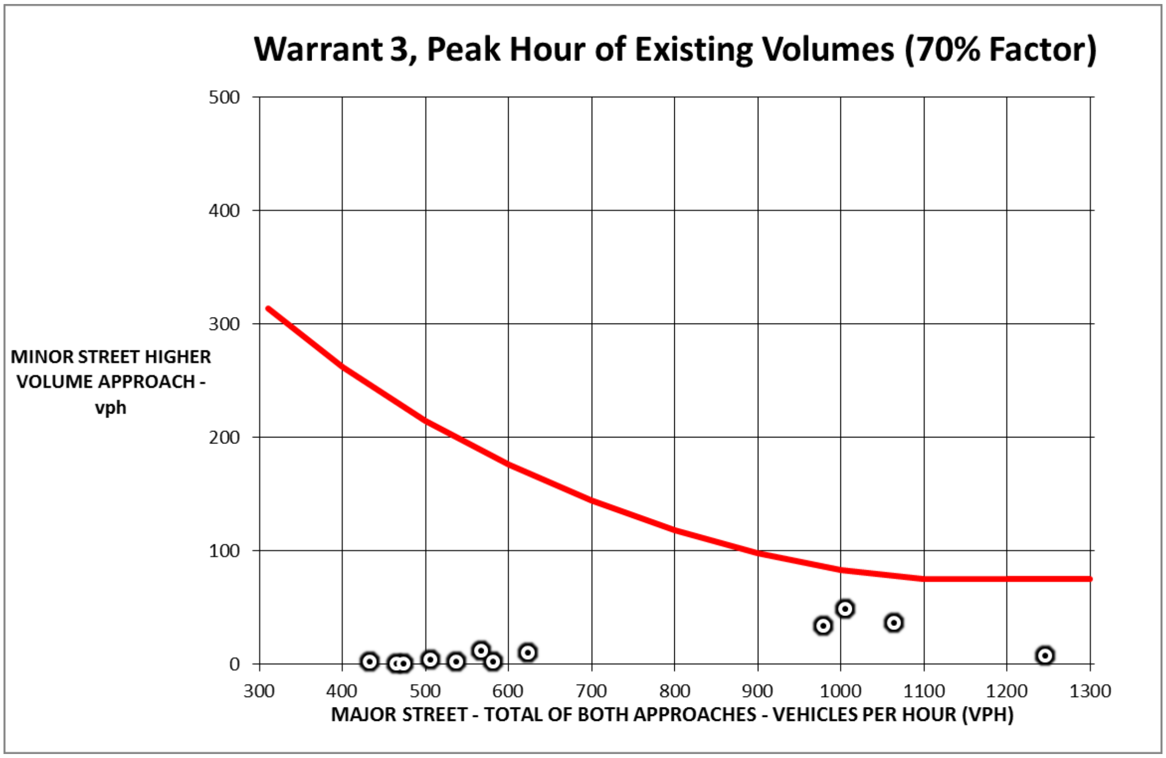
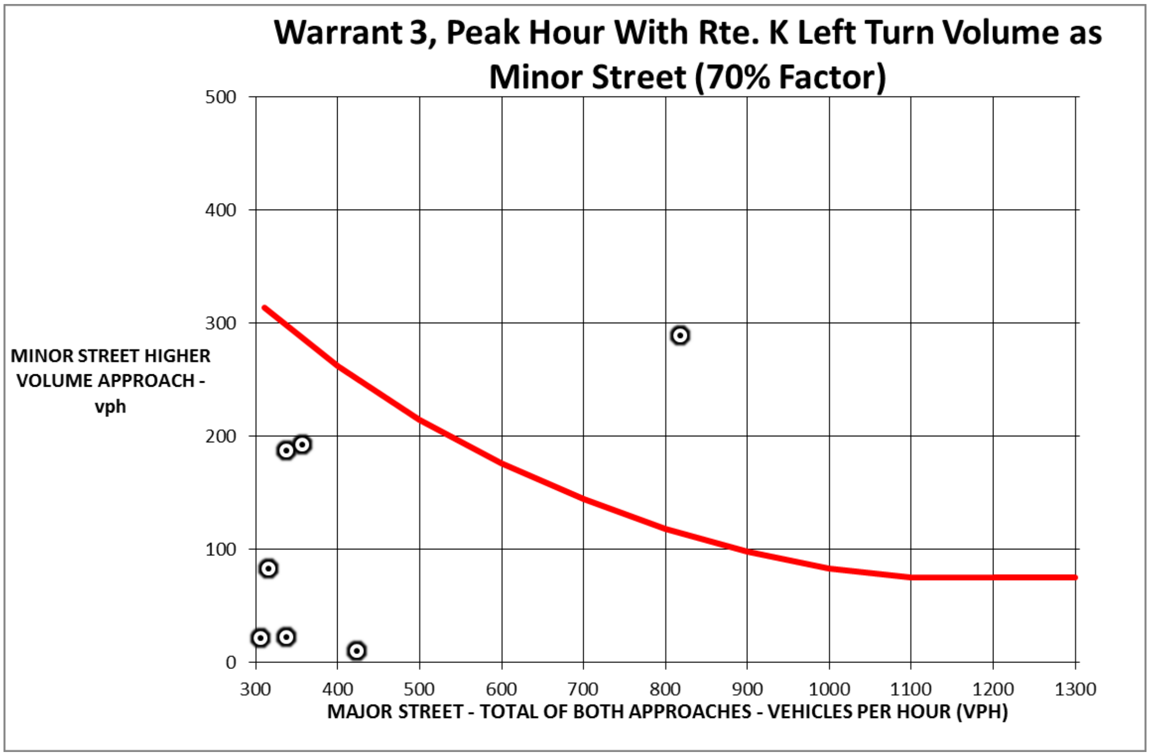


FIGURE 2A: WARRANT 3, PEAK HOUR RTE. K WESTBOUND LEFT TURN USED AS A MINOR STREET VEHICULAR VOLUMES PLOTTED ON THE MUTCD STANDARD CURVE CORRESPONDING TO APPROACH LANES AND ADJUSTEMENT FACTOR.



Evaluation: Warrant 3 for existing traffic volumes are not met since none of the twelve hours were greater than the plotted threshold. Warrant 3 for the volumes considering Rte. K left turning moment as a separate minor street is met with 1 of the 12 hours exceeding the volume curve.

WARRANT 4, PEDESTRIAN VOLUME

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. The lower threshold of pedestrian traffic necessary for the warrant to be considered is 107 pedestrians per hour (PPH) for at least a one hour period on an average day. Since pedestrian traffic does not approach the 107 PPH minimum threshold necessary for Warrant 4 to be considered the pedestrian volume Warrant is not met.

WARRANT 5, SCHOOL CROSSING

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students. The current layout of the intersection being a 3 approach T has not been identified to be a significant crossing point for schoolchildren. Warrant 5 is not met.

WARRANT 6, COORDINATED SIGNAL SYSTEM

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles. The adjacent traffic signals already provide the necessary degree of platooning. For the section of US 61 being evaluated, a coordination plan is not in place therefore Warrant 6 is not met.

WARRANT 7, CRASH EXPERIENCE

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. A full five year reported crash experience from January 1, 2010 to December 31, 2014 was evaluated for this study of this intersection.

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 902.3.3 (see EPG 902.3.3), or the vph in both of the 80 percent columns of Condition B in Table 902.3.3 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Summary: The significantly low amount of crashes at the intersection has not warranted additional safety countermeasures to be implemented at this intersection. The intersection has not had any reported crashes in any of the five 12-month periods of this study that would be correctable from the installation of a traffic signal. The traffic volumes for the intersection were compared to the table for the eighty percent factor and neither condition A or B was met for more than eight hours. Since none of the criteria was met, Warrant 7 is not met.

WARRANT 8, ROADWAY NETWORK

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network. This warrant is based on existing traffic and is not normally used during project development.

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2 and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have at least one of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.

B. It includes rural or suburban highways outside, entering, or traversing a city.

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Since Notre Dame Drive is not considered a major route, Warrant 8 is not met.

WARRANT 9, INTERSECTION NEAR A GRADE CROSSING

The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Warrant 9 is not met since the intersection is not located in close proximity to a grade crossing.

SUMMARY

Warrant	Existing Traffic Volumes (Minus Notre Dame Right Turn Traffic)		Rte. K Westbound Left Turn Considered as a Minor Street	
	Warrant Criteria Met?		Warrant Criteria Met?	
	Yes	No	Yes	No
1. *Eight-Hour Vehicular Volume*		X		X
2. *Four-Hour Vehicular Volume*		X		X
3. *Peak Hour*		X	X	
4. *Pedestrian Volume*		X		X
5. *School Crossing*		X		X
6. *Coordinated Signal System*		X		X
7. *Crash Experience*		X		X
8. *Roadway Network*		X		X
9. *Intersection Near a Grade Crossing*		X		X

None of the warrants are met when evaluating the existing traffic volumes. Warrant 3 is only met when using the volumes of the Westbound Left Turn for Rte. K as a separate minor street from the through lane of Westbound Rte. K. Since using this Left turn traffic volume as a minor street passed a warrant, further evaluation was conducted of the intersection and roadway network to determine if installing a traffic signal at the intersection will positively affect the level of service and mobility of the area.

Table 4: Level of Service comparison of each different intersection control device for each approach leg of this intersection from the program Synchro. See Appendix for the definition of each level of service in terms of delay time for the different traffic control devices.

Traffic Control Device used		Intersection Approach Leg - Level of Service given in Synchro				
		Rte K East Bound Through	Rte K West Bound Through	Rte K West Bound Left Turn	Norte Dame Drive Left Turn	Norte Dame Drive Right Turn
AM PEAK	Signalized- Protected Left Turn	C	A	F	B	A
	Signalized- Protected/Permissive Left Turn	C	A	B	B	A
	Unsignalized – Stop sign			B	E	C
	Roundabout	F	A	A	B	B
PM PEAK	Signalized- Protected Left Turn	A	A	E	B	A
	Signalized- Protected/Permissive Left Turn	A	A	A	B	A
	Unsignalized – Stop sign			A	E	B
	Roundabout	A	B	B	A	A
OFF PEAK	Signalized- Protected Left Turn	A	A	F	C	A
	Signalized- Protected/Permissive Left Turn	A	A	A	C	A
	Unsignalized – Stop sign			A	B	A
	Roundabout	A	A	A	A	A

As shown in Table 4 the best level of service achieved for all approaches of the intersection using the program Synchro was by using the a signalized intersection with a Protected/Permissive left turn for westbound Rte. K in both the AM and PM peaks. It should be mentioned that the AM portion for Protective/Permissive is misleading because with the high volumes of east bound traffic on Rte. K the signal will primarily run in protected left turn mode because of the small amount of gaps available to make the turn before it turns to protected mode. During the Off peak the traffic control device that has the best level of service for all approaches is the Roundabout. Also during this Off peak the current Unsignalized condition has a better level of service on all approaches than either signalized conditions.

In conclusion, the intersection has only met 1 of the 9 Warrants and that was only when using the Rte. K west bound left turn as a minor street. It is not recommended that a signal be installed at this location. Since this intersection had to analysis the major streets left turn volumes as a minor street volume to even meet a single warrant for a signal. And further evaluation did not indicate that the installation of a traffic signal at this location would positively impact the Level of Service and mobility in the area, it is not recommended that a traffic signal be installed.

Table 5: Existing Traffic Volume Count

Missouri Department of Transportation

15 MINUTE TURNING MOVEMENT COUNTS (ALL VEHICLES)

Date: 10/13/2015 City: Cape Girardeau

Location: Route K and Notre Dame Drive County: Cape Girardeau

Time	Rte K							Notre Dame Drive				Grand Total
	Westboound		Total	Eastbound		Total	E/W Total	Northbound		Total	N/S Total	
	L	T		T	R			L	R			
6:00 AM	2	10	**12**	38	0	**38**	50	0	0	**0**	**0**	**50**
6:15 AM	5	24	**29**	77	1	**78**	107	0	1	**1**	**1**	**108**
6:30 AM	6	33	**39**	98	3	**101**	140	0	3	**3**	**3**	**143**
6:45 AM	9	39	**48**	119	2	**121**	169	0	2	**2**	**2**	**171**
Total	**22**	**106**	**128**	**332**	**6**	**338**	**466**	**0**	**6**	**6**	**6**	**472**
7:00 AM	38	31	**69**	111	11	**122**	191	3	13	**16**	**16**	**207**
7:15 AM	72	22	**94**	168	41	**209**	303	2	39	**41**	**41**	**344**
7:30 AM	99	44	**143**	221	47	**268**	411	1	41	**42**	**42**	**453**
7:45 AM	80	41	**121**	184	36	**220**	341	1	37	**38**	**38**	**379**
Total	**289**	**138**	**427**	**684**	**135**	**819**	**1246**	**7**	**130**	**137**	**137**	**1383**
8:00 AM	5	49	**54**	147	4	**151**	205	2	2	**4**	**4**	**209**
8:15 AM	0	37	**37**	102	2	**104**	141	0	2	**2**	**2**	**143**
8:30 AM	4	26	**30**	82	0	**82**	112	0	2	**2**	**2**	**114**
8:45 AM	1	36	**37**	87	0	**87**	124	0	2	**2**	**2**	**126**
Total	**10**	**148**	**158**	**418**	**6**	**424**	**582**	**2**	**8**	**10**	**10**	**592**
9:00 AM	1	42	**43**	70	1	**71**	114	1	15	**16**	**16**	**130**
9:15 AM	2	53	**55**	75	2	**77**	132	0	2	**2**	**2**	**134**
9:30 AM	11	47	**58**	78	1	**79**	137	2	1	**3**	**3**	**140**
9:45 AM	7	37	**44**	78	1	**79**	123	1	1	**2**	**2**	**125**
Total	**21**	**179**	**200**	**301**	**5**	**306**	**506**	**4**	**19**	**23**	**23**	**529**
10:00 AM	2	37	**39**	62	0	**62**	101	1	1	**2**	**2**	**103**
10:15 AM	1	46	**47**	67	0	**67**	114	0	0	**0**	**0**	**114**
10:30 AM	1	39	**40**	59	0	**59**	99	0	2	**2**	**2**	**101**
10:45 AM	2	47	**49**	67	3	**70**	119	1	0	**1**	**1**	**120**
Total	**6**	**169**	**175**	**255**	**3**	**258**	**433**	**2**	**3**	**5**	**5**	**438**
11:00 AM	2	56	**58**	47	1	**48**	106	0	1	**1**	**1**	**107**
11:15 AM	0	61	**61**	48	1	**49**	110	0	1	**1**	**1**	**111**
11:30 AM	0	59	**59**	70	0	**70**	129	0	90	**90**	**90**	**219**
11:45 AM	2	59	**61**	67	1	**68**	129	0	5	**5**	**5**	**134**
Total	**4**	**235**	**239**	**232**	**3**	**235**	**474**	**0**	**97**	**97**	**97**	**571**
12:00 PM	2	78	**80**	60	2	**62**	142	0	1	**1**	**1**	**143**
12:15 PM	3	70	**73**	63	0	**63**	136	1	3	**4**	**4**	**140**
12:30 PM	4	61	**65**	50	1	**51**	116	1	2	**3**	**3**	**119**
12:45 PM	7	73	**80**	63	1	**64**	144	0	2	**2**	**2**	**146**
Total	**16**	**282**	**298**	**236**	**4**	**240**	**538**	**2**	**8**	**10**	**10**	**548**
1:00 PM	15	75	**90**	73	1	**74**	164	6	13	**19**	**19**	**183**
1:15 PM	4	72	**76**	65	1	**66**	142	0	7	**7**	**7**	**149**
1:30 PM	7	78	**85**	48	0	**48**	133	3	10	**13**	**13**	**146**
1:45 PM	4	60	**64**	63	2	**65**	129	3	3	**6**	**6**	**135**
Total	**30**	**285**	**315**	**249**	**4**	**253**	**568**	**12**	**33**	**45**	**45**	**613**
2:00 PM	1	75	**76**	69	1	**70**	146	4	5	**9**	**9**	**155**
2:15 PM	4	84	**88**	54	1	**55**	143	2	8	**10**	**10**	**153**
2:30 PM	11	89	**100**	49	6	**55**	155	1	4	**5**	**5**	**160**
2:45 PM	37	87	**124**	42	14	**56**	180	3	2	**5**	**5**	**185**
Total	**53**	**335**	**388**	**214**	**22**	**236**	**624**	**10**	**19**	**29**	**29**	**653**
3:00 PM	45	94	**139**	58	15	**73**	212	24	89	**113**	**113**	**325**
3:15 PM	42	115	**157**	73	15	**88**	245	12	41	**53**	**53**	**298**
3:30 PM	48	141	**189**	80	17	**97**	286	9	14	**23**	**23**	**309**
3:45 PM	57	107	**164**	74	25	**99**	263	4	13	**17**	**17**	**280**
Total	**192**	**457**	**649**	**285**	**72**	**357**	**1006**	**49**	**157**	**206**	**206**	**1212**
4:00 PM	77	111	**188**	86	11	**97**	285	8	13	**21**	**21**	**306**
4:15 PM	40	133	**173**	70	14	**84**	257	4	19	**23**	**23**	**280**
4:30 PM	38	153	**191**	67	10	**77**	268	12	25	**37**	**37**	**305**
4:45 PM	32	142	**174**	67	13	**80**	254	12	26	**38**	**38**	**292**
Total	**187**	**539**	**726**	**290**	**48**	**338**	**1064**	**36**	**83**	**119**	**119**	**1183**
5:00 PM	30	174	**204**	75	7	**82**	286	11	43	**54**	**54**	**340**
5:15 PM	15	173	**188**	62	6	**68**	256	6	32	**38**	**38**	**294**
5:30 PM	24	137	**161**	68	4	**72**	233	7	33	**40**	**40**	**273**
5:45 PM	14	96	**110**	88	6	**94**	204	10	28	**38**	**38**	**242**
Total	**83**	**580**	**663**	**293**	**23**	**316**	**979**	**34**	**136**	**170**	**170**	**1149**

Table 6A: Signalized Intersection Level of Service (2010 HCM) from Synchro

Control Delay Per Vehicle (seconds)	Level of Service by Volume to Capacity Ratio	
	≤1	>1
≤10	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Table 6B: Two-Way Stopped Controlled, All-Way Stop-Controlled and Roundabout Level of Service Criteria (2010 HCM) from Synchro

Control Delay Per Vehicle (seconds)	Level of Service by Volume to Capacity Ratio	
	≤1	>1
≤10	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>15 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

EXHIBIT 3

MoDOT

Southeast District
Mark Shelton, District Engineer

Missouri Department of Transportation

2675 North Main Street
P.O. Box 160
Sikeston, Missouri 63801
573.472.5333
Fax: 573.472.5351
1.888.ASK MODOT (275.6636)

TO: File

FROM: Seiji Shimbo, Senior Materials Inspector & Jake Butler, Senior Traffic Studies Specialist

DATE: September 30, 2019

SUBJECT: Updated Rte. K and Eagle Ridge Intersection – Benefit Cost Analysis Left Turn Lane

I have completed a Traffic Study for the intersection of Rte. K and Eagle Ridge Drive in Cape Girardeau County.

Crash history and other factors were taken into consideration when evaluating this intersection for a possible countermeasure. Results of this study indicate that the installation of left turn lane would be a cost effective way to improve safety and mobility for this particular intersection and is therefore recommended.

Please find attached a study summarizing the support for this decision.

Cc: Craig Compas, District Traffic Engineer and Steve Hoernig Traffic Operations Engineer

PURPOSE

An engineering study of traffic conditions, crash frequency, and physical characteristics of the location was performed to determine whether installation of a left turn lane would be cost efficient at the intersection of Rte. K and Eagle Ridge Drive in Cape Girardeau County Missouri

INTERSECTION DESCRIPTION

The intersection of Rte. K and Eagle Ridge Drive is a rural 3-legged intersection that currently has Eagle Ridge Drive stop controlled. The posted speed limit on Rte. K is 50 mph.

INTERSECTION OBSERVATION

This intersection's operation was observed on October 16, 2018 after a verbal complaint had been received from a MoDOT employee about safety and needing a separate turn lane. During this observation the intersection had mostly right-in vehicles but occasionally had a left-in vehicle that had some difficulty finding an adequate gap in WB Rte. K traffic to make the turn. During this left turn movement the Rte. K EB traffic would queue up to approximately 500' in length and then clear out after the vehicle made its turn.

After this observation a cost estimate was acquired from the Design department for a 200' Left turn lane with a 150' taper. Also from this observation the entrance to Eagle Ridge School should be striped for a separate right lane and left lane for exiting purposed.

DATA COLLETCTION

An intersection turning movement count and traffic count on Eagle Ridge Drive should be conducted for this intersection.

SAFETY AND BENEFIT/COST ANALYSIS

SAFETY

The crash rate at the intersection of Rte. K and Eagle Ridge Drive near the City of Cape Girardeau is higher than would be expected for an intersection of its characteristics. By using the Predictive Method from the Highway Safety Manual (HSM) this intersection should see approximately 1.766 crashes per year or around 8 to 9 crashes in a five year period. When reviewing the recorded crashes in a five year period from 2014 to 2018 the crash rate was actually 3.0 crashes per year or 15 crashes in a five year period. The actual crash rate is nearly two times the expected amount for this type of intersection which shows that the current intersection configuration warrants investigation.

93% of this intersection's crash types are a rear end that occurred on Rte. K where the vehicles on Eastbound Rte. K attempting to turn left to go to Eagle Ridge Christian School backup the traffic during AM and PM peak hours. . The installation of a left turn lane would theoretically eliminate most rear-end collisions because it would eliminate the issue of traffic backup.

BENEFIT/COST

The estimated cost of proposed improvement was determined by the District Design department while crash costs were drawn from established values of crash cost by severity (See Table 4 in Appendix). When comparing the annualized cost of the installation of a left turn lane to the annualized dollar amount realized from the projected reduction in crash numbers the ratio came to be 3.54:1. This means that for every $1 invested in installing a left turn lane $3.54 will be saved in prevented crashes. Crash costs were determined by crash severity. (See Table 4 in Appendix)

Left-turn Lane Benefit Cost Summary	
Designed Service Life	20 Years
Estimated Project Cost	$157,724
Annualized Project Cost	$7,886
Annualized Crash Benefit with Left-turn Lane	$27,905

Table 3: Benefit Cost Summary for the installation of a left turn lane

SUMMARY

Upon completion of the study, it is my recommendation to have a left turn lane installed at the intersection of Rte. K and Eagle Ridge Drive. The benefit/cost ratio of 3.54:1 makes the installation of a left turn lane an effective use of funds. Although this work shows a positive safety benefit with this being a private school the cost for this turn lane is typically on the school to fund and MoDOT will provide a permit for the work to be done.

Crash Cost by severity	
Crash Type	Individual Crash Cost
Property Damage Only Crash	$11,100.00
Minor Injury Crash	$161,700.00
Disabling Injury Crash	$613,100.00
Fatal Injury Crash	$10,572,700.00

Table 4: Crash cost by severity

Appendix B: 2016 & 2017 Traffic Volumes received from MoDOT

Street Name	Rte K			Notre Dame High School			Rte K		
9/8/2016									
Start Time	Left	Thru	U-Turn	Left	Right	U-Turn	Thru	Right	U-Turn
6:00 AM	7	21	0	0	1	0	54	1	0
6:15 AM	1	12	0	1	1	0	64	1	0
6:30 AM	4	31	0	0	4	0	119	4	0
6:45 AM	11	40	0	1	5	0	129	3	0
7:00 AM	33	29	1	3	17	0	130	15	0
7:15 AM	88	34	0	2	50	0	187	36	0
7:30 AM	101	46	0	0	65	0	220	63	0
7:45 AM	61	60	1	0	38	0	236	21	0
8:00 AM	2	47	0	1	1	0	148	1	0
8:15 AM	1	62	0	0	3	0	107	0	0
8:30 AM	1	41	0	0	1	0	91	0	0
8:45 AM	3	41	0	0	0	0	99	0	0
9:00 AM	1	50	0	1	4	0	89	0	0
9:15 AM	0	52	0	0	1	0	73	1	0
9:30 AM	4	38	1	0	1	0	91	1	0
9:45 AM	2	61	0	1	2	0	78	0	0
10:00 AM	3	35	0	1	2	0	67	0	0
10:15 AM	2	59	0	0	1	0	74	1	0
10:30 AM	1	58	0	2	1	0	71	0	0
10:45 AM	6	59	0	1	5	0	69	1	0
11:00 AM	5	65	0	0	2	0	64	0	0
11:15 AM	2	67	0	1	2	0	71	2	0
11:30 AM	1	79	0	0	3	0	71	0	0
11:45 AM	2	76	0	0	1	0	60	0	0
12:00 PM	2	75	0	0	0	0	72	0	0
12:15 PM	2	82	1	0	0	0	63	1	0
12:30 PM	0	86	1	0	0	0	86	0	0
12:45 PM	2	65	0	0	0	0	73	1	0
1:00 PM	0	71	0	1	1	0	77	0	0
1:15 PM	3	85	0	0	1	0	79	0	1
1:30 PM	2	75	0	0	4	0	75	1	0
1:45 PM	0	96	0	1	2	0	54	0	0
2:00 PM	3	88	1	0	7	0	56	0	0
2:15 PM	2	103	0	0	6	0	62	2	0
2:30 PM	8	101	0	0	5	0	63	2	0
2:45 PM	31	101	0	2	1	0	55	2	0
3:00 PM	26	108	0	20	94	0	72	6	0
3:15 PM	40	118	0	25	90	0	91	1	0
3:30 PM	8	137	0	7	30	0	67	5	0
3:45 PM	11	119	0	4	24	0	60	2	0
4:00 PM	15	166	2	7	18	0	83	5	0
4:15 PM	15	134	0	8	32	0	77	1	0
4:30 PM	10	144	0	8	16	0	72	1	0
4:45 PM	6	160	0	8	14	0	67	2	0
5:00 PM	6	157	0	5	18	0	74	0	0
5:15 PM	10	202	0	0	4	0	80	1	0
5:30 PM	6	148	0	2	8	0	78	3	0
5:45 PM	5	116	0	3	15	0	69	1	0

Missouri Department of Transportation
Souteast District Sikeston MO

MO 25 at Rte k
Gordonville
Cape Girardeau County
counted with MV

File Name : MO 25 at Rte K Gordonville 2017
Site Code :
Start Date : 9/19/2017
Page No : 1

Groups Printed- Cars - Trucks

	MO 25 From North			Rte K From East			MO 25 From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
06:00	81	147	228	44	53	97	210	105	315	640
07:00	128	380	508	129	77	206	369	170	539	1253
08:00	93	192	285	59	68	127	182	70	252	664
09:00	62	112	174	82	94	176	125	64	189	539
10:00	55	89	144	93	92	185	108	55	163	492
11:00	70	122	192	105	102	207	129	72	201	600
12:00	73	126	199	116	133	249	113	78	191	639
13:00	67	92	159	122	133	255	114	72	186	600
14:00	81	108	189	142	155	297	80	83	163	649
15:00	166	159	325	209	223	432	120	115	235	992
16:00	111	147	258	251	253	504	134	122	256	1018
17:00	118	144	262	293	288	581	115	117	232	1075
Grand Total	1105	1818	2923	1645	1671	3316	1799	1123	2922	9161
Apprch %	37.8	62.2		49.6	50.4		61.6	38.4		
Total %	12.1	19.8	31.9	18	18.2	36.2	19.6	12.3	31.9	
Cars	1029	1731	2760	1564	1635	3199	1759	1038	2797	8756
% Cars	93.1	95.2	94.4	95.1	97.8	96.5	97.8	92.4	95.7	95.6
Trucks	76	87	163	81	36	117	40	85	125	405
% Trucks	6.9	4.8	5.6	4.9	2.2	3.5	2.2	7.6	4.3	4.4

Missouri Department of Transportation
Souteast District Sikeston MO

MO 25 at Rte k
Gordonville
Cape Girardeau County
counted with MV

File Name : MO 25 at Rte K Gordonville 2017
Site Code :
Start Date : 9/19/2017
Page No : 1

Groups Printed- Cars - Trucks

	MO 25 From North			Rte K From East			MO 25 From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
06:00	16	28	44	8	7	15	22	13	35	94
06:15	19	23	42	10	14	24	48	26	74	140
06:30	22	41	63	14	17	31	75	34	109	203
06:45	24	55	79	12	15	27	65	32	97	203
Total	81	147	228	44	53	97	210	105	315	640
07:00	24	65	89	22	19	41	78	30	108	238
07:15	31	79	110	36	21	57	93	47	140	307
07:30	34	125	159	39	21	60	110	47	157	376
07:45	39	111	150	32	16	48	88	46	134	332
Total	128	380	508	129	77	206	369	170	539	1253
08:00	31	69	100	13	18	31	55	11	66	197
08:15	21	44	65	20	17	37	56	26	82	184
08:30	17	38	55	12	22	34	33	17	50	139
08:45	24	41	65	14	11	25	38	16	54	144
Total	93	192	285	59	68	127	182	70	252	664
09:00	16	28	44	16	14	30	28	10	38	112
09:15	16	30	46	16	29	45	27	18	45	136
09:30	23	30	53	27	27	54	33	20	53	160
09:45	7	24	31	23	24	47	37	16	53	131
Total	62	112	174	82	94	176	125	64	189	539
10:00	9	22	31	22	24	46	27	11	38	115
10:15	14	24	38	23	23	46	30	12	42	126
10:30	13	16	29	29	19	48	28	17	45	122
10:45	19	27	46	19	26	45	23	15	38	129
Total	55	89	144	93	92	185	108	55	163	492
11:00	18	27	45	22	23	45	39	20	59	149
11:15	16	36	52	28	27	55	30	17	47	154
11:30	19	30	49	26	30	56	19	17	36	141
11:45	17	29	46	29	22	51	41	18	59	156
Total	70	122	192	105	102	207	129	72	201	600
12:00	26	23	49	31	32	63	25	15	40	152
12:15	12	30	42	24	33	57	27	14	41	140
12:30	21	45	66	26	36	62	34	21	55	183

Missouri Department of Transportation

Souteast District Sikeston MO

File Name : MO 25 at Rte K Gordonville 2017
Site Code :
Start Date : 9/19/2017
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Groups Printed- Cars - Trucks

	MO 25 From North			Rte K From East			MO 25 From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
12:45	14	28	42	35	32	67	27	28	55	164
Total	73	126	199	116	133	249	113	78	191	639
13:00	17	31	48	29	28	57	26	18	44	149
13:15	18	19	37	39	38	77	33	27	60	174
13:30	19	25	44	33	26	59	29	14	43	146
13:45	13	17	30	21	41	62	26	13	39	131
Total	67	92	159	122	133	255	114	72	186	600
14:00	17	32	49	35	38	73	17	20	37	159
14:15	26	20	46	33	45	78	23	21	44	168
14:30	18	33	51	49	34	83	24	20	44	178
14:45	20	23	43	25	38	63	16	22	38	144
Total	81	108	189	142	155	297	80	83	163	649
15:00	37	31	68	55	45	100	24	35	59	227
15:15	42	50	92	41	48	89	29	31	60	241
15:30	45	37	82	56	67	123	27	27	54	259
15:45	42	41	83	57	63	120	40	22	62	265
Total	166	159	325	209	223	432	120	115	235	992
16:00	26	30	56	52	55	107	34	27	61	224
16:15	28	23	51	52	66	118	38	31	69	238
16:30	21	51	72	73	58	131	29	29	58	261
16:45	36	43	79	74	74	148	33	35	68	295
Total	111	147	258	251	253	504	134	122	256	1018
17:00	34	41	75	86	64	150	29	41	70	295
17:15	34	26	60	79	96	175	26	26	52	287
17:30	20	38	58	64	68	132	33	33	66	256
17:45	30	39	69	64	60	124	27	17	44	237
Total	118	144	262	293	288	581	115	117	232	1075
Grand Total	1105	1818	2923	1645	1671	3316	1799	1123	2922	9161
Apprch %	37.8	62.2		49.6	50.4		61.6	38.4		
Total %	12.1	19.8	31.9	18	18.2	36.2	19.6	12.3	31.9	
Cars	1029	1731	2760	1564	1635	3199	1759	1038	2797	8756
% Cars	93.1	95.2	94.4	95.1	97.8	96.5	97.8	92.4	95.7	95.6
Trucks	76	87	163	81	36	117	40	85	125	405
% Trucks	6.9	4.8	5.6	4.9	2.2	3.5	2.2	7.6	4.3	4.4

Missouri Department of Transportation

Souteast District Sikeston MO

MO 25 at Rte k
Gordonville
Cape Girardeau County
counted with MV

File Name : MO 25 at Rte K Gordonville 2017
Site Code :
Start Date : 9/19/2017
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Groups Printed- Cars

	MO 25 From North			Rte K From East			MO 25 From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
06:00	79	139	218	36	50	86	207	96	303	607
07:00	123	373	496	122	72	194	368	159	527	1217
08:00	88	185	273	53	68	121	178	66	244	638
09:00	56	104	160	74	89	163	123	56	179	502
10:00	52	86	138	87	87	174	106	50	156	468
11:00	61	111	172	97	100	197	125	68	193	562
12:00	61	114	175	107	129	236	108	69	177	588
13:00	61	85	146	115	132	247	108	63	171	564
14:00	75	103	178	135	151	286	78	73	151	615
15:00	149	152	301	204	221	425	112	105	217	943
16:00	108	140	248	246	250	496	132	117	249	993
17:00	116	139	255	288	286	574	114	116	230	1059
Grand Total	1029	1731	2760	1564	1635	3199	1759	1038	2797	8756
Apprch %	37.3	62.7		48.9	51.1		62.9	37.1		
Total %	11.8	19.8	31.5	17.9	18.7	36.5	20.1	11.9	31.9	

Missouri Department of Transportation

Souteast District Sikeston MO

MO 25 at Rte k
Gordonville
Cape Girardeau County
counted with MV

File Name : MO 25 at Rte K Gordonville 2017
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Groups Printed- Trucks

	MO 25 From North			Rte K From East			MO 25 From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
06:00	2	8	10	8	3	11	3	9	12	33
07:00	5	7	12	7	5	12	1	11	12	36
08:00	5	7	12	6	0	6	4	4	8	26
09:00	6	8	14	8	5	13	2	8	10	37
10:00	3	3	6	6	5	11	2	5	7	24
11:00	9	11	20	8	2	10	4	4	8	38
12:00	12	12	24	9	4	13	5	9	14	51
13:00	6	7	13	7	1	8	6	9	15	36
14:00	6	5	11	7	4	11	2	10	12	34
15:00	17	7	24	5	2	7	8	10	18	49
16:00	3	7	10	5	3	8	2	5	7	25
17:00	2	5	7	5	2	7	1	1	2	16
Grand Total	76	87	163	81	36	117	40	85	125	405
Apprch %	46.6	53.4		69.2	30.8		32	68		
Total %	18.8	21.5	40.2	20	8.9	28.9	9.9	21	30.9	

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2016
Site Code :
Start Date : 9/8/2016
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Groups Printed- Lights - Other Vehicles

	Rte K From East				Notre Dame High School From South				Rte K From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	23	104	0	127	2	11	0	13	366	9	0	375	515
07:00 AM	283	169	2	454	5	170	0	175	773	135	0	908	1537
08:00 AM	7	191	0	198	1	5	0	6	445	1	0	446	650
09:00 AM	7	201	1	209	2	8	0	10	331	2	0	333	552
10:00 AM	12	211	0	223	4	9	0	13	281	2	0	283	519
11:00 AM	10	287	0	297	1	8	0	9	266	2	0	268	574
12:00 PM	6	308	2	316	0	0	0	0	294	2	0	296	612
01:00 PM	5	327	0	332	2	8	0	10	285	1	1	287	629
02:00 PM	44	393	1	438	2	19	0	21	236	6	0	242	701
03:00 PM	85	482	0	567	56	238	0	294	290	14	0	304	1165
04:00 PM	46	604	2	652	31	80	0	111	299	9	0	308	1071
05:00 PM	27	623	0	650	10	45	0	55	301	5	0	306	1011
Grand Total	555	3900	8	4463	116	601	0	717	4167	188	1	4356	9536
Apprch %	12.4	87.4	0.2		16.2	83.8	0		95.7	4.3	0		
Total %	5.8	40.9	0.1	46.8	1.2	6.3	0	7.5	43.7	2	0	45.7	
Lights	549	3771	8	4328	112	597	0	709	4026	187	1	4214	9251
% Lights	98.9	96.7	100	97	96.6	99.3	0	98.9	96.6	99.5	100	96.7	97
Other Vehicles	6	129	0	135	4	4	0	8	141	1	0	142	285
% Other Vehicles	1.1	3.3	0	3	3.4	0.7	0	1.1	3.4	0.5	0	3.3	3

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2016
Site Code :
Start Date : 9/8/2016
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Groups Printed- Lights - Other Vehicles

	Rte K From East				Notre Dame High School From South				Rte K From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	7	21	0	28	0	1	0	1	54	1	0	55	84
06:15 AM	1	12	0	13	1	1	0	2	64	1	0	65	80
06:30 AM	4	31	0	35	0	4	0	4	119	4	0	123	162
06:45 AM	11	40	0	51	1	5	0	6	129	3	0	132	189
Total	23	104	0	127	2	11	0	13	366	9	0	375	515
07:00 AM	33	29	1	63	3	17	0	20	130	15	0	145	228
07:15 AM	88	34	0	122	2	50	0	52	187	36	0	223	397
07:30 AM	101	46	0	147	0	65	0	65	220	63	0	283	495
07:45 AM	61	60	1	122	0	38	0	38	236	21	0	257	417
Total	283	169	2	454	5	170	0	175	773	135	0	908	1537
08:00 AM	2	47	0	49	1	1	0	2	148	1	0	149	200
08:15 AM	1	62	0	63	0	3	0	3	107	0	0	107	173
08:30 AM	1	41	0	42	0	1	0	1	91	0	0	91	134
08:45 AM	3	41	0	44	0	0	0	0	99	0	0	99	143
Total	7	191	0	198	1	5	0	6	445	1	0	446	650
09:00 AM	1	50	0	51	1	4	0	5	89	0	0	89	145
09:15 AM	0	52	0	52	0	1	0	1	73	1	0	74	127
09:30 AM	4	38	1	43	0	1	0	1	91	1	0	92	136
09:45 AM	2	61	0	63	1	2	0	3	78	0	0	78	144
Total	7	201	1	209	2	8	0	10	331	2	0	333	552
10:00 AM	3	35	0	38	1	2	0	3	67	0	0	67	108
10:15 AM	2	59	0	61	0	1	0	1	74	1	0	75	137
10:30 AM	1	58	0	59	2	1	0	3	71	0	0	71	133
10:45 AM	6	59	0	65	1	5	0	6	69	1	0	70	141
Total	12	211	0	223	4	9	0	13	281	2	0	283	519
11:00 AM	5	65	0	70	0	2	0	2	64	0	0	64	136
11:15 AM	2	67	0	69	1	2	0	3	71	2	0	73	145
11:30 AM	1	79	0	80	0	3	0	3	71	0	0	71	154
11:45 AM	2	76	0	78	0	1	0	1	60	0	0	60	139
Total	10	287	0	297	1	8	0	9	266	2	0	268	574
12:00 PM	2	75	0	77	0	0	0	0	72	0	0	72	149
12:15 PM	2	82	1	85	0	0	0	0	63	1	0	64	149
12:30 PM	0	86	1	87	0	0	0	0	86	0	0	86	173
12:45 PM	2	65	0	67	0	0	0	0	73	1	0	74	141
Total	6	308	2	316	0	0	0	0	294	2	0	296	612

Missouri Department of Transportation

Southeast District Sikeston, MO

File Name : Rte K at Notre Dame Cape 2016
Site Code :
Start Date : 9/8/2016
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Groups Printed- Lights - Other Vehicles

	Rte K From East				Notre Dame High School From South				Rte K From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
01:00 PM	0	71	0	71	1	1	0	2	77	0	0	77	150
01:15 PM	3	85	0	88	0	1	0	1	79	0	1	80	169
01:30 PM	2	75	0	77	0	4	0	4	75	1	0	76	157
01:45 PM	0	96	0	96	1	2	0	3	54	0	0	54	153
Total	5	327	0	332	2	8	0	10	285	1	1	287	629
02:00 PM	3	88	1	92	0	7	0	7	56	0	0	56	155
02:15 PM	2	103	0	105	0	6	0	6	62	2	0	64	175
02:30 PM	8	101	0	109	0	5	0	5	63	2	0	65	179
02:45 PM	31	101	0	132	2	1	0	3	55	2	0	57	192
Total	44	393	1	438	2	19	0	21	236	6	0	242	701
03:00 PM	26	108	0	134	20	94	0	114	72	6	0	78	326
03:15 PM	40	118	0	158	25	90	0	115	91	1	0	92	365
03:30 PM	8	137	0	145	7	30	0	37	67	5	0	72	254
03:45 PM	11	119	0	130	4	24	0	28	60	2	0	62	220
Total	85	482	0	567	56	238	0	294	290	14	0	304	1165
04:00 PM	15	166	2	183	7	18	0	25	83	5	0	88	296
04:15 PM	15	134	0	149	8	32	0	40	77	1	0	78	267
04:30 PM	10	144	0	154	8	16	0	24	72	1	0	73	251
04:45 PM	6	160	0	166	8	14	0	22	67	2	0	69	257
Total	46	604	2	652	31	80	0	111	299	9	0	308	1071
05:00 PM	6	157	0	163	5	18	0	23	74	0	0	74	260
05:15 PM	10	202	0	212	0	4	0	4	80	1	0	81	297
05:30 PM	6	148	0	154	2	8	0	10	78	3	0	81	245
05:45 PM	5	116	0	121	3	15	0	18	69	1	0	70	209
Total	27	623	0	650	10	45	0	55	301	5	0	306	1011
Grand Total	555	3900	8	4463	116	601	0	717	4167	188	1	4356	9536
Apprch %	12.4	87.4	0.2		16.2	83.8	0		95.7	4.3	0		
Total %	5.8	40.9	0.1	46.8	1.2	6.3	0	7.5	43.7	2	0	45.7	
Lights	549	3771	8	4328	112	597	0	709	4026	187	1	4214	9251
% Lights	98.9	96.7	100	97	96.6	99.3	0	98.9	96.6	99.5	100	96.7	97
Other Vehicles	6	129	0	135	4	4	0	8	141	1	0	142	285
% Other Vehicles	1.1	3.3	0	3	3.4	0.7	0	1.1	3.4	0.5	0	3.3	3

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2016
Site Code :
Start Date : 9/8/2016
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Groups Printed- Lights

	Rte K From East				Notre Dame High School From South				Rte K From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	23	100	0	123	2	11	0	13	359	9	0	368	504
07:00 AM	282	165	2	449	5	169	0	174	758	135	0	893	1516
08:00 AM	6	171	0	177	1	5	0	6	425	1	0	426	609
09:00 AM	6	186	1	193	0	8	0	8	315	2	0	317	518
10:00 AM	10	196	0	206	4	8	0	12	269	2	0	271	489
11:00 AM	10	280	0	290	1	7	0	8	255	2	0	257	555
12:00 PM	6	292	2	300	0	0	0	0	286	2	0	288	588
01:00 PM	5	310	0	315	2	8	0	10	269	1	1	271	596
02:00 PM	44	384	1	429	1	19	0	20	226	6	0	232	681
03:00 PM	84	468	0	552	56	237	0	293	273	14	0	287	1132
04:00 PM	46	597	2	645	30	80	0	110	292	8	0	300	1055
05:00 PM	27	622	0	649	10	45	0	55	299	5	0	304	1008
Grand Total	549	3771	8	4328	112	597	0	709	4026	187	1	4214	9251
Apprch %	12.7	87.1	0.2		15.8	84.2	0		95.5	4.4	0		
Total %	5.9	40.8	0.1	46.8	1.2	6.5	0	7.7	43.5	2	0	45.6	

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2016
Site Code :
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Groups Printed- Other Vehicles

	Rte K From East				Notre Dame High School From South				Rte K From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	0	4	0	4	0	0	0	0	7	0	0	7	11
07:00 AM	1	4	0	5	0	1	0	1	15	0	0	15	21
08:00 AM	1	20	0	21	0	0	0	0	20	0	0	20	41
09:00 AM	1	15	0	16	2	0	0	2	16	0	0	16	34
10:00 AM	2	15	0	17	0	1	0	1	12	0	0	12	30
11:00 AM	0	7	0	7	0	1	0	1	11	0	0	11	19
12:00 PM	0	16	0	16	0	0	0	0	8	0	0	8	24
01:00 PM	0	17	0	17	0	0	0	0	16	0	0	16	33
02:00 PM	0	9	0	9	1	0	0	1	10	0	0	10	20
03:00 PM	1	14	0	15	0	1	0	1	17	0	0	17	33
04:00 PM	0	7	0	7	1	0	0	1	7	1	0	8	16
05:00 PM	0	1	0	1	0	0	0	0	2	0	0	2	3
Grand Total	6	129	0	135	4	4	0	8	141	1	0	142	285
Apprch %	4.4	95.6	0		50	50	0		99.3	0.7	0		
Total %	2.1	45.3	0	47.4	1.4	1.4	0	2.8	49.5	0.4	0	49.8	

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2015
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Groups Printed- Lights - Other Vehicles

	Rte K			Notre Dame High School			Rte K			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
06:00 AM	22	106	128	0	6	6	332	6	338	472
07:00 AM	289	138	427	7	130	137	684	135	819	1383
08:00 AM	10	148	158	2	8	10	418	6	424	592
09:00 AM	21	179	200	4	19	23	301	5	306	529
10:00 AM	6	169	175	2	3	5	255	3	258	438
11:00 AM	4	235	239	0	97	97	232	3	235	571
12:00 PM	16	282	298	2	8	10	236	4	240	548
01:00 PM	30	285	315	12	33	45	249	4	253	613
02:00 PM	53	335	388	10	19	29	214	22	236	653
03:00 PM	192	457	649	49	157	206	285	72	357	1212
04:00 PM	187	539	726	36	83	119	290	48	338	1183
05:00 PM	83	580	663	34	136	170	293	23	316	1149
Grand Total	913	3453	4366	158	699	857	3789	331	4120	9343
Apprch %	20.9	79.1		18.4	81.6		92	8		
Total %	9.8	37	46.7	1.7	7.5	9.2	40.6	3.5	44.1	
Lights	901	3337	4238	155	692	847	3671	323	3994	9079
% Lights	98.7	96.6	97.1	98.1	99	98.8	96.9	97.6	96.9	97.2
Other Vehicles	12	116	128	3	7	10	118	8	126	264
% Other Vehicles	1.3	3.4	2.9	1.9	1	1.2	3.1	2.4	3.1	2.8

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

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Groups Printed- Lights - Other Vehicles

	Rte K			Notre Dame High School			Rte K			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
06:00 AM	2	10	12	0	0	0	38	0	38	50
06:15 AM	5	24	29	0	1	1	77	1	78	108
06:30 AM	6	33	39	0	3	3	98	3	101	143
06:45 AM	9	39	48	0	2	2	119	2	121	171
Total	22	106	128	0	6	6	332	6	338	472
07:00 AM	38	31	69	3	13	16	111	11	122	207
07:15 AM	72	22	94	2	39	41	168	41	209	344
07:30 AM	99	44	143	1	41	42	221	47	268	453
07:45 AM	80	41	121	1	37	38	184	36	220	379
Total	289	138	427	7	130	137	684	135	819	1383
08:00 AM	5	49	54	2	2	4	147	4	151	209
08:15 AM	0	37	37	0	2	2	102	2	104	143
08:30 AM	4	26	30	0	2	2	82	0	82	114
08:45 AM	1	36	37	0	2	2	87	0	87	126
Total	10	148	158	2	8	10	418	6	424	592
09:00 AM	1	42	43	1	15	16	70	1	71	130
09:15 AM	2	53	55	0	2	2	75	2	77	134
09:30 AM	11	47	58	2	1	3	78	1	79	140
09:45 AM	7	37	44	1	1	2	78	1	79	125
Total	21	179	200	4	19	23	301	5	306	529
10:00 AM	2	37	39	1	1	2	62	0	62	103
10:15 AM	1	46	47	0	0	0	67	0	67	114
10:30 AM	1	39	40	0	2	2	59	0	59	101
10:45 AM	2	47	49	1	0	1	67	3	70	120
Total	6	169	175	2	3	5	255	3	258	438
11:00 AM	2	56	58	0	1	1	47	1	48	107
11:15 AM	0	61	61	0	1	1	48	1	49	111
11:30 AM	0	59	59	0	90	90	70	0	70	219
11:45 AM	2	59	61	0	5	5	67	1	68	134
Total	4	235	239	0	97	97	232	3	235	571
12:00 PM	2	78	80	0	1	1	60	2	62	143
12:15 PM	3	70	73	1	3	4	63	0	63	140

Missouri Department of Transportation

Southeast District Sikeston, MO

File Name : Rte K at Notre Dame Cape 2015
Site Code :
Start Date : 4/29/2015
Page No : 2

Groups Printed- Lights - Other Vehicles

	Rte K			Notre Dame High School			Rte K			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
12:30 PM	4	61	65	1	2	3	50	1	51	119
12:45 PM	7	73	80	0	2	2	63	1	64	146
Total	16	282	298	2	8	10	236	4	240	548
01:00 PM	15	75	90	6	13	19	73	1	74	183
01:15 PM	4	72	76	0	7	7	65	1	66	149
01:30 PM	7	78	85	3	10	13	48	0	48	146
01:45 PM	4	60	64	3	3	6	63	2	65	135
Total	30	285	315	12	33	45	249	4	253	613
02:00 PM	1	75	76	4	5	9	69	1	70	155
02:15 PM	4	84	88	2	8	10	54	1	55	153
02:30 PM	11	89	100	1	4	5	49	6	55	160
02:45 PM	37	87	124	3	2	5	42	14	56	185
Total	53	335	388	10	19	29	214	22	236	653
03:00 PM	45	94	139	24	89	113	58	15	73	325
03:15 PM	42	115	157	12	41	53	73	15	88	298
03:30 PM	48	141	189	9	14	23	80	17	97	309
03:45 PM	57	107	164	4	13	17	74	25	99	280
Total	192	457	649	49	157	206	285	72	357	1212
04:00 PM	77	111	188	8	13	21	86	11	97	306
04:15 PM	40	133	173	4	19	23	70	14	84	280
04:30 PM	38	153	191	12	25	37	67	10	77	305
04:45 PM	32	142	174	12	26	38	67	13	80	292
Total	187	539	726	36	83	119	290	48	338	1183
05:00 PM	30	174	204	11	43	54	75	7	82	340
05:15 PM	15	173	188	6	32	38	62	6	68	294
05:30 PM	24	137	161	7	33	40	68	4	72	273
05:45 PM	14	96	110	10	28	38	88	6	94	242
Total	83	580	663	34	136	170	293	23	316	1149
Grand Total	913	3453	4366	158	699	857	3789	331	4120	9343
Apprch %	20.9	79.1		18.4	81.6		92	8		
Total %	9.8	37	46.7	1.7	7.5	9.2	40.6	3.5	44.1	
Lights	901	3337	4238	155	692	847	3671	323	3994	9079
% Lights	98.7	96.6	97.1	98.1	99	98.8	96.9	97.6	96.9	97.2
Other Vehicles	12	116	128	3	7	10	118	8	126	264
% Other Vehicles	1.3	3.4	2.9	1.9	1	1.2	3.1	2.4	3.1	2.8

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2015
Site Code :
Start Date : 4/29/2015
Page No : 1

Groups Printed- Lights

	Rte K			Notre Dame High School			Rte K			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
06:00 AM	22	99	121	0	6	6	330	6	336	463
07:00 AM	287	126	413	7	128	135	674	135	809	1357
08:00 AM	10	136	146	2	8	10	406	6	412	568
09:00 AM	20	167	187	3	19	22	287	5	292	501
10:00 AM	4	163	167	2	3	5	239	3	242	414
11:00 AM	4	225	229	0	97	97	222	3	225	551
12:00 PM	15	272	287	2	8	10	228	4	232	529
01:00 PM	30	273	303	12	32	44	241	4	245	592
02:00 PM	52	325	377	8	19	27	203	20	223	627
03:00 PM	189	445	634	49	153	202	268	68	336	1172
04:00 PM	185	536	721	36	83	119	285	46	331	1171
05:00 PM	83	570	653	34	136	170	288	23	311	1134
Grand Total	901	3337	4238	155	692	847	3671	323	3994	9079
Apprch %	21.3	78.7		18.3	81.7		91.9	8.1		
Total %	9.9	36.8	46.7	1.7	7.6	9.3	40.4	3.6	44	

Missouri Department of Transportation

Southeast District Sikeston, MO

Rte K at Notre Dame High School
Cape Girardeau
Cape Girardeau County
counted with MV

File Name : Rte K at Notre Dame Cape 2015
Site Code :
Start Date : 4/29/2015
Page No : 1

Groups Printed- Other Vehicles

	Rte K			Notre Dame High School			Rte K			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
06:00 AM	0	7	7	0	0	0	2	0	2	9
07:00 AM	2	12	14	0	2	2	10	0	10	26
08:00 AM	0	12	12	0	0	0	12	0	12	24
09:00 AM	1	12	13	1	0	1	14	0	14	28
10:00 AM	2	6	8	0	0	0	16	0	16	24
11:00 AM	0	10	10	0	0	0	10	0	10	20
12:00 PM	1	10	11	0	0	0	8	0	8	19
01:00 PM	0	12	12	0	1	1	8	0	8	21
02:00 PM	1	10	11	2	0	2	11	2	13	26
03:00 PM	3	12	15	0	4	4	17	4	21	40
04:00 PM	2	3	5	0	0	0	5	2	7	12
05:00 PM	0	10	10	0	0	0	5	0	5	15
Grand Total	12	116	128	3	7	10	118	8	126	264
Apprch %	9.4	90.6		30	70		93.7	6.3		
Total %	4.5	43.9	48.5	1.1	2.7	3.8	44.7	3	47.7	

Appendix C: Traffic Volume Forecasting Background & Assumptions Memorandum (December 29, 2021)

MEMO

To: Tim Pickett,PE - MoDOT
Craig Compas, PE - MoDOT

From: Cheryl Sharp, PE, PTOE

Date: December 29, 2021

Subject: Rte K & Notre Dame/ Parkwood Lake and Rte 25 Conceptual Intersection Study - Traffic Volume Forecasting Background and Assumptions
MoDOT MOU# 2021-09-65864, Lochmueller Project #: 521-0075-00T

Traffic Volume Forecasting

Improvements at the intersections of Rte K at Notre Dame Dr., Rte K at Parkwood Lake St., and Rte K at Rte 25 must not only address current operational and safety issues, but anticipated issues that can be expected based on increased traffic volumes associated with future growth in the surrounding area. Two sources were consulted to forecast traffic volumes in the study area, including MoDOT historical daily traffic volumes, and the Southeast Metropolitan Planning Organization's (SEMPO) 2021 Travel Demand Model (TDM). These sources are described below and followed by a description of the chosen growth rates for the 2025 construction year and 2045 design year.

MoDOT Historical Traffic Volumes

The historical ADT trends reflect an increase in recent years, backed up by the travel demand model that looks into the future anticipating slow and steady growth, development, and increases in traffic in and around the study area. As such, historical ADTs serve as a useful reference for this project for traffic forecasting purposes.

MoDOT Historical average daily traffic volumes (ADTs) along study area corridors reveal an increase in traffic from 2016 to 2020, as shown in . While some of the decrease in motor vehicle traffic between 2019 and 2020 may be related to the nationwide decrease in vehicle travel due to the pandemic, growth was already evident on Rte K and Rte 25 prior to the pandemic. Growth between 2016 and 2019 is substantial (>3%) and would not likely be a long term trend, while the trend between 2017 and 2019 is in the 0.75% range. The 1.33% rate seems to be a conservative estimate and reflective of Rte K. Route 25 has seen less growth at 0.43% per year, and also saw the same year over year trends as Route K.

TABLE 1: MODOT HISTORIC ADTS

Segment	Year	ADT
Rte K	2020	12,246
	2019	12,890
	2018	12,762
	2017	12,699
	2016	11,617
r =		***1.33%***
Rte 25 South of Rte K	2020	3,685
	2019	4,041
	2018	4,005
	2017	4,083
	2016	3,623
r =		***0.43%***
Rte 25 North of Rte K	2020	5,319
	2019	5,833
	2018	5,781
	2017	5,893
	2016	5,229
r =		***0.43%***

411 North 10th Street, Suite 200
St. Louis, Missouri 63101
PHONE: 314.621.3395

Travel Demand Model Update

In 2021, SEMPO created a regional TDM for the area inclusive of the Cape Girardeau Urbanized Area and surrounding planning area as part of it's required Metropolitan Transportation Plan (MTP) udpate. The TDM explored various land use growth scenarios reflective of Cape Girardeau and Jackson's Comprehensive Plans, included near-term and long-term programmed capital improvements, and was a tool for identifying unfunded regional transportation needs. Two growth scenarios were explored through this travel demand model update:

- **Conventional Approach Scenario** – This scenario extends current growth patterns into the future. It included a mixture of growth in undeveloped fringe areas, as well as auto-dependent growth in currently developed areas.
- **Retrofit and Redevelopment Scenario** – This scenario extends infill-type growth in currently developed areas, and redevelopment of aged infrastructure including retrofitting existing developments.

Based on the results of the scenario planning exercises and public and stakeholder input, both scenarios expected a 26-28% increase in daily vehicle miles traveled (VMT) on regionally significant roads by 2045. The Retrofit and Redevelopment scenario nominally improved operational performance over the conventional growth scenario.

An element of SEMPO's TDM and scenario planning process is the identification of road segments nearing capacity to address operational deficiencies in the regional system. SEMPO recognized this study area of State Highway K from I-55 to 2 miles west as nearing capacity and a LOS D.

Growth Rate

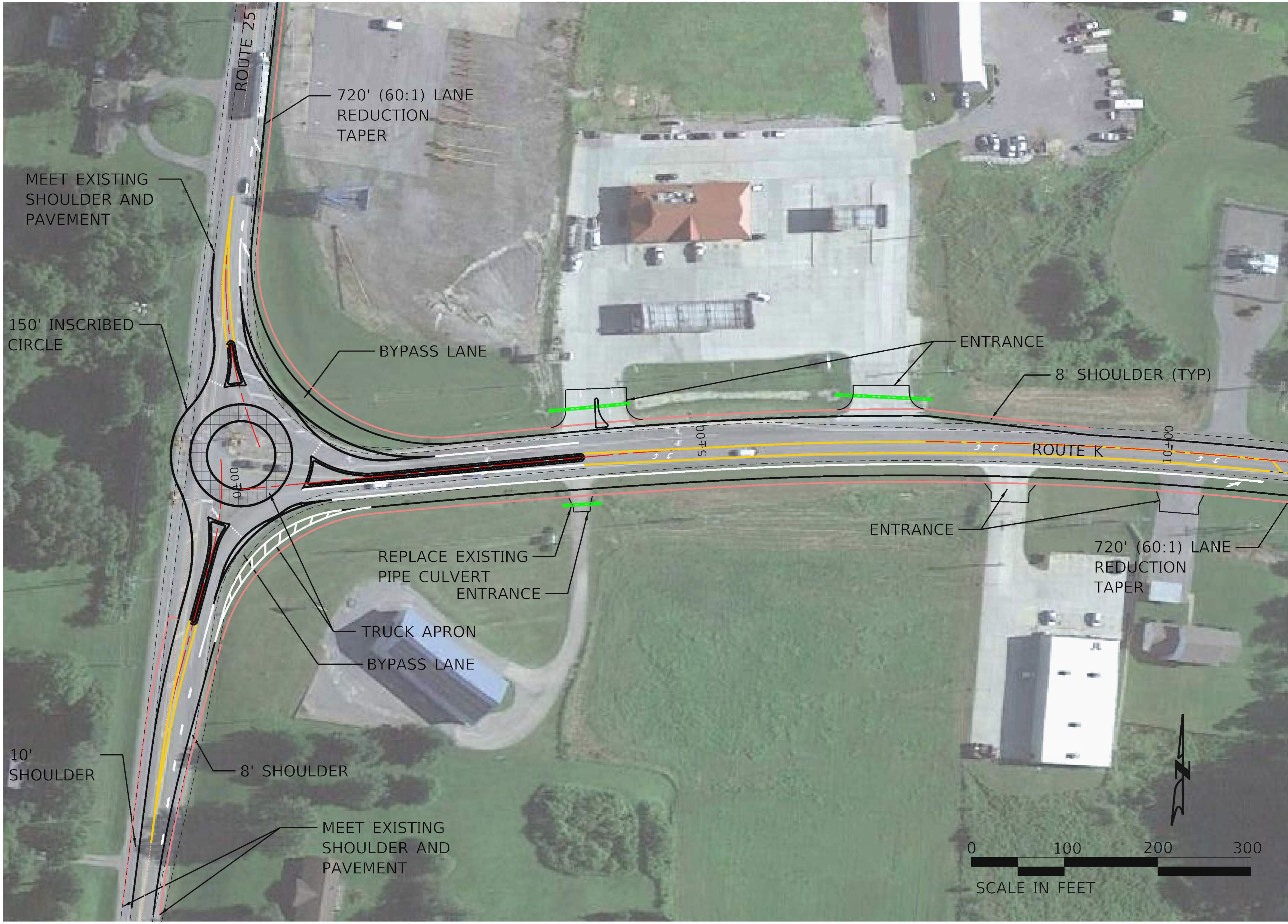
For this study, a linear growth rate for the study area was derived from SEMPO Travel Demand Model using AADT data for the 2018 base line year and the 2045 Scenario. The Travel Demand Model calculates growth rates for each network segment individually based on network connections, Traffic Analysis Zones (TAZs), and other factors such as residential and employment growth. It should be noted that these two roads are at the edge of the area modeled in the TDM, and may not be quite as reliable as roadways in the center. The resulting vehicular annual growth rates from the TDM are presented below in Table 2, and are in line with the rates calculated from MoDOT's historical ADTs.

TABLE 2: GROWTH RATES FOR CONSIDERATION

Capture Area	Growth Rate
Rte K from I-55 to 319	1.4%
Rte K from 319 to CR 25	0.5%
Rte 25 from Rte K to 324	0.4%
Rte 25 from Rte K to 203	0.2%

Based on MoDOT's historical data and the Travel Demand Model projections, the project team is proposing to use a conservative linear growth rate of 1.40% on Rte K, and 0.5% on Rte 25 to forecast traffic volumes for the 2025 build year and 2045 design year.

Appendix D: Concept Plans



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RT K AT RT 25 ROUNDABOUT

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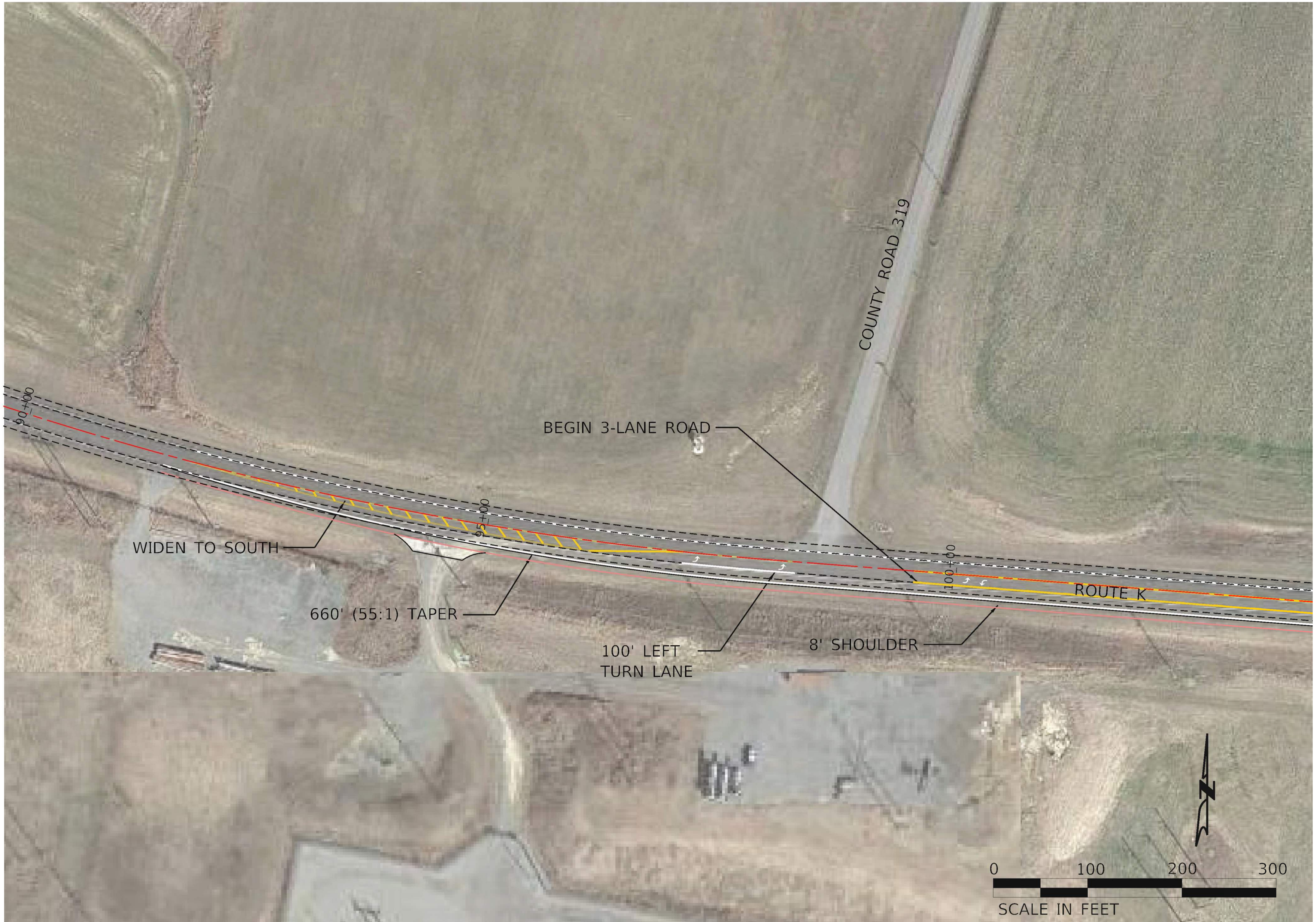

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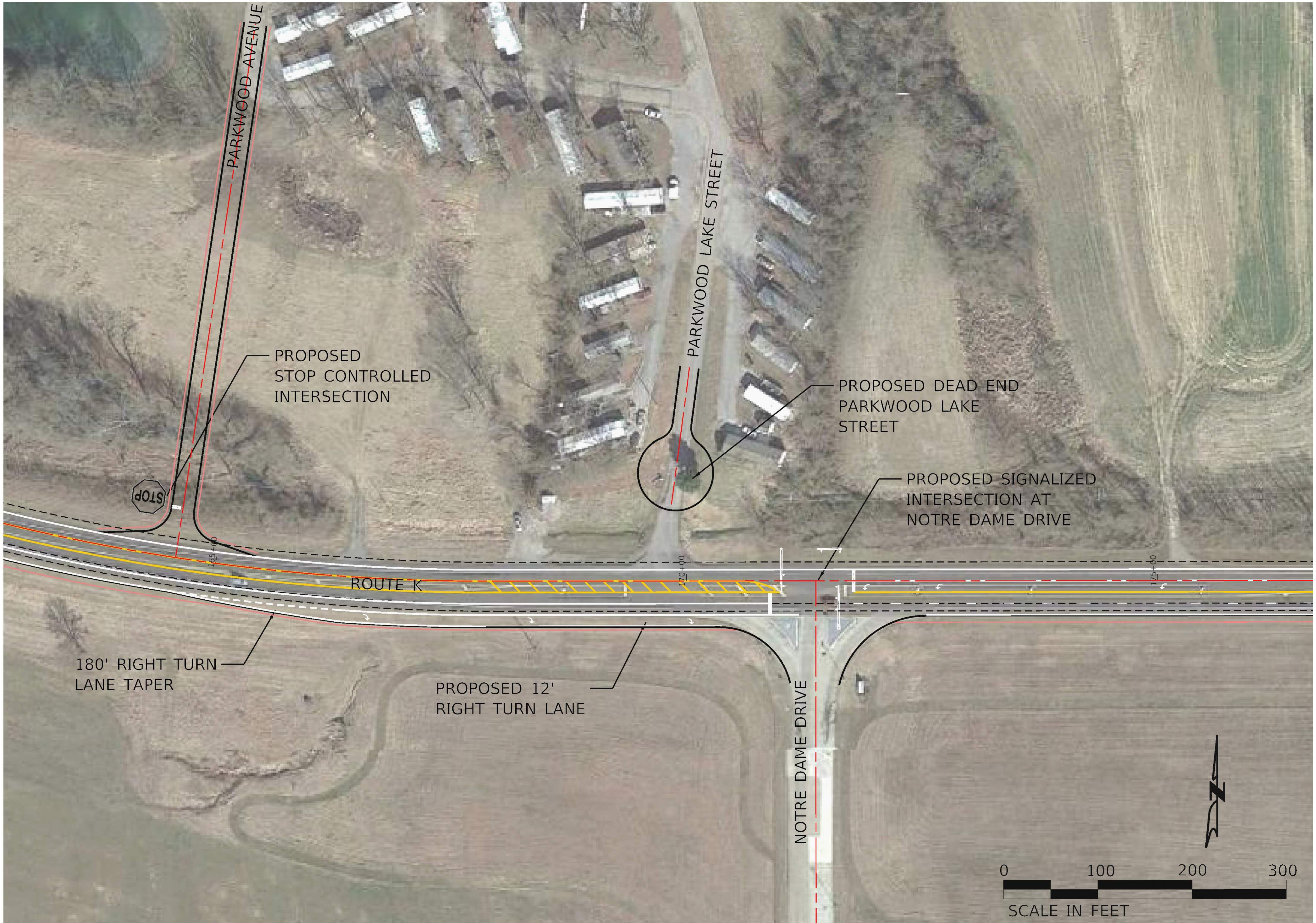

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REV	DATE	BY	DESCRIPTION

REVISIONS

LOCHMUELLER GROUP

411 N 10TH STREET, SUITE 200
SAINT LOUIS, MISSOURI 63101
P (314) 621-3395 F (314) 621-3288
WWW.LOCHGROUP.COM
MISSOURI STATE ENGINEERING CORPORATION
CERTIFICATE/LICENSE NO. 2002011852

CAPE GIRARDEAU
RT K CONCEPTS

PROJECT/JOB NO.
-
MSD PROJECT NO.
-
MSD BASE MAP
-
DATE PREPARED
4/13/2022
SHEET
OF

LOCHMUELLER PROJECT NO. 520-0047

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CONCEPT PLANS

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4/13/2022

SHEET
OF

LOCHMUELLER PROJECT NO. 520-0047

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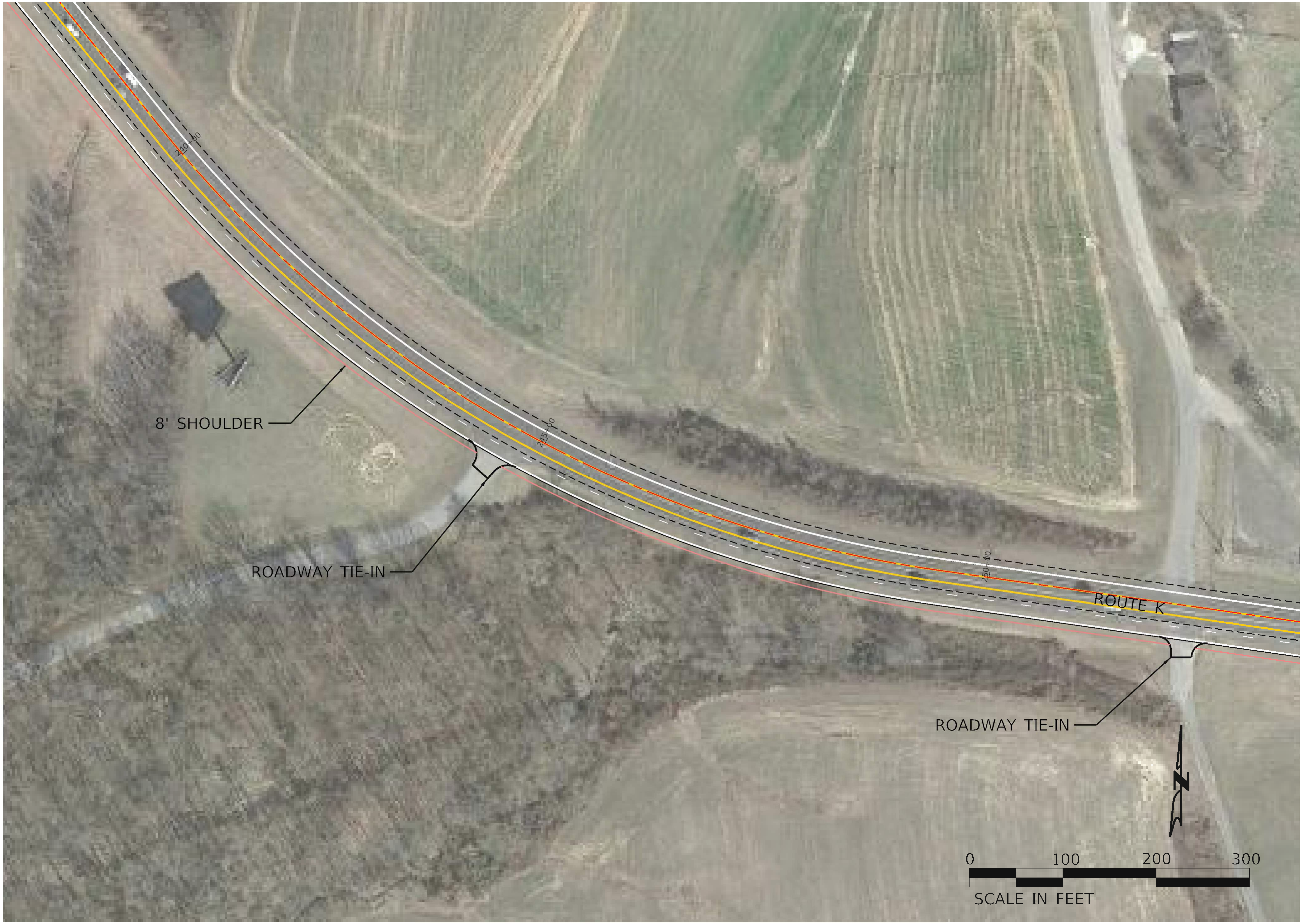

CONCEPT PLANS

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REVISIONS			
REV	DATE	BY	DESCRIPTION

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SAINT LOUIS, MISSOURI 63101
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CAPE GIRARDEAU
RT K CONCEPTS

PROJECT/JOB NO.
-

MSD PROJECT NO.
-

MSD BASE MAP
-

DATE PREPARED
4/13/2022

SHEET
OF

LOCHMUELLER PROJECT NO. 520-0047

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PLANS

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REVISIONS			
REV	DATE	BY	DESCRIPTION

LOCHMUELLER GROUP
411 N 10TH STREET, SUITE 200
SAINT LOUIS, MISSOURI 63101
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MISSOURI STATE ENGINEERING CORPORATION
CERTIFICATE/LICENSE NO. 2002011852

CAPE GIRARDEAU
RT K CONCEPTS

RT K AT
COMMERCIAL ROAD

PROJECT/JOB NO.
-
MSO PROJECT NO.
-
MSO BASE MAP
-
DATE PREPARED
4/13/2022
SHEET
OF

LOCHMUELLER PROJECT NO. 520-0047

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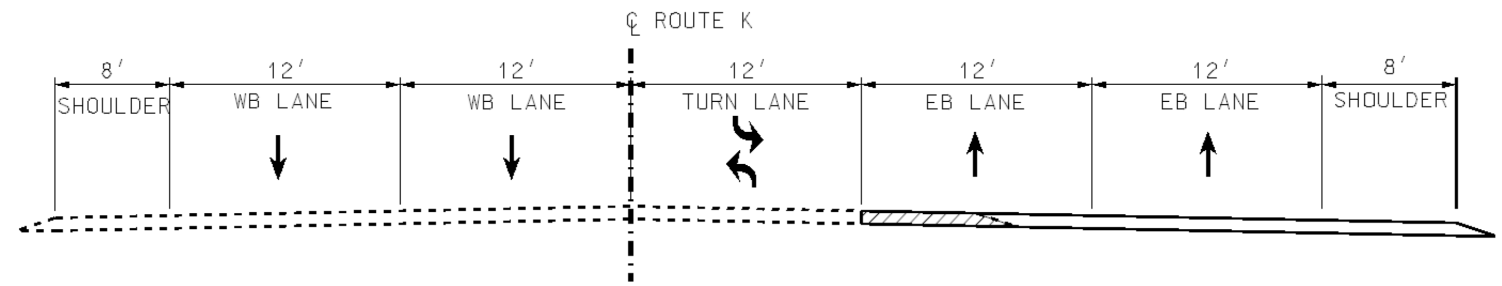
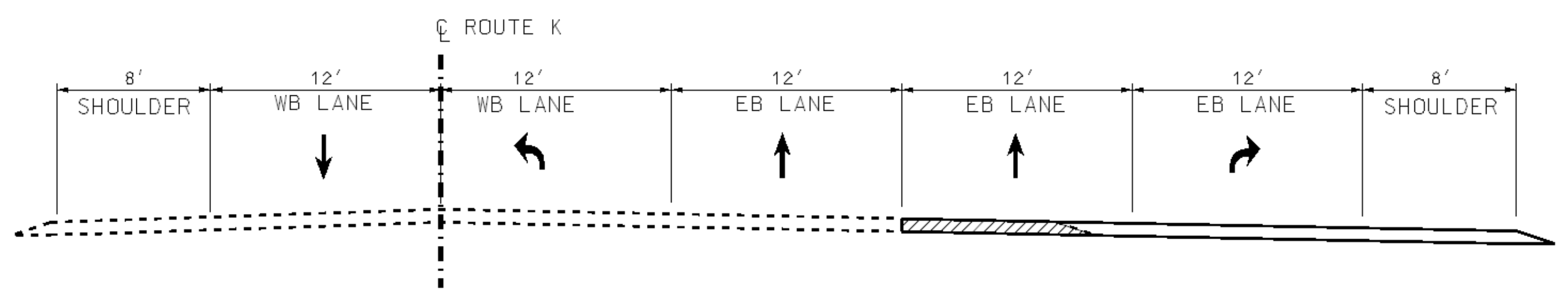


RT K @ MO 25



RT K @ NOTRE DAME

CONCEPT PLANS

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REV	DATE	BY	REVISIONS DESCRIPTION

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MISSOURI STATE ENGINEERING CORPORATION
CERTIFICATE/LICENSE NO. 2002011852

CAPE GIRARDEAU RT K CONCEPTS

TYPICAL SECTIONS

PROJECT/JOB NO.	-
MSD PROJECT NO.	-
MSD BASE MAP	-
DATE PREPARED	4/13/2022
SHEET	1 OF

LOCHMUELLER PROJECT NO. 520-0047

Appendix E: Opinion of Probable Cost

ENGINEER'S OPINION OF PROBABLE COST

Rt K at Rt 25 - Concept Phase

Cape Girardeau County, MO

RT K CONCEPT PHASE		**Date:**	5/2/2022
CAPE GIRARDEAU COUNTY		**Prepared By:**	KLG
MISSOURI DEPARTMENT OF TRANSPORTATION		**Checked By:**	

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
SPECIFIC ROADWAY ITEMS				
CLEARING AND GRUBBING	LS	$10,000.00	4.00	$40,000.00
REMOVAL OF IMPROVEMENTS	LS	$10,000.00	1.00	$10,000.00
EARTHWORK	LS	$50,000.00	4.00	$200,000.00
PAVEMENT REMOVAL	SY	$15.00	12080.00	$181,200.00
PAVED SHOULDER REMOVAL	SY	$15.00	16800.00	$252,000.00
CONCRETE PAVEMENT, 9"	SY	$75.00	13500.00	$1,012,500.00
TYPE A2 SHOULDERS	SY	$35.00	17300.00	$605,500.00
CONCRETE CURB AND GUTTER	LF	$45.00	3500.00	$157,500.00
CONCRETE TRUCK APRON	SY	$85.00	700.00	$59,500.00
CONCRETE MEDIAN	SY	$120.00	375.00	$45,000.00
AGGREGATE BASE, 6"	SY	$10.00	31300.00	$313,000.00
EROSION CONTROL	LS	$20,000.00	3.00	$60,000.00
PAVED APPROACH (8" DEPTH AT COMMERCIAL AND 7" DEPTH AT RESIDENTIAL)	SY	$65.00	1420.00	$92,300.00
BITUMINOUS PAVMENT MIXTURE, 8"	TON	$100.00	17150.00	$1,715,000.00
BITUMINOUS PAVMENT MIXTURE (BASE), 4"	TON	$150.00	8610.00	$1,291,500.00
TACKCOAT	GAL	$2.50	4250.00	$10,625.00
STORM SEWER PIPE	LF	$80.00	240.00	$19,200.00
FLARED END SECTION	EA	$3,000.00	6.00	$18,000.00
	ROADWAY SUBTOTAL			**$6,082,825.00**

SPECIFIC SIGNALS / LIGHTING / SIGNING/ STRIPING ITEMS				
DESCRIPTION	**UNIT**	**UNIT PRICE**	**QUANTITY**	**EXTENDED PRICE**
PAVEMENT MARKING	LF	$2.50	105000.00	$262,500.00
SIGNAGE	LS	$10,000.00	3.00	$30,000.00
INSTALL TRAFFIC SIGNAL	EA	$200,000.00	1.00	$200,000.00
LIGHTING	LS	$20,000.00	1.00	$20,000.00
SIGNAL / ITS / LIGHTING SUBTOTAL				**$512,500.00**
			SUBTOTAL	**$6,595,325.00**
MISCELLANEOUS ITEMS				
DESCRIPTION	**UNIT**	**UNIT PRICE**	**QUANTITY**	**EXTENDED PRICE**
MOBILIZATION (5%)	LS	$329,766.25	1.00	$329,766.25
TRAFFIC CONTROL (5%)	LS	$329,766.25	1.00	$329,766.25
UTILITY RELOCATIONS/ADJUSTMENTS*			0.00	$0.00
CONSTRUCTION SURVEYING/STAKING (5%)	LS	$329,766.25	1.00	$329,766.25
MISCELLANEOUS SUBTOTAL				**$989,298.75**
			CONSTRUCTION COST TOTAL	**$7,584,623.75**
			30% CONTINGENCY	**$2,275,000.00**
			INFLATION (4%/YEAR FOR 2 YEARS)	**$607,000.00**
			CONSTRUCTION SUBTOTAL	**$10,466,623.75**
			ENGINEERING (12%)	**$1,255,994.85**
			RIGHT-OF-WAY*	
			CONSTRUCTION ENGINEERING/INSPECTION (10%)	**$1,046,662.38**
			PROJECT TOTAL	**$12,769,280.98**

ENGINEER'S OPINION OF PROBABLE COST

Rt K at Rt 25 - Concept Phase

Cape Girardeau County, MO

Rt 25 and Rt K From 0+00 To STA 22+50

Date: 5/2/2022

Prepared By: KLG

Missouri Department of Transportation

Checked By:

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
SPECIFIC ROADWAY ITEMS				
CLEARING AND GRUBBING	LS	$10,000.00	1.00	$10,000.00
REMOVAL OF IMPROVEMENTS	LS	$10,000.00	0.00	$0.00
EARTHWORK	LS	$50,000.00	1.00	$50,000.00
PAVEMENT REMOVAL	SY	$15.00	12000.00	$180,000.00
PAVED SHOULDER REMOVAL	SY	$15.00	2000.00	$30,000.00
CONCRETE PAVEMENT, 9"	SY	$75.00	13500.00	$1,012,500.00
TYPE A2 SHOULDERS	SY	$35.00	2000.00	$70,000.00
CONCRETE CURB AND GUTTER	LF	$45.00	3500.00	$157,500.00
CONCRETE TRUCK APRON	SY	$85.00	700.00	$59,500.00
CONCRETE MEDIAN	SY	$120.00	375.00	$45,000.00
AGGREGATE BASE, 6"	SY	$10.00	16000.00	$160,000.00
EROSION CONTROL	LS	$20,000.00	1.00	$20,000.00
PAVED APPROACH *(8" DEPTH AT COMMERCIAL AND 7" DEPTH AT RESIDENTIAL)*	SY	$65.00	750.00	$48,750.00
BITUMINOUS PAVMENT MIXTURE, 8"	TON	$100.00	1050.00	$105,000.00
BITUMINOUS PAVMENT MIXTURE (BASE), 4"	TON	$150.00	510.00	$76,500.00
TACKCOAT	GAL	$2.50	250.00	$625.00
STORM SEWER PIPE	LF	$80.00	240.00	$19,200.00
FLARED END SECTION	EA	$3,000.00	6.00	$18,000.00
		ROADWAY SUBTOTAL		**$2,062,575.00**

SPECIFIC SIGNALS / LIGHTING / SIGNING/ STRIPING ITEMS

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
PAVEMENT MARKING	LF	$2.50	20000.00	$50,000.00
SIGNAGE	LS	$10,000.00	1.00	$10,000.00
INSTALL TRAFFIC SIGNAL	EA	$200,000.00	0.00	$0.00
LIGHTING	LS	$20,000.00	1.00	$20,000.00
		SIGNAL / ITS / LIGHTING SUBTOTAL		**$80,000.00**
			SUBTOTAL	**$2,142,575.00**

MISCELLANEOUS ITEMS				
DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
MOBILIZATION (5%)	LS	$107,128.75	1	$107,128.75
TRAFFIC CONTROL (5%)	LS	$107,128.75	1	$107,128.75
UTILITY RELOCATIONS/ADJUSTMENTS*				
CONSTRUCTION SURVEYING/STAKING (5%)	LS	$107,128.75	1	$107,128.75
		MISCELLANEOUS SUBTOTAL		$321,386.25

CONSTRUCTION COST TOTAL	$2,463,961.25
30% CONTENGENCY	$739,000.00
INFLATION (4%/YEAR FOR 2 YEARS)	$197,000.00
CONSTRUCTION SUBTOTAL	$3,399,961.25
ENGINEERING (12%)	$407,995.35
RIGHT-OF-WAY*	
CONSTRUCTION ENGINEERING/INSPECTION (10%)	$339,996.13
PROJECT TOTAL	$4,147,952.73

*ESTIMATE DOES NOT INCLUDE

ENGINEER'S OPINION OF PROBABLE COST
Rt K - Concept Phase
Cape Girardeau County, MO

Rt K - From STA 90+00 to 157+00

Missouri Department of Transportation

Date: 5/2/2022
Prepared By: KLG
Checked By:

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
SPECIFIC ROADWAY ITEMS				
CLEARING AND GRUBBING	LS	$10,000.00	1.00	$10,000.00
REMOVAL OF IMPROVEMENTS	LS	$10,000.00	0.00	$0.00
EARTHWORK	LS	$50,000.00	1.00	$50,000.00
PAVEMENT REMOVAL	SY	$15.00	65.00	$975.00
PAVED SHOULDER REMOVAL	SY	$15.00	5800.00	$87,000.00
CONCRETE PAVEMENT, 9"	SY	$75.00	0.00	$0.00
TYPE A2 SHOULDERS	SY	$35.00	5800.00	$203,000.00
CONCRETE CURB AND GUTTER	LF	$45.00	0.00	$0.00
CONCRETE TRUCK APRON	SY	$85.00	0.00	$0.00
CONCRETE MEDIAN	SY	$120.00	0.00	$0.00
AGGREGATE BASE, 6"	SY	$10.00	5800.00	$58,000.00
EROSION CONTROL	LS	$20,000.00	1.00	$20,000.00
PAVED APPROACH *(8" DEPTH AT COMMERCIAL AND 7" DEPTH AT RESIDENTIAL)*	SY	$65.00	550.00	$35,750.00
BITUMINOUS PAVMENT MIXTURE, 8"	TON	$100.00	4100.00	$410,000.00
BITUMINOUS PAVMENT MIXTURE (BASE), 4"	TON	$150.00	2100.00	$315,000.00
TACKCOAT	GAL	$2.50	1000.00	$2,500.00
STORM SEWER PIPE	LF	$80.00	0.00	$0.00
FLARED END SECTION	EA	$3,000.00	0.00	$0.00
	ROADWAY SUBTOTAL			**$1,192,225.00**

SPECIFIC SIGNALS / LIGHTING / SIGNING/ STRIPING ITEMS

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
PAVEMENT MARKING	LF	$2.50	30000.00	$75,000.00
SIGNAGE	LS	$10,000.00	1.00	$10,000.00
INSTALL TRAFFIC SIGNAL	EA	$200,000.00	0.00	$0.00
LIGHTING	LS	$20,000.00	0.00	$0.00
SIGNAL / ITS / LIGHTING SUBTOTAL				**$85,000.00**
			SUBTOTAL	**$1,277,225.00**

MISCELLANEOUS ITEMS				
DESCRIPTION	**UNIT**	**UNIT PRICE**	**QUANTITY**	**EXTENDED PRICE**
MOBILIZATION (5%)	LS	$63,861.25	1	$63,861.25
TRAFFIC CONTROL (5%)	LS	$63,861.25	1	$63,861.25
UTILITY RELOCATIONS/ADJUSTMENTS*				$0.00
CONSTRUCTION SURVEYING/STAKING (5%)	LS	$63,861.25	1	$63,861.25
MISCELLANEOUS SUBTOTAL				**$191,583.75**

CONSTRUCTION COST TOTAL	**$1,468,808.75**
30% CONTENGENCY	**$441,000.00**
INFLATION (4%/YEAR FOR 2 YEARS)	**$118,000.00**
CONSTRUCTION SUBTOTAL	**$2,027,808.75**
ENGINEERING (12%)	**$243,337.05**
RIGHT-OF-WAY*	
CONSTRUCTION ENGINEERING/INSPECTION (10%)	**$202,780.88**
PROJECT TOTAL	**$2,473,926.68**

*ESTIMATE DOES NOT INCLUDE

ENGINEER'S OPINION OF PROBABLE COST

Rt K - Concept Phase

Cape Girardeau County, MO

Rt K - From STA 157+00 to 264+00

Missouri Department of Transportation

Date: 5/2/2022

Prepared By: KLG

Checked By:

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
SPECIFIC ROADWAY ITEMS				
CLEARING AND GRUBBING	LS	$10,000.00	2.00	$20,000.00
REMOVAL OF IMPROVEMENTS	LS	$10,000.00	1.00	$10,000.00
EARTHWORK	LS	$50,000.00	2.00	$100,000.00
PAVEMENT REMOVAL	SY	$15.00	15.00	$225.00
PAVED SHOULDER REMOVAL	SY	$15.00	9000.00	$135,000.00
CONCRETE PAVEMENT, 9"	SY	$75.00	0.00	$0.00
TYPE A2 SHOULDERS	SY	$35.00	9500.00	$332,500.00
CONCRETE CURB AND GUTTER	LF	$45.00	0.00	$0.00
CONCRETE TRUCK APRON	SY	$85.00	0.00	$0.00
CONCRETE MEDIAN	SY	$120.00	0.00	$0.00
AGGREGATE BASE, 6"	SY	$10.00	9500.00	$95,000.00
EROSION CONTROL	LS	$20,000.00	1.00	$20,000.00
PAVED APPROACH *(8" DEPTH AT COMMERCIAL AND 7" DEPTH AT RESIDENTIAL)*	SY	$65.00	120.00	$7,800.00
BITUMINOUS PAVMENT MIXTURE, 8"	TON	$100.00	12000.00	$1,200,000.00
BITUMINOUS PAVMENT MIXTURE (BASE), 4"	TON	$150.00	6000.00	$900,000.00
TACKCOAT	GAL	$2.50	3000.00	$7,500.00
STORM SEWER PIPE	LF	$80.00	0.00	$0.00
FLARED END SECTION	EA	$3,000.00	0.00	$0.00
	ROADWAY SUBTOTAL			**$2,828,025.00**

SPECIFIC SIGNALS / LIGHTING / SIGNING/ STRIPING ITEMS

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	EXTENDED PRICE
PAVEMENT MARKING	LF	$2.50	55000.00	$137,500.00
SIGNAGE	LS	$10,000.00	1.00	$10,000.00
INSTALL TRAFFIC SIGNAL	EA	$200,000.00	1.00	$200,000.00
LIGHTING	LS	$20,000.00	0.00	$0.00
SIGNAL / ITS / LIGHTING SUBTOTAL				**$347,500.00**
			SUBTOTAL	**$3,175,525.00**

MISCELLANEOUS ITEMS				
DESCRIPTION	**UNIT**	**UNIT PRICE**	**QUANTITY**	**EXTENDED PRICE**
MOBILIZATION (5%)	LS	$158,776.25	1	$158,776.25
TRAFFIC CONTROL (5%)	LS	$158,776.25	1	$158,776.25
UTILITY RELOCATIONS/ADJUSTMENTS*				$0.00
CONSTRUCTION SURVEYING/STAKING (5%)	LS	$158,776.25	1	$158,776.25
MISCELLANEOUS SUBTOTAL				**$476,328.75**

CONSTRUCTION COST TOTAL	**$3,651,853.75**
30% CONTENGENCY	**$1,096,000.00**
INFLATION (4%/YEAR FOR 2 YEARS)	**$292,000.00**
CONSTRUCTION SUBTOTAL	**$5,039,853.75**
ENGINEERING (12%)	**$604,782.45**
RIGHT-OF-WAY*	
CONSTRUCTION ENGINEERING/INSPECTION (10%)	**$503,985.38**
PROJECT TOTAL	**$6,148,621.58**

*ESTIMATE DOES NOT INCLUDE