

To: Chad Voigt, P.E.
Director of Public Works – Douglas County

From: Jason Hoskinson, P.E., PTOE

Date: January 30, 2026

Re: Wakarusa Drive Extension Project
Douglas County, KS



Review and Confirmation of Proposed Roadway Alignment(s)

BG Consultants, Inc. was retained by Douglas County Public Works Department to review the preliminary Douglas County alignment of the Wakarusa Drive Extension project with respect to the existing Banning’s Curve alignment of CR 458 at the South end of the Project and the alignment’s connection to the Wakarusa Drive roundabout at the K-10 interchange to be built by KDOT. Field survey was collected and alignment information was coordinated with the surrounding projects.

In conjunction with the alignment review effort, options for the Wakarusa Drive alignment were considered at a conceptual level. The attached **Exhibit 1** summarizes the alternatives considered for the project alignment.

Alignment A: No roadway alignment on USACE property.

Alignment B: Partial roadway alignment on USACE property, less impact to Eagle Bend Golf Course.

Alignment C: Significant roadway alignment on USACE property.

After reviewing the pros and cons of each alternative alignment with Douglas County Staff and City of Lawrence Staff (Parks & Rec and Eagle Bend Site Manager), Alignment B was chosen as the preferred alignment to begin the project planning efforts documented in this memo. The alignment B minimizes impacts to surrounding farm ground, does not displace residents along CR 458 as would Alignment A, provides for an ideal bridge location to cross the Wakarusa River, and offers opportunities for berm screening, landscaping, and wetlands/pond construction to mitigate construction impacts and complement the Eagle Bend golf course.

Geotechnical Considerations for Road and Bridge Construction:

Terracon was retained to explore the geology along Alignment B and develop preliminary roadway and bridge construction recommendations. Their report titled “Wakarusa Dr. Extension – Roadway” and dated October 24, 2024 is attached to this memo. The predominant soil type encountered on the project alignment is Fat Clay (CH). All road bores performed along the alignment were drilled to 15 ft. deep and auger refusal was not encountered at any location.

The Fat Clay soils predominately located in the Project area have moderate-to-high swell potential, low permeability, low strength when saturated, and are moderately susceptible to frost action. Although these soils can be used for roadway construction, Terracon recommends either cement stabilization of the top 8” of subgrade soil or removal and replacement of the top 8” of subgrade soil with a KDOT AB-1 or AB-3 aggregate

base. Additional findings, summary, and recommendations pertaining to the in-situ geology and the proposed roadway and bridge construction are included in the attached report.

Roadway Alignment Impact to Potential Wetlands:

Norman Ecological was retained to evaluate the preferred Alignment B for the presence of wetlands. Information regarding the wetlands review is attached to this memo. Some existing manmade wetlands will be encountered toward the southern end of the project between Banning's Curve and Eagle Bend Golf Course. However, current US Army Corps of Engineers policy will likely view these wetlands as non-jurisdictional due to them being manmade and disconnected from the Wakarusa River WOTUS. Furthermore, the preferred Alignment B offers the County opportunities to mitigate/offset any project impacts on the existing manmade wetlands with newly constructed wetlands in conjunction with roadway construction.

Existing Utilities within the Project Area:

- Evergy – Evergy supplies electricity/power to properties in this area of Douglas County. The only anticipated location of possible utility conflict is at the southern end of the Project at the existing curve in CR 458 alignment known as “Banning’s Curve”. There are existing overhead utilities along the south right-of-way line. The anticipated conflicts with the power lines is little to known based on the roadway alignment alternatives considered. Normal Douglas County project utility coordination can be anticipated with no direct cost to the Project for addressing utility conflicts with Evergy.
- AT&T – Communications lines tend to be located along/near powerlines in rural areas. There are no known utility easements in which AT&T may be located and in conflict with the project. Normal Douglas County project utility coordination can be anticipated with no direct cost to the Project for addressing utility conflicts with AT&T.
- Midco – Cable lines are located both overhead on Evergy power poles as well as underground on the South side of CR 458. Their existing infrastructure should primarily be clear of any roadway construction necessary for the Wakarusa Drive Extension Project. Normal Douglas County project utility coordination can be anticipated with no direct cost to the Project for addressing utility conflicts with Midco.
- Douglas County RWD #5 – Rural Water District #5 has a private utility easement for their waterline on the south side (inside) of the Banning’s Curve on CR 458. The existing waterline was relocated/clear of the recent construction of this curved alignment so the anticipated pavement work and alternative alignments being considered should be clear of construction with no significant utility coordination needed with RWD #5.

Bridge Design Considerations

Regardless of the Wakarusa Drive Extension alignment selected, the project will require a bridge for the crossing of the Wakarusa River. Several bridge structure types were considered in conjunction with the evaluation of roadway extension alignments. It is important for the bridge structure type to complement the roadway alignment and for the roadway alignment to consider placement of a bridge in a location with stable riverbanks.

All options considered in the Roadway Alignment discussion above will require a total bridge span total length of about 180 ft. to 200 ft. The three structure types considered in this evaluation are a (1) Reinforced Concrete Slab Haunch Bridge (RCSH) Bridge, a (2) Multi-span Prestressed Concrete Beam Bridge, and a (3) Multi-span Steel Girder Bridge. A summary of each of these bridge structure types follows with a recommendation for Douglas County to consider when pursuing design and construction of the Wakarusa Drive Extension Project.



(1) Reinf. Concrete Slab Haunch



(2) Prestressed Concrete Beam



(3) Steel Beam

(1) Reinforced Concrete Haunch Slab Bridge (RCSH) Bridge

Some advantages associated with an RCSH bridge type include:

- They are relatively simple structures to construct.
- They have a low deck profile.
- They typically have a long service life with minimal maintenance.
- This type of structure is commonly constructed in the State of Kansas. KDOT has standard bridge design details for 3-span RCSH bridge sizes up to a total length of 180 feet. Many bridge builders are familiar with the construction process and requirements of RCSH construction and are capable of building these bridges.

However, RCSH bridge construction requires a lot of temporary falsework which would need to occur within the banks and streambed area of the Wakarusa River. The falsework construction will be somewhat risky and challenging for the Contractor considering the potential for high stream flows, steep banks, and access into the channel with equipment and crews. These risks and challenges could result in higher-than-average construction costs for an RCSH bridge type.

Furthermore, the KDWP has identified the Wakarusa River as having a potential for critical habitat for the Mucket Mussel which is listed as an endangered species. The amount of bridge construction work necessary within the riverbanks for an RCSH bridge could be challenging, relative to the other bridge structure types considered, for the Action Permit approval and mitigation efforts that will be likely be required by the KDWP.

(2) Multi-span Prestressed Concrete Beam Bridge

Some advantages associated with a Prestressed Concrete Beam bridge type include:

- They are relatively simple structures to construct.
- They utilize readily and locally available materials.
- They typically have a long service life with minimal maintenance.
- This type of structure minimizes the required work within the riverbanks and reduces some construction risk when compared to the RCSH type bridge structure.
 - A longer center span can be incorporated into the bridge design to place the two piers on either side of the Wakarusa River just outside of the normal low-flow waterway.
 - The beams can then be lifted into place by a crane on the riverbanks.
- Although the profile of this bridge structure type is greater than the other options due to the deeper beams required, the shape of the Wakarusa River channel and the hydraulic conditions for all alignment options considered support this type of bridge structure construction.

(3) Multi-span Steel Girder Bridge

The Multi-span Steel Girder bridge option carries with it the same pros & cons as compared to the Prestressed Concrete Beam Bridge option with exception of the material availability and cost.

- Steel beams currently have a substantial lead time after ordering
- Steel prices are higher right now than the concrete beam option for this particular location.
- Steel beams could provide an option for longer spans than bridge options (1) and (2), thereby reducing the number of piers constructed within the riverbanks. However, the advantage of longer spans would not be beneficial for this project as the shape of the stream and overbanks is not conducive to a 2-span bridge with a pier in the middle of the Wakarusa River.

Bridge Structure Type Recommendation: Based on the information above, the project location and potential alignment, and our preliminary review of the existing site conditions, we recommend Douglas County plan for a Multi-Span Precast Concrete Beam Bridge structure. Geology information provided by the KDOT and Terracon indicate that founding the bridge piers and abutments on driven pile foundations with a depth of ± 65 feet for driving piles can be expected.

Jurisdictional Permitting

The following agencies were consulted at this Project Concept stage to determine the expected process(es) to obtain permits associated with the construction of the Wakarusa Drive Extension Project.

Kansas Department of Agriculture – Division of Water Resources (DWR)

DWR's jurisdiction as it pertains to this project is primarily for stream crossing and floodplain permitting. The location of the preferred alignment is located within an area that contains an existing floodplain/floodway for the Wakarusa River below the Clinton Lake Dam. Based on information from Janelle Phillips, P.E. with the DWR, the only available digital modeling of the floodplain in this area is a HEC-2 model available from the DWR/FEMA. According to the existing modeling information it appears the 1% (100-year) flood event is contained within the banks of the Wakarusa River.

Requirements for State agency permitting of stream crossing and floodplain fill:

- An Application for Permit (DWR Form 2-200) will be required for construction of the roadway embankment with bridge crossing of the Wakarusa River and the associated floodplain/floodway fill.
 - The Project does not qualify for the Kansas General Permit (DWR 2-190).
 - Estimated permit cost for DWR Form 2-200: ±\$1,000 (based on 2024 fees).
 - Engineering Design services should include FEMA floodplain modeling.
 - Anticipate approximately 3-5 months for the DWR permitting process.
- Douglas County will be required to submit a HEC-RAS model of the Wakarusa River as a supporting document for review and approval of the preferred alignment project.



Douglas County Floodplain Permitting

Douglas County will require a Floodplain Development Permit to construct the new bridge and roadway fill in the FEMA floodplain/floodway. The process is relatively simple assuming a State floodplain fill permit is approved and issued from the DWR. The duration of time required to obtain this permit from Douglas County is ±1 month and can be planned to occur concurrently with and/or immediately after the State floodplain fill permitting process.

Federal Emergency Management Association (FEMA)

Because the potential project area impacts a FEMA mapped floodplain and because that mapped floodplain does not currently contain a modern detailed study to support the delineation, it is recommended Douglas County pursue a Conditional Letter of Map Revision (CLOMR) approval from FEMA to modify the floodplain delineation of the most recently published FEMA flood map. This process should occur in conjunction with the State and County floodplain fill permitting processes. Similar information utilized in those State and County permit applications will be necessary for the FEMA CLOMR approval process. Douglas County can anticipate about a 4-6 month permitting process with the FEMA to obtain an approved CLOMR for the project.

United States Army Corps of Engineers (USACE)

The USACE has jurisdiction over 2 primary aspects of the project. One aspect is the impact to Waters of the U.S. (WOTUS) such as streams and wetlands. The other aspect is the use of property owned by the United States of America and managed by the USACE for the Project.

Section 404 Permit – The first aspect of potential USACE jurisdictional impacts pertains to the Wakarusa River and potentially any wetlands areas. This will likely go through a routine process with the Kansas City District for permitting. Based on current federal administration and policy, the Project will likely qualify for a Nationwide Permit (NWP). Current USACE administrative policy will not view the planned impacts to the manmade wetlands as an impact connected to the WOTUS and thus won't count towards the total square footage of WOTUS impacts. The primary impact will be the crossing of the Wakarusa River which should fall under one or more NWP's to include "NWP 13. Bank Stabilization" and/or "NWP 14. Linear Transportation Projects".

Non-Recreation Outgrant Policy Permit – The second aspect of the jurisdictional permitting is the use of the USACE land. The application to construct any roadway on the USACE's property will need to follow that agency's Non-Recreation Outgrant Policy. Generally speaking, this Policy is in place to evaluate and approve/deny non-recreational real estate outgrant requests for use of Civil Works lands and waters operated and maintained by the Corps. The Policy is explained in greater detail in Chapter 17 of the ER 1130-2-550, Change 6 version available from the USACE. Critical to this

Timeline for Outgrant Policy Permitting: The process for successfully obtaining a Non-Recreational Outgrant Policy Permit will initially consist of about 4-6 months of fact finding and analysis to determine if the application will be acceptable to the USACE. If the project application is acceptable, the USACE's Real Estate Section will then prepare an Agreement between the U.S. Government and Douglas County which is currently expected to take about 6-8 months. Construction can only begin after the Agreement is executed (a total of 10-14 months, or more, from the date of initial application).

Issues to be addressed with the Outgrant Policy Permitting Process:

1. Ecological and/or Cultural and Archaeological concerns and considerations.
2. Does the Project provide a benefit to the United States of America?
3. Evaluation of viable alternatives to the use of public lands (project cost not a factor).
4. Ability for Douglas County to own, maintain, and operate the facility into the future if approved.
5. Acceptability of the proposed Outgrant use by other agencies (i.e. City of Lawrence) previously approved to utilize the subject property.

6. Other considerations listed in ER 1130-2-550, Change 6, Chapter 17, Item 17-9 “Evaluation Criteria”.

General Process for Non-recreation Outgrant Policy Permitting:

Step 1 – Douglas County will need to submit, in writing, a formal request for the USACE agency to review the County’s request for a Non-Recreation Outgrant Policy Permit for the Wakarusa Drive Extension Project. Information to support the formal request is outlined in Appendix E of the ER 1130-2-550, Change 6, Chapter 17 document previously referenced.

Step 2 – Douglas County will work with the Clinton Project Park Manager’s office to determine acceptability of the proposed Non-Recreation Outgrant use. Additional NEPA coordination supporting data will be required and depending on the scope of project and determination from the USACE, an Environmental Assessment (EA) may be needed to support the project.

Step 3 – Upon completion of the Step 2 efforts and if Douglas County obtains the USACE’s determination that the project proposal is acceptable, the USACE’s Real Estate section will begin preparing the agreement between the USACE and Douglas County for construction of the project.

Step 4 – Upon completion of the Step 3 efforts and execution of the USACE’s real estate agreement, Douglas County may begin construction of the Wakarusa Drive Extension Project.

Kansas Department of Wildlife and Parks (KDWP)

An initial screening of the potential project area was performed to identify potential impacts to critical wildlife habitats, for current state-listed threatened or endangered species and species in need of conservation, as well as KDWP managed areas for which the agency has administrative authority. Based on this initial screening, it appears a KDWP Action Permit will need to be obtained prior to construction. This segment of the Wakarusa River is designated as critical habitat for the endangered species known as the Mucket Mussel (*Actinonaias ligamentini*). Any instream and/or stream bank construction activity will require specific permitting as well as protocols to adhere to during construction.

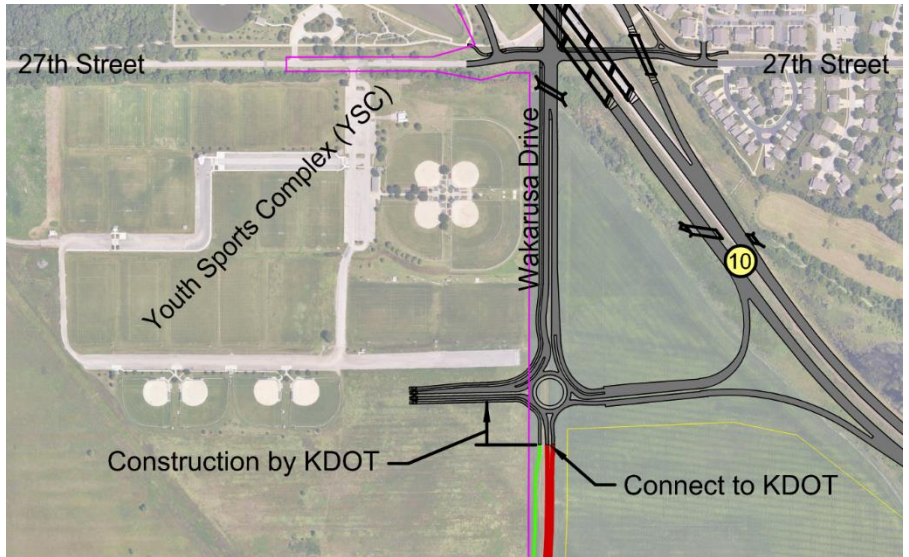


Construction phase protocols will be determined during the design phase and Action Permit approval process when additional construction details are available. For this preliminary stage however, Douglas County should plan on working with the KDWP for the Action Permit during the design phase and then implementing protocols during construction to either characterize the substrate within about 60-100 feet upstream and downstream of the bridge construction and/or contract with a qualified third party to perform a Mussel Survey and perform translocation of any Native Mussels encountered.

Douglas County should plan for about a 2-4 month permitting process for obtaining KDWP approval of an Action Permit. Specific protocols that will be required during construction will be established during the permitting approval process.

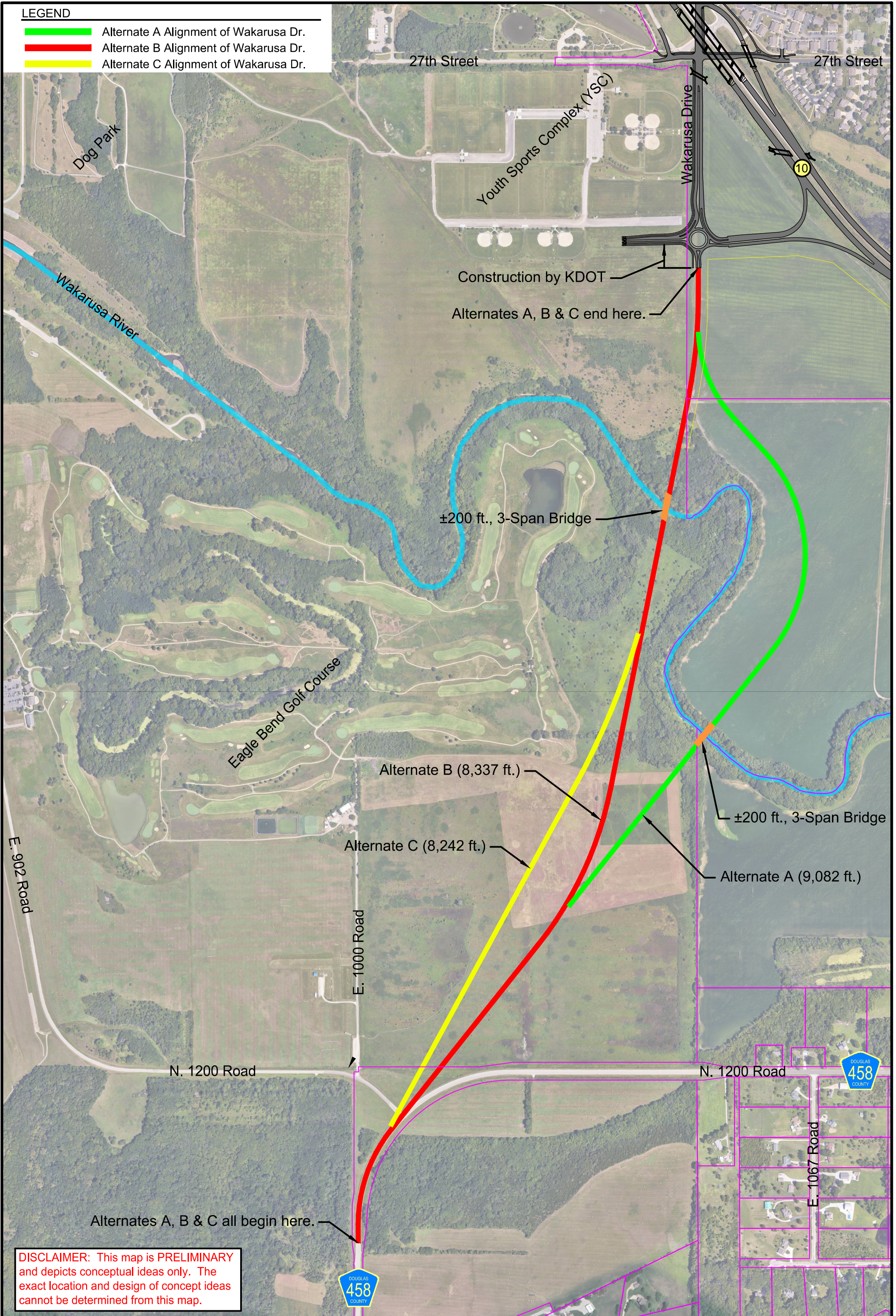
Kansas Department of Transportation (KDOT)

The KDOT will need to be contacted during the design phase of the Wakarusa Drive Extension Project to coordinate the interaction between the design/construction of KDOT infrastructure and the Douglas County project on the KDOT rights-of-way. This coordination only pertains to the very northern end of the Douglas County project. Prior to construction of the Wakarusa Drive Extension Project, an application for Use of Highway Right-of-Way permit will need to be obtained. This is a no-cost permit obtained online via KDOT's KUPS system. There is a high likelihood of the agency approving this permit application considering the fact that the KDOT is constructing a roundabout with a connection point specifically for this Wakarusa Drive extension project.



LEGEND

- Alternate A Alignment of Wakarusa Dr.
- Alternate B Alignment of Wakarusa Dr.
- Alternate C Alignment of Wakarusa Dr.

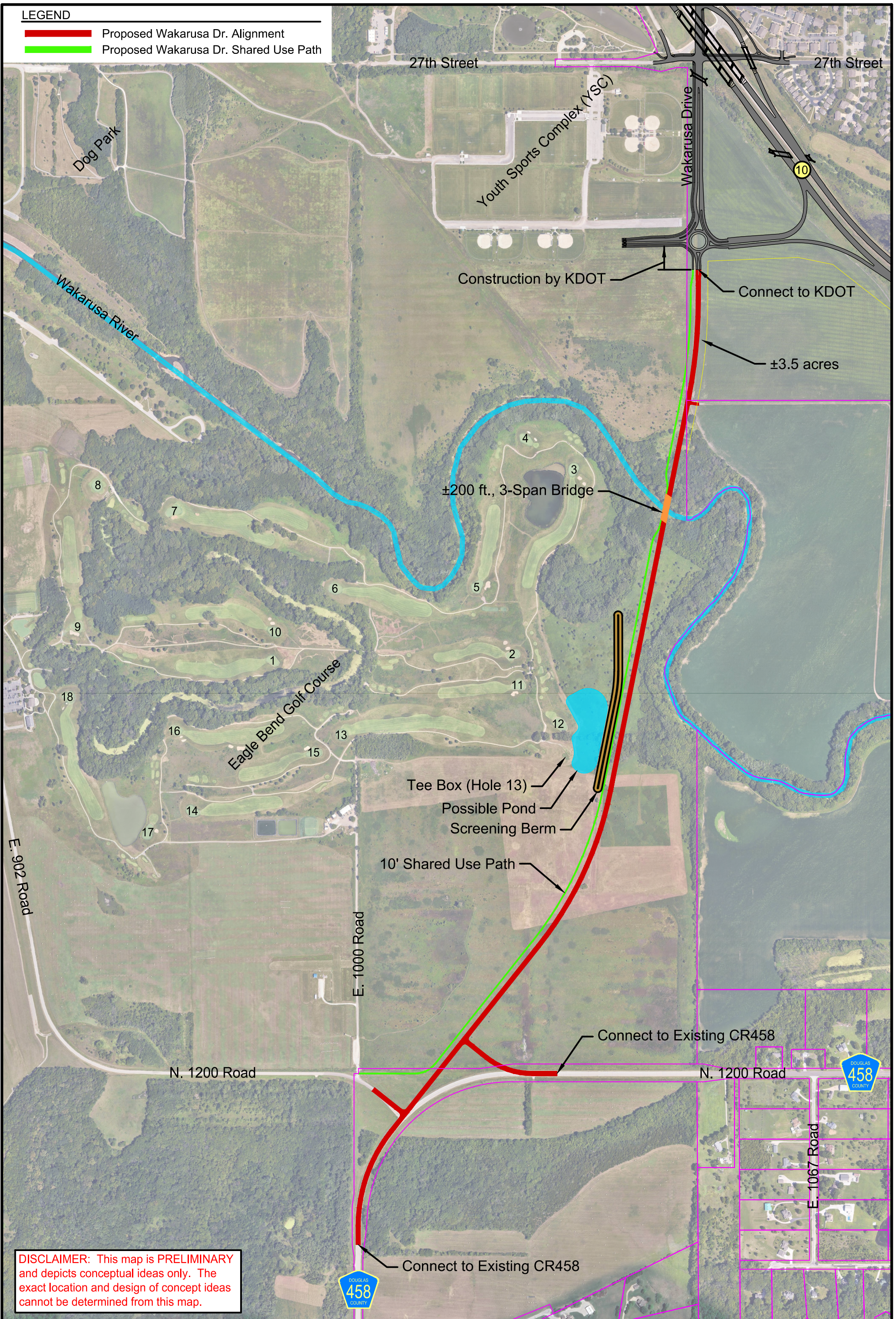


DISCLAIMER: This map is PRELIMINARY and depicts conceptual ideas only. The exact location and design of concept ideas cannot be determined from this map.



LEGEND

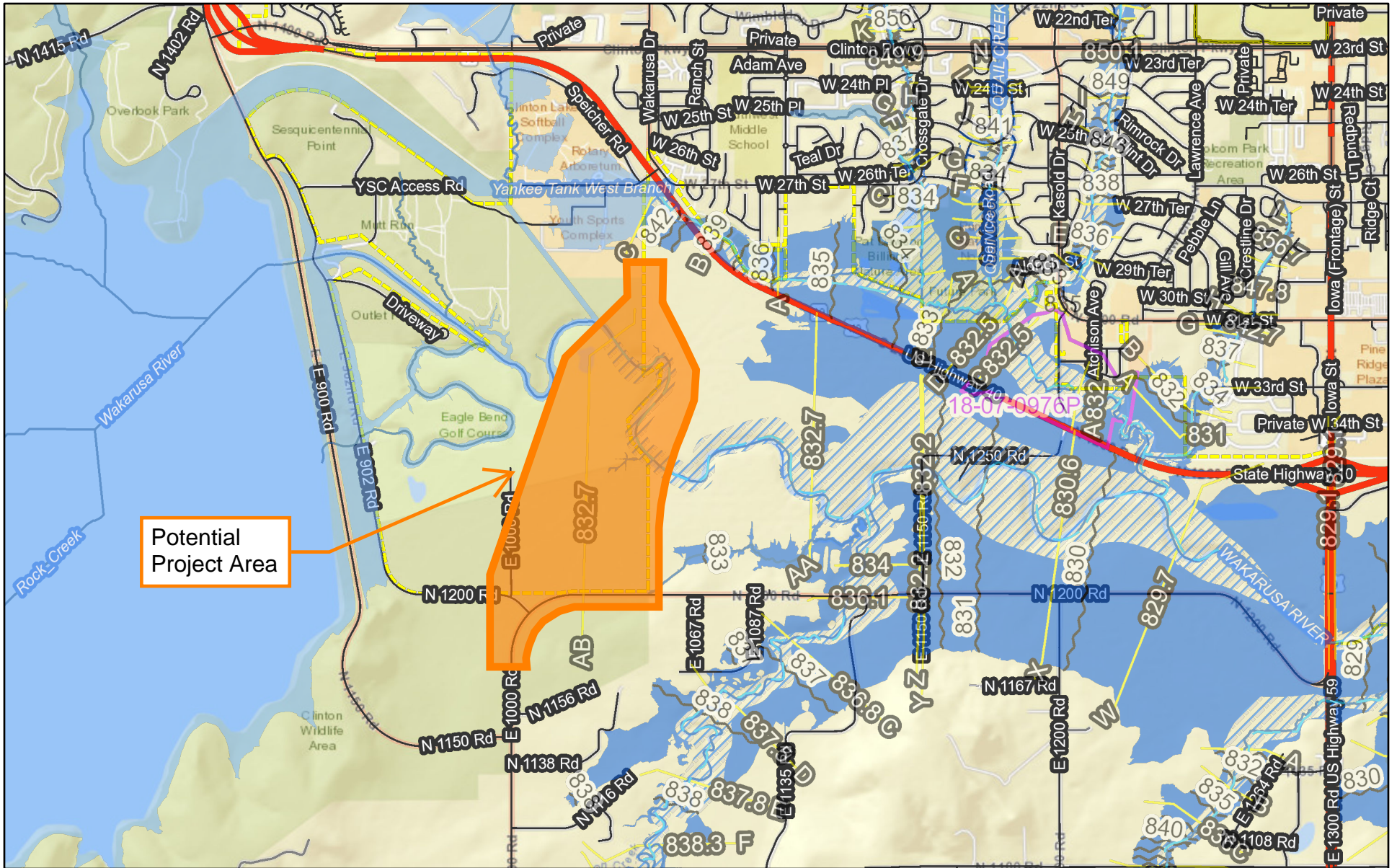
- Proposed Wakarusa Dr. Alignment
- Proposed Wakarusa Dr. Shared Use Path



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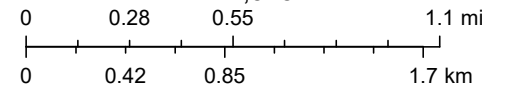


Potential Project Area

November 19, 2024

- | | | | | |
|---------------------------|-----------------------------------|--------------------|--------------------------|-------|
| Special Flood Hazard Area | LOMR Areas | Stream Centerlines | Authoritative Boundaries | PAVED |
| AO | Unlettered, Mapped Cross Sections | PLSS | Municipal Boundaries | SOIL |
| AH | Lettered Cross Sections | DFIRM Status | Road Centerline | |
| AE, FLOODWAY | Base Flood Elevations | Effective DFIRM | OTHER | |
| AE | Streams | Not Modernized | GRAVEL | |
| A | Profile Baseline | PSAP | HIGHWAY | |

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All Kansas PSAPs, NG911 Coordinating Council, DASC, City of Lawrence, Kansas, City of Lawrence, Missouri Dept. of Conservation, Esri, HERE,

Base Flood Approximate Elevations developed by Kansas Department of
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