EXHIBIT "A"

SCOPE OF SERVICES

New Location Road
Corridor Alignment Analysis, Public/Stakeholder Involvement, Schematic Design, Traffic Analysis, Geotechnical Investigation, Subsurface Utility Engineering (SUE), Aerial LiDAR/Ortho-Photogrammetry, Field Surveying, and Right-of-Way (ROW) Mapping

Limits:
From Bridgefarmer Road in Lowry Crossing, TX to CR 400 in Princeton, TX
From 2,300 feet east of FM 982 to Baron Drive in Princeton, TX at intersection with US 380

PURPOSE

The Scope of Work to be performed by BGE, Inc. (the "ENGINEER") under this contract will determine a feasible alignment for a 6-lane major thoroughfare, with a minimum of 120 feet of ROW at the following locations:

- Approximately 2 miles, from Bridgefarmer Road to CR 400
- Approximately 0.7 mile, from 2300 feet east of FM 982/S 2nd Street to Baron Drive
- At intersection with US 380

New Location Road (the "Project") will consist of a feasibility study and be further defined by a design schematic. The Project will include alignment analysis, public/stakeholder involvement, schematic design, minor Level of Service (LOS) traffic analysis, geotechnical investigations, SUE, Aerial LiDAR/Ortho-Photogrammetry, field surveying, and full ROW mapping. Collin County (the "COUNTY") serves as the owner of the Project. The Aerial LiDAR and Ortho-Photogrammetry shall be flown for the entire limits of the corridor (including west of Bridgefarmer Road to just south of McKinney National Airport) to reduce mobilization costs and delays.

DETAILS

- The initial phase of the Project will consist of a corridor refinement study, utilizing public/stakeholder outreach to assist in the identification of a recommended alternative from Bridgefarmer Road to CR 400. The recommended alternative shall be submitted for approval and will be followed by detailed schematic design to a level adequate to develop the final footprint for ROW acquisition.
- CSJ limits are being developed by TxDOT for future FM 546 improvements that extend from Harry McKillop Blvd in McKinney, TX to the intersection of FM 546 and CR 393 in Lowry Crossing, TX. The design schematic for this phase of the project will begin at the eastern limit of TxDOT's CSJ.

- Design Criteria for the project shall comply with AASHTO Policy on Geometric Design of Highways and Streets.
- This Project will be developed utilizing English units of measure and all final schematic exhibits will be provided in roll format.

The work described in this scope of services will include the following major work tasks: Assembly and Review of Data; Corridor Typical Section Evaluation; Corridor Alternatives Analysis; Schematic Development; Hydrologic and Hydraulic Investigation; Public/Stakeholder Involvement; Project Management; Survey and Right-of-Way; Utility Investigation (SUE); Aerial Photography and LiDAR Acquisition; Geotechnical Investigation; and 3D Visualization Services.

- For the purpose of this contract, "Stakeholders" refers to, but is not limited to, the following:

    - COUNTY
    - Federal, state and local public officials
    - TxDOT
    - City of Lowry Crossing
    - City of Princeton
    - NCTCOG
    - NTMWD
    - USACE
    - Civic and community leaders
    - Advisory committees
    - Interest groups

BASIC SERVICES

BS1. ASSEMBLY AND REVIEW OF DATA

A. Collection of Data, Reports, and Maps

The determination of data requirements, availability, and sources will be coordinated with the COUNTY. Once the data needs and sources are identified, the ENGINEER will contact the appropriate agencies and organizations to obtain the data. Data to be collected will include, but not be limited to:

- Previous studies, exhibits, designs, and reports.
- COUNTY, state and city planning documents (zoning information, thoroughfare maps, preliminary plats, design schematics).
- Utility plans and documents from appropriate municipalities and utility companies.
- Readily available plan sets for crossing or abutting sections within the Project limits.
- Readily available flood plain information and studies from the Federal Emergency Management Agency (FEMA), the Corps of Engineers and/or other governmental agencies.
- The ENGINEER will obtain electronic and/or hard copies from the COUNTY: GIS Data, drainage reports, mapping, survey, and improvement plans within the scoped area. The

ENGINEER will acquire from the COUNTY any aerial mapping and soil data for the designated area.

- The ENGINEER will acquire from the COUNTY and NCTCOG any traffic/travel demand numbers for the corridor to be used in LOS analysis.
- Obtain desktop level environmental constraints mapping from NCTCOG based on existing environmental databases.

B. Field Reconnaissance

The ENGINEER will perform a corridor site visit to obtain field notes and digital photos along the project corridor.

C. Review of Data/Base File Creation

The ENGINEER will review the data collected and from this information will:

- Integrate additional data into the study file as it becomes available.
- Develop base CAD files (Bentley PowerGeopak V8i) that will be utilized for corridor evaluation including, but not limited to, existing utilities from visual analysis and additional SUE research; FEMA flood plain limits converted from GIS; and parcels and right-of-way converted from the latest Collin County Appraisal District GIS database.

Note: The entire limits of this project will be flown for aerial photogrammetry and LiDAR. A high-level 3D topographic existing ground surface will be created for use in the corridor evaluation process and to develop conceptual profile alignments and geometrics. Upon approval of a recommended alignment, detailed topography and 3D existing ground surface will be processed in detail (from the obtained LiDAR point cloud) to create design-level survey and will be augmented with field survey to fill void areas as needed.

D. Preliminary Design Conference

The ENGINEER shall prepare and submit a Design Summary Report (DSR) to the COUNTY for review and approval. Additionally, the ENGINEER will attend a Kick-Off Meeting to establish and agree on fundamental aspects, concepts, establish the basic features and design criteria for the project.

Task BS1 Deliverables

1. Field Notes and Site Photographs
2. Design Summary Report (DSR)

BS2. CORRIDOR TYPICAL SECTION EVALUATION

The ENGINEER will prepare an ultimate typical section based on a 6-lane urban major thoroughfare. The ENGINEER will prepare and analyze an interim typical section (4-lane) as deemed appropriate and in coordination with the most recent traffic analysis within and surrounding the corridor.

The COUNTY will provide selection and approval of any alternate design criteria and typical corridor section.

Task BS2 Deliverables

1. Ultimate and interim typical sections for the corridor.

BS3. CORRIDOR ALTERNATIVES ANALYSIS

The ENGINEER will utilize previously developed alternative alignments and develop additional alignments based on input from project stakeholders and property owners (coordination covered in BS7). Up to five (5) alignment alternatives will be developed to a 30% schematic design level from 0.18 mile east of Bridgefarmer Road to 0.19 mile south of CR 400. The currently identified alignment will be refined based on the latest data collected in BS1.

Alternate corridor evaluation will include the following:

1. Identification of impacts in each of the following categories:
    a. Enhanced Mobility and Safety
        i. Accessibility
        ii. Safety
    b. Cost Effectiveness
        i. Construction Cost
        ii. ROW Acquisition Impact
        iii. Utility and Infrastructure
    c. Engineering Feasibility
        i. Compatibility with Other Projects
    d. Input from Project Stakeholders and Property Owners
2. Preparation of an Alternatives Comparison Scoring Matrix for each impact (shown above) to assist in documenting the recommended alternative to move further into design.

A. Lowry Crossing Alignment Analysis just east of S. Bridgefarmer Road

The ENGINEER will develop up to five (5) alternative alignments in coordination with stakeholders and property owners for this new location alignment from Bridgefarmer Road to CR 400. No alternative alignments are anticipated for CR 452.

This segment requires early attention to begin coordination with identified stakeholders and property owners to build consensus on a single, recommended alignment alternative. Alignments will be developed to a 30% conceptual planning level of effort and will include a drainage analysis. Horizontal alignments will be refined and used to create conceptual vertical alignments for each option. Additionally, generic templates will be developed in Bentley's OpenRoads (SS4) software and used to create a proposed, conceptual 3D design model for use in conceptual cost estimate development (earthwork, pavement quantities, etc.). Superelevation will be considered, if required, as part of the conceptual effort for each alternative.

B. Development of Comparison Scoring Matrix

Develop a matrix-based scoring tool to be used to compare alternatives within Lowry Crossing. Items to be considered include, but are not limited to, public/stakeholder input, safety, mobility, etc. Alternatives will be scored, and the recommended alternative identified through the scoring matrix effort.

C. Public Meetings

For public involvement and meeting related tasks, see section BS7. The ENGINEER will provide a response to any stakeholder comments to the COUNTY, including engineering backup figures and/or exhibits. No public hearings are anticipated for this project.

D. Corridor Presentation

The ENGINEER will prepare up to two (2) technical PowerPoint presentations and present a refined corridor alignment for COUNTY approval.

Task BS3 Deliverables

1. Preliminary Corridor Exhibit Maps
2. Technical Presentation of Alternate Corridors
3. Final Corridor Exhibit Maps
4. All design files and deliverable in electronic format (PDF, DOC, DGN, DWG, etc.)

BS4. SCHEMATIC DEVELOPMENT

The ENGINEER will utilize the recommended corridor alignment from Task BS3 to develop a detailed design schematic for the ultimate build-out of CR 400 and CR 452 (in coordination with the COUNTY). No grade separations or bridges are anticipated or included as part of this scope of work.

The ENGINEER will prepare a schematic layout to a scale of 1" = 100' depicting the proposed improvements for the project. The schematic shall include: the location of intersections, retaining walls, driveways; the geometric typical sections (pavement cross slopes, lane and shoulder widths, slope rates for fills and cuts); vertical and horizontal geometry; the degree of horizontal curves and vertical curve data, including "K" values; the lane lines and/or arrows indicating the number of lanes; the existing and proposed ROW limits; the existing and proposed drainage and construction easements; the direction of traffic flow on all roadways; the geometrics of speed change (acceleration, deceleration) lanes; removal items, and major utility conflicts. The schematic will be prepared using the English system of units. All designs will be prepared in accordance with the latest versions of: *Roadway Design Manual* (TxDOT), *A Policy on Geometric Design of Highways and Streets* (AASHTO), *Standard Specifications for Construction of Highways, Streets and Bridges* (TxDOT), *Highway Operations Manual of the Traffic Operations Manual* (TxDOT), and *Highway Capacity Manual* (Transportation Research Board).

In preparing the schematic, the ENGINEER will:

A. General

1. Develop typical roadway sections for proposed CR 400 and CR 452 facilities, major cross streets, and other locations with specific design features (retaining walls (if needed), and intersections). Typical sections for future cross streets will be based on best-available data provided by the COUNTY.
2. Produce plan and profile schematic exhibits on roll plots at a scale of 1" = 100' showing proposed features, existing features, title block, and legend.
3. Develop a 3D corridor model of the proposed facility and provide design of roadway templates and end conditions throughout the corridor according to the proposed design.
4. Evaluate potential utility conflicts based on Level C/D/B/A SUE data and label crossings on the schematic.
5. Perform a LOS analysis using HCS7 and HMC7 for a multi-lane highway.
6. Traffic Control Plans:

    - Alternative Analysis. The ENGINEER shall consider the requirements for construction staging and traffic control throughout the development of schematic design to ensure that the proposed design can be constructed. The ENGINEER shall provide construction phasing assumptions to the County as requested. A comparative assessment will be provided for up to two (2) TCP alternatives.
    - TCP Narrative and Construction Sequence. The ENGINEER shall prepare a Preliminary Construction Narrative and Typical Sections in conjunction with the Geometric Schematic of the Preferred Alternative.
    - Quantity and Cost Estimate. The ENGINEER shall prepare a preliminary planning-level cost estimate for the Preliminary Traffic Control Plan.

B. Intersections

The ENGINEER will evaluate, in detail, the following intersections within the corridor:

1. Project at The Crossings Drive
2. Project at CR 393
3. Project at Bridgefarmer Road
4. Alignment approaching FM 982 and intersection at US 380

Smaller intersections will be analyzed to tie correctly horizontally and vertically as part of the intersection analysis

1. Up to two (2) proposed roadways found through data collection and in coordination with stakeholders, such as the intersection at US 380

At each location the ENGINEER will:

1. Design preliminary horizontal alignments for intersections based on the approved corridor alignment. Any proposed deviation from this approved alignment will require COUNTY approval and re-design of a non-approved alignment is not included in this scope of services.

2. Design of preliminary profiles for intersections based on preliminary horizontal alignments.
3. Perform a LOS analysis using HCS7 and HMC7 for each of the following scenarios:
    a. Existing Condition – Build Out Year
    b. Existing Condition – Horizon Year
    c. Proposed Condition – Build Out Year
    d. Proposed Condition – Horizon Year
4. "Build Out Year" refers to the year when construction for the project would be complete. "Horizon Year" refers to 20 years after the project has been constructed.
5. Show preliminary location of cross culverts including preliminary sizing. Studied floodplain areas within the project corridor will be displayed based on available GIS data.
6. Identify major utility locations based on Level C/D/B/A subsurface utility engineering (SUE).
7. Design and show preliminary pavement markings.
8. Determine preliminary right-of-way and easement limits and need including any necessary easements based on proposed geometric design. Property boundaries will be developed once a recommended alternative corridor is selected to move forward into schematic design.

C. Project Delivery

The schematics will be provided to the County for review at the following stages of completion:

1. Concept (30%) – Plan view only
2. Preliminary (60%) – Plan and Profiles Developed; Cross Sections; Cost Estimate
3. Pre-Final (90%)
    a. Plan and Profile Layout
    b. Cross Sections
    c. Cost Estimate
    d. Draft Level of Service Analysis Report
    e. Draft TCP Narrative and Construction Sequence
4. Final (100%)
    a. Plan and Profile Layout
    b. Cross Sections
    c. Cost Estimate
    d. Level of Service Analysis Report
    e. TCP Narrative and Construction Sequence

Prior to each submission, the ENGINEER will:

1. Log any previous County or stakeholder comments in a Comment Response Log spreadsheet and provide a resolution for each comment.
2. Provide a Quality Control (QC) review of plans, calculations, documents, and other supporting design data, if requested by the COUNTY.
3. Provide a Quality Assurance (QA) audit of the QC review to assure all comments were addressed and/or resolved.
4. Coordinate production of the milestone deliverables including printing, compiling electronic files, and preparation of a transmittal letter.

D. Project Update Presentations

The ENGINEER will prepare and present up to two (2) technical PowerPoint presentations during the schematic design providing a briefing on project schedule, design development, and future tasks.

Task BS4 Deliverables

1. Concept Schematic (30%)
2. Preliminary Schematic, Cross Sections, and Estimate (60%)
3. Pre-Final Schematic, Cross Sections, and Estimate (90%)
4. Final Schematic, Cross Sections, and Estimate (100%)
5. QA/QC Documentation for each milestone deliverable, if requested
6. Technical PowerPoint Presentations
7. Final Electronic Design Files placed on USB thumb drive

BS5. HYDROLOGIC AND HYDRAULIC INVESTIGATION

The ENGINEER shall perform drainage tasks to determine the approximate size and type of cross drainage structures. Cross drainage analysis will include a comparison of existing and future land use in the watershed and the cross-drainage structures needed for both conditions. Drainage tasks will be performed in accordance with Collin County and TxDOT requirements.

Scour analysis will not be provided as part of this work. Scour countermeasures will be approximated for inclusion in the opinion of probable construction cost. Driveway culverts and cross street culverts will not be designed as part of this work but will be considered in the opinion of probable construction cost.

The following drainage tasks will be performed in the preparation of the schematic layout:

A. Minor Cross Drainage - Estimate 8 Minor Drainage Crossings

1. Drainage Area Mapping
   Delineate drainage area boundaries based on Collin County GIS data, North Central Texas Council of Governments (NCTCOG) contour maps, Texas Natural Resources Information System (TNRIS) Lidar, United States Geological Survey (USGS) contour maps, or other suitable topographic maps, if available. A drainage area map will be presented on 11”x17” plan sheets at maximum 1" = 200' scale with topographic data shown and labeled.

2. Calculate Discharges
   Determine conveyance paths, channel slopes, time of concentration, Natural Resources Conservation Service (NRCS) curve numbers and other factors as required to determine frequency-discharge relationships using hydrologic models. Determine preliminary design flows for the crossings based on the design frequency and a check of the 100-year event using the appropriate hydrologic method. Previous studies, including local studies, shall be obtained and considered during the hydrologic analysis. The results of the hydrologic calculations will be tabulated and presented on 11”x17” Hydrologic and Hydraulic Data Sheets.

3. Size and Locate Cross Drainage Structures
   Determine approximate cross drainage structure sizes denoting size, type, orientation, flowlines, tailwater, and headwater conditions. Approximate sizing will be shown on the schematic along with needed drainage easements. Evaluate existing cross culverts for extension. HY-8 culvert analysis software will be used to size minor culvert crossings. The results of the hydraulic calculations will be tabulated and presented on 11”x17” Hydrologic and Hydraulic Data Sheets. Culvert layouts will be provided for minor cross drainage structures. The ENGINEER will provide opinion of probable construction costs.

B. Major Cross Drainage - 1 Crossing (East Fork Trinity River Tributary 1)

1. Obtain and Review Available FEMA Data and Reports
   The ENGINEER will obtain available Flood Insurance Studies (FIS), Flood Insurance Rate Maps (FIRMs), Letters of Map Revisions (LOMR), and electronic data readily available from FEMA for East Fork Trinity River.

2. Drainage Area Mapping
   Delineate drainage area boundaries based on Collin County GIS data, NCTCOG contour maps, TNRIS Lidar, USGS contour maps, or other suitable topographic maps, if available. A drainage area map will be presented on 11”x17” plan sheets at maximum 1" = 200' scale with topographic data shown and labeled.

3. Calculate Discharges
   Determine conveyance paths, channel slopes, time of concentration, NRCS curve numbers and other factors as required to determine frequency-discharge relationships using hydrologic models. Determine preliminary design flows for the crossings based on the design frequency and a check of the 100-year event using the appropriate hydrologic method. Previous studies, including FEMA and local studies, shall be obtained and considered during the hydrologic analysis. The results of the hydrologic calculations will be tabulated and presented on 11”x17” Hydrologic and Hydraulic Data Sheets.

4. Develop Hydraulic Models
   Develop water surface profile models of open channels for existing/pre-project and proposed design conditions in accordance with Collin County, TxDOT, and FEMA requirements. All relevant conveyance features, (channels, culverts, slab bridges, encroachments) will be included in the hydraulic analysis using HEC-RAS.

5. Develop Alternative Drainage Schemes (up to two)
   Based on the results of the discharge calculations and water surface profile models, develop alternative schemes to alleviate potential adverse drainage issues associated with the highway construction. Determine optimum drainage scheme to be used for schematic design. An alternatives analysis will be performed to determine if cross drainage structures should be bridge-class culverts or span bridges. The ENGINEER will develop preliminary layouts for all bridge-class culverts and span bridges on the plan and profile of the schematic. The ENGINEER will

provide opinion of probable construction costs. The ENGINEER will provide bridge and bridge class culvert layouts.

6. Identify Easement Requirements
   The ENGINEER shall identify any required drainage easements needed to accommodate drainage facilities at inlet and discharge points along the route.

7. Size and Locate Major Cross Drainage Structures
   Determine approximate cross drainage structure sizes denoting size, type, orientation, flowlines, tailwater, and headwater conditions. Approximate sizing will be shown on the schematic. HEC-RAS will be used to size major culvert crossings. The results of the hydraulic calculations will be tabulated and presented on 11"x17" Hydrologic and Hydraulic Data Sheets. Culvert layouts will be provided for major cross drainage structures. The ENGINEER will provide opinion of probable construction costs.

C. Closed Storm Sewer

The ENGINEER will provide an approximation of trunk size and inlet spacing for the closed storm sewer system and ensure adequate drainage to an outfall location can be obtained. The ENGINEER will determine ROW and easement needs and include the system in the opinion of probable construction cost.

D. Drainage Design Technical Summary Report

Upon completion of the hydraulic analyses and alternative evaluations of potential improvements for the project drainage system, the ENGINEER shall prepare a Drainage Design Technical Summary Report. A preliminary report will be submitted with the 60% schematic deliverable and the final report will be submitted with the 100% schematic submittal. The report shall include the following sections:

1. INTRODUCTION: location, study objectives, general stream and watershed information, and other pertinent facts.
2. HYDROLOGY: watershed description, soil and land use information, source of hydrologic data and methodology/models used to develop flow data, pertinent input data and parameters for hydrologic analyses; summary table of results for full range of peak discharges for 10-, 25-, 50-, 100-, 200-, and 500-year events.
3. HYDRAULICS: overview of hydraulic modeling process, including data sources, specific model uses, descriptions of existing drainage structures, discussion of design alternatives and the results of respective hydraulic modeling for the scenarios evaluated; hydraulic model output data including existing, hydraulic data sheet, and proposed conditions summary tables; summary of assumptions made in preliminary closed storm sewer design.
4. SUMMARY OF CONCLUSIONS/RECOMMENDATIONS: summary of study objectives, alternatives being considered, opinions of probable costs, and identification of preferred design alternatives.
5. PHOTOGRAPHS, FIGURES AND APPENDICES: all items necessary to support the analysis.
6. ELECTRONIC DATA: computer files of hydrologic and hydraulic modeling with appropriate labeling of location, project reference, and submittal date.

7. FINALIZED DOCUMENT: one (1) copy of final report with CD (CD to include a PDF of the entire report).

Task BS5 Deliverables

1. Plan and Profile depictions of drainage structures on Schematic
2. Drainage Area Map Sheets
3. Hydrologic and Hydraulic Data Sheets - minor drainage structures
4. Hydrologic and Hydraulic Data Sheets - major drainage structures
5. Bridge and Culvert Layouts
6. Preliminary Drainage Report
7. Final Drainage Report
8. Opinion of Probable Construction Costs

BS6. SOCIAL, ECONOMIC AND ENVIRONMENTAL STUDIES

Not Applicable: Social, Economic, and Environmental Studies are excluded from this contract.

BS7. PUBLIC/STAKEHOLDER INVOLVEMENT

A. Public Involvement Plan

The project team will develop a comprehensive Public Involvement Plan (PIP) that will include communications with stakeholders. Key items will include:

Public and Stakeholder Definitions

- Outreach Timeline
- Goals
- Stakeholder Meetings Methodology
- Public Meetings Methodology
- Quality Assurance Protocols

Note: The alignment within City of Princeton is controlled by the beginning and end limits, which are being developed by others. No public involvement is anticipated at this time. However, some design coordination effort with the City of Princeton is expected.

B. Public Involvement Management

This task provides for the monthly management of tasks and activities, as well as internal project team meetings. In addition, the project team will utilize www.publicinput.com for public and stakeholder involvement management. The system will track stakeholder progress from kick-off through the end and assist with identifying and managing stakeholder input throughout the corridor area.

The task includes the utilization of Facebook and Twitter ad space for up to 20,000 residents along the corridor. Each ad placement is approximately $300. For each public meeting as well as general information updates, we estimate the number of ad placements to be six.

C. Stakeholder Coordination/Involvement

The project team will work with identified stakeholders to ensure that the right participants are at the table and to conduct a series of policy briefings and technical briefings. The task is divided into two approaches:

1. **Stage A:** Policy briefings will be conducted with the elected/public officials, while technical briefings will be conducted with county, city and state staff as needed. It is estimated that each stakeholder meeting will not exceed 12 participants.

   The following stakeholder meetings are identified:

   City of Lowry Crossing and Collin County
   Up to four Policy and four Technical Stakeholder Meetings throughout the Project.

   Representatives from the City of Princeton, TxDOT, USACE, NCTCOG and NTMWD will be invited to each of the above meetings, if applicable.

   The project team will coordinate these meetings, as well as RSVPs, identify appropriate venues, create sign-in sheets, take notes and develop summaries for each meeting.

2. **Stage B:** The project team will conduct two additional stakeholder meetings that bring the technical, policy and business stakeholders together for facilitated discussions to build consensus and identify appropriate project goals.

   The project team will coordinate these meetings, as well as RSVPs, identify appropriate venues, create sign-in sheets, take notes and develop summaries for each meeting, as well as assist with facilitation.

Additional Property Owner/Stakeholder Coordination: It is anticipated that the following, additional meetings may be needed to coordinate and gain consensus for the recommended alternative in the early stage of the project. Each will include time to prepare for and document each meeting.

- For our current, worst-case alignment scenario, there are forty-five (45) possible properties to be impacted along the corridor. It is assumed that we would plan for and attend up to fifteen (15) meetings with affected property owners along the corridor throughout the alignment analysis stage of the project.
- Prepare for and attend one (1) separate meeting with NCTCOG to discuss their Collin County Strategic Roadway Initiative, projected traffic volumes within the project limits, demographics, and development of traffic numbers for use in microsimulations for the corridor.
- Prepare for and attend up to one (1) meeting with bicycle groups that utilize the corridor. Identified are the following: Bike DFW, Plano Bicycle Association, and Shawnee Trail Cycling Club.

- We anticipate a need to hold one (1) separate meeting/work session with Lowry Crossing early in the project to discuss concerns, options, impacts, etc. (Bob Petitt – EDC; Janis Cable – City Secretary; Derek Stephens – Mayor; Marley Phillips – Mayor Pro Tem; Paul Wood – Fire Chief)
- We anticipate a need to hold one (1) meeting with the City of Princeton's consultant currently working on PS&E for an eastern segment of the corridor within the southern limits of Princeton.

Note: COUNTY may request virtual stakeholder coordination meetings in lieu of in-person meetings. Microsoft Teams, WebEx, or other COUNTY approved application will be used to host the meetings.

D. Public Meetings

The project will require up to two (2) public meetings. Public Involvement coordination for each meeting includes the development of the following:

- TxDOT Public Meeting Checklist – for general guidance/information only
- EO/PO Database
- APO Database
- Public Notice (English/Spanish, if necessary)
- Location Map
- Venue Coordination
- Newspaper Ad Placement and Schedule Matrix
- Public Meeting Materials
- Comment Cards (English/Spanish, if necessary)
- Sign-in Sheets
- Public Meeting Photography
- Public Meeting Registration
- Coordination of All Public Meeting Comments and Responses
- Public Meeting Summary

COUNTY may request virtual public meetings in lieu of in-person meetings. A virtual public meeting is a meeting that is held on-line, in which members of the public log-on to the meeting and participate via the internet. Notice of a virtual public meeting must also include the following:

- Clear instructions about how to log onto the virtual public meeting;
- An explanation of how the virtual public meeting will be conducted;
- An explanation that members of the public may contact COUNTY or project staff during business hours to ask questions about the project or access project materials; and
- An explanation that members of the public may submit public comments via email or letter.

The virtual public meeting must include the following:

- Presentation, which includes both audio and visual components
- Project website
- Email address, physical address and/or phone number as an alternate option to provide comments

- Timeframe to provide comments, if any

The presentation may be live or pre-recorded and uploaded for viewing at the time of the scheduled public meeting and thereafter. www.publicinput.com will be used in coordination with Facebook live, or another COUNTY approved platform. Participants in a virtual public meeting may be asked to "sign-in" by entering their name and/or email address.

Public Hearings are excluded from this contract.

Task BS7 Deliverables

1. Stakeholder Meeting sign-in sheets, if applicable, and meeting minutes.
2. Public Meeting sign-in sheets, if applicable, comment sheets, project information handout and meeting minutes.

BS8. PROJECT MANAGEMENT

The ENGINEER'S project manager, in coordination with the COUNTY'S Director/Assistant Director of Engineering, will be responsible for directing and coordinating all activities and personnel associated with this project.

A. Schedule, Progress Reports, and Invoices

The ENGINEER will prepare a simple graphic milestone schedule indicating completion dates of major work items, deliverables, and reviews.

The ENGINEER will submit monthly progress reports to the County. Invoices for all work completed during the period will be submitted monthly to the County. Monthly progress reports will include verbal description of all activities ongoing or completed during the reporting period, problems encountered, and action required to remedy them. The progress report will include a tabulation of percent complete by task.

B. Progress/Coordination Meetings

Attend an estimated eighteen (18) project team meetings with Collin County. The purpose of these meetings is to discuss project status, plan upcoming events, and discuss and resolve any key project issues. Meeting minutes will be prepared by the ENGINEER and distributed for all meetings.

The ENGINEER will coordinate and hold eighteen (18) internal monthly team meetings to coordinate critical path schedule items, outstanding tasks, and maintain a risk analysis for the project to keep the project on track and on budget.

The ENGINEER will prepare subcontracts for subconsultants, direct and monitor subconsultant activities, and review and recommend approval of subconsultant work and invoices.

Task BS8 Deliverables

1. Monthly Progress Reports and Invoices

2. Design Schedule
3. Meeting Sign-In Sheets and Minutes (18 Meetings)

SPECIAL SERVICES

SS1. SURVEY AND RIGHT-OF WAY

A. General Standards

All surveys shall meet or exceed the standards set in the Professional Land Surveying Practices Act, the *General Rules of Procedures and Practices* promulgated by the Texas Board of Professional Engineers and Land Surveyors (TBPELS), and TxDOT's *Survey Manual*, latest edition, and shall be accomplished in an organized and workman-like manner, subject to the approval of the COUNTY.

TxDOT's *Right-of-Way Procedures Preliminary to Project Release, Volume 1,* (online at: http://manuals.dot.State.tx.us/) and TxDOT's *Survey Manual*, latest edition, will serve as a guide for the format and preparation of all right-of-way documents produced, including Right-of-Way maps, property descriptions (including parcel plats), and other Right-of-Way work products, unless otherwise directed by the COUNTY.

The North American Datum of 1983 (NAD83), Texas Coordinate System of 1983 (State Plane Coordinates), with an applied combined scale factor utilized by TXDOT for Collin County, with values in U.S. Survey Feet, will be used as the basis for all horizontal coordinates derived, unless otherwise directed by the COUNTY.

Elevations will be based on the North American Vertical Datum 88 (NAVD88), unless otherwise directed by the COUNTY.

All GPS work, whether primary control surveys or other, shall meet or exceed the current TxDOT's *GPS Manual of Practice*, latest edition, to the order of accuracy specified in the categories listed below or in a work authorization. If the order of accuracy is not specified in this contract or in a work authorization, the work shall meet or exceed the order of accuracy specified in the publications listed in this paragraph.

All conventional horizontal and vertical control surveys shall meet or exceed the current, TxDOT's *Survey Manual*, latest edition, and the Texas Society of Professional Surveyors (TSPS) *Manual of Practice for Land Surveying in the State of Texas*, latest edition, to the order of accuracy specified, and in the categories listed below or in a work authorization. If the order of accuracy is not specified in this contract or in a work authorization, the work shall meet or exceed the order of accuracy specified in the publications listed in this paragraph.

In order to ensure accuracy and accountability of the services provided under this contract, the Surveyor may be required to certify work performed under this contract as true and correct according to, TxDOT's *Survey Manual*, latest edition, TxDOT's *GPS Manual of Practice*, latest edition, or the TSPS *Manual of Practice for Land Surveying in the State of Texas*, as may be applicable.

The Surveyor shall provide temporary signing and traffic control in and around survey operations. All signs, flags and safety equipment shall be provided by the Surveyor. The COUNTY shall be notified at least 48 hours in advance of any lane closures.

The Surveyor shall provide all personnel, equipment, and survey supplies necessary for the performance of the activities required by this agreement or by any work authorization.

Data (original and processed) shall be provided to the COUNTY on a compact disk or other approved medium and shall be in the following formats: Microsoft Word for word processing, MicroStation, GeoPak V8i for graphics applications.

Variations from these software applications or other requirements listed above shall only be allowed if requested in writing by the Surveyor and approved by the COUNTY.

The Surveyor shall perform Quality Control/Quality Assurance on all procedures, field surveys, data, and products prior to delivery to the COUNTY. If, at any time, during the course of reviewing a submittal of any item it becomes apparent to the COUNTY that the submittal contains errors, omissions, and inconsistencies, the COUNTY may cease its review and return the submittal to the Surveyor immediately for appropriate action by the Surveyor. A submittal returned to the Surveyor for this reason is not a submittal for purposes of the submission schedule.

The Standards for services that are not boundary-related but that relate to surveying for engineering projects may be determined by the project Engineer, construction specifications, or design specifications.

B. Survey Location

Survey will be performed along the approved corridor determined in **Task BS3**.

C. Specific Work to Be Performed (Survey)

1. The Surveyor shall establish Horizontal and Vertical Control Monuments, consisting of a 5/8" capped iron rod set in concrete, at approximately 2000-foot intervals. The monuments shall be set outside the future construction limits, when possible. GPS RTK will be utilized to establish the horizontal locations, and differential leveling will be utilized to establish vertical values. A Horizontal and Vertical Data Sheet shall be produced for each Monument. Each data sheet shall contain Grid and Surface horizontal coordinates, a Surface Adjustment Factor, an elevation and a locative sketch. The ENGINEER shall supply this data to the County.
2. Provide cross-sections of any existing public roadways in the corridor with shots being taken at the ROW, ditch line, edge of shoulder, edge of travel lane and centerline.
3. Provide structure details of all visible cross culverts including flow line elevations, inside top of slab elevations, top of road profile and structural dimensions, and downstream channel cross sections within the project limits.
4. Locate existing visible improvements within the project limits, including but not limited to, manholes, water valves, concrete, fences, buildings and other visible utilities.
5. Surveyor shall obtain Right-of-Entry permission prior to physically accessing any private property. Surveyor will utilize public records to determine ownership data and secure permission to enter

private property for purposes of performing Land Surveying. A right-of-entry (ROE) letter will be prepared on County letterhead and mailed to each property owner in the project limits. A written response will be requested either confirming or denying ROE. The Surveyor will make reasonable attempts to contact each landowner verbally prior to conducting any fieldwork if written correspondence is not successful. A log of all contact with landowners will be maintained.

6. Prepare a final design and topographic drawing in MicroStation, GeoPak V8i showing all features located in the field, an ASCII coordinate file of the associated points located in the field and a hard copy of all field notes and field sketches.
7. Determine boundary lines and rights-of-way lines for approximately 84 parcels and/or rights-of-way that are within or adjacent to the technically preferred alignment.
8. Perform Aerial Mapping survey to produce a design grade topographic map supplemented with traditional land surveying methods within the obscured areas. The aerial survey will include a 700-foot wide path for topographic features, a 1500-foot wide path for ortho photos, at a flight scale of 1" = 180' (0.1' yield on vertical accuracy on solid surfaces), mapping at a 1" = 50' scale with 1.0 foot contours and color ortho photos at 0.2' pixel resolution in MrSID format.
9. All Surveying shall be performed under the direct supervision of a Professional Land Surveyor licensed and in good standing with the State of Texas.
10. All Aerial Mapping shall be performed under the direct supervision of a Certified Photogrammetrist certified and in good standing with the American Society of Photogrammetry and Remote Sensing.

Task SS1 Deliverables (Survey)

1. ROE Contact Log, copies of ROE permission letters
2. DGN file containing planimetrics, contours, breaklines, and property lines and ownership information
3. MicroStation GeoPak DTM file
4. ASCII file of points, field notes and field sketches
5. Control Monument Data Sheets
6. MrSID Ortho Photos

D. Specific Work to Be Performed (Right-of-Way)

1. The Surveyor will prepare overall Parcel Exhibit Map. The Surveyor shall use the previously established Aerial mapping image as a backdrop for the new parcel configuration that comprises the length of the new Right-of-Way corridor. The overall Parcel Exhibit Map will show the new right-of-way lines, parcel boundaries, current ownership, bearings and distances and set or found monumentation for the new right-of-way corridor. Each 22"x 34" sheet will cover approximately 5,600 feet of length of the new right-of-way corridor.
2. The Surveyor will prepare up to 45 Parcel Exhibits. These will show the individual configurations that comprise the new right-of-way corridor. These will show new right-of-way lines, parcel boundaries, current ownership, bearings and distances and set or found monumentation. They will be reviewed by COUNTY and ENGINEER representatives for correctness and parcel configuration. These will include area designations for any determined prescriptive easement areas within the boundaries of the Parcel Exhibits and shown for appraisal purposes. There are approximately 45 Parcels that need Right-of-Entry permission within the Right-of-Way corridor.

If Right-of-Entry cannot be obtained, the Surveyor will be unable to set the new Right-of-Way monuments on those Parcels. The Surveyor could prepare Parcel Exhibits omitting the new Right-of-Way monumentation to be set. New Right-of-Way monuments can be set after Collin County obtains title to these parcels.

3. The Surveyor will prepare up to 45 Metes and Bounds descriptions that describe the Parcel boundaries. These will be signed and sealed by a Texas Registered Professional Land Surveyor and will become part of each Parcel Exhibit and suitable for acquisition purposes. These will be prepared after Parcel Exhibits have been reviewed and approved by others.
4. The Surveyor shall research public records to obtain names, physical addresses, mailing addresses, and telephone numbers, if available, of all property owners that adjoin and are within the ROW Mapping project limits. The surveyor shall fill out an Excel Spreadsheet with the found information. The Surveyor shall obtain copies of all parent tract recorded deeds and current subdivision plats within the project limits and obtain copies of all existing right-of-way deeds within the project limits.
5. ABSTRACT MAP (Working Sketch): The Surveyor shall create an Abstract Map (working sketch) of up to 100 properties for the ROW Mapping Project. The final MicroStation shall be a scale drawing prepared from record documents depicting the approximate locations of existing right-of-way lines, easement lines, and private property lines with relevant grantee names, recording data, and recording dates. The Abstract Map (working sketch) shall not depict right-of-way, easement, or private property lines resolved through found monumentation and evaluation by a Registered Professional Land Surveyor and will not be suitable as a land survey document for right-of-way or easement parcel document creation. Easement research shall span no earlier than 1945 (75 years).
6. All Surveying shall be performed under the direct supervision of a Texas Registered Professional Land Surveyor licensed and in good standing with the State of Texas.

Task SS1 Deliverables (Right-of-Way)

1. DGN files containing bearings, distances, monumentation of each parcel configuration (with easements) required to reproduce the overall Parcel Exhibit Maps.
2. Three (3) copies of signed and sealed Parcel Exhibits that include the associated Metes and Bounds for approximately forty-five (45) Parcels with PDF copies.
3. Two hard copies (22”x34” and 11”x17”) and PDF copies of the overall Parcel Exhibit Map.
4. Excel Spreadsheet that includes information of all property owners within the described limits.
5. An electronic file of the Abstract Map shall be provided in MicroStation V8i format.

SS2. UTILITY INVESTIGATION (SUE)

The ENGINEER shall complete a Quality Level B subsurface utility engineering (SUE) investigation (exclusive of Quality Levels C and D) for 200 LF at seven (7) locations within the full project limits, as requested by the ENGINEER, estimated at up to 1,320 LF of Quality Level B. The

ENGINEER shall complete twenty (20) Quality Level A test holes as needed at potential utility conflict locations as identified by others.

Subsurface Utility Engineering (SUE) includes utility investigations subsurface and above ground prepared in accordance with AASHTO standards [ASCE C-1 38-02 http://www.fhwa.dot.gov/programadmin/asce.cfm)] and Utility Quality Levels.

A. Utility Quality Levels

Utility Quality Levels are defined in cumulative order (least to greatest) as follows:

1. Quality Level D - Existing Records: Utilities are plotted from review of available existing records.
2. Quality Level C - Surface Visible Feature Survey: Quality level "D" information from existing records is correlated with surveyed surface-visible features. Includes Quality Level D information.
3. Quality Level B - Designate: Two-dimensional horizontal mapping. This information is obtained through the application and interpretation of appropriate non-destructive surface geophysical methods. Utility indications are referenced to established survey control. Incorporates quality levels C and D information to produce Quality Level B.
4. Quality Level A - Locate (Test Hole): Three-dimensional mapping and other characterization data. This information is obtained through exposing utility facilities through test holes and measuring and recording (to appropriate survey control) utility/environment data. Incorporates quality levels B, C and D information to produce Quality Level A.

B. Designate (Quality Level B)

Designate means to indicate the horizontal location of underground utilities by the application and interpretation of appropriate non-destructive surface geophysical techniques and reference to established survey control. Designate (Quality Level B) Services are inclusive of Quality levels C and D.

The ENGINEER shall:

1. As requested by the Client compile "As Built" information from plans, plats and other location data as provided by the utility owners.
2. Coordinate with utility owner when utility owner's policy is to designate their own facilities at no cost for preliminary survey purposes. The ENGINEER shall examine utility owner's work to ensure accuracy and completeness.
3. For the alignment options being considered, correlate utility owner records with designating data and resolve discrepancies using professional judgment. A color-coded composite utility facility plan with utility owner names, quality levels, line sizes and subsurface utility locate (test hole) locations, shall be prepared and delivered to the Client. It is understood by both the ENGINEER and the Client that the line sizes of designated utility facilities detailed on the deliverable are from the best available records and that an actual line size is normally determined from a test hole vacuum excavation. All above ground appurtenance locations must be included in the deliverable to the Client. This information shall be provided in the latest version of MicroStation or GeoPak used by the Client.
4. After a final alignment has been selected, designate, record, and mark the horizontal location of the existing utility facilities and their service laterals to existing buildings using non-destructive surface geophysical techniques.

5. Revise the utility facility plan by incorporating the Level B utility information collected along the selected final alignment. Clearly identify all utilities that were discovered from quality level B or what cannot be depicted in quality level B standards (levels C and D). These utilities must have a unique line style and symbology in the designate (Quality Level B) deliverable.

C. Subsurface Utility Locate (Test Hole) Service (Quality Level A)

Locate means to obtain precise horizontal and vertical position, material type, condition, size and other data that may be obtainable about the utility facility and its surrounding environment through exposure by non-destructive excavation techniques that ensures the integrity of the utility facility. Subsurface Utility Locate (Test Hole) Services (Quality Level A) are exclusive of Quality Levels B, C, and D.

The ENGINEER shall:

1. Review requested test hole locations and advise the COUNTY in the development of an appropriate locate (test hole) work plan relative to the existing utility infrastructure and proposed highway design elements.
2. Coordinate with utility owner inspectors as may be required by law or utility owner policy.
3. Neatly cut and remove existing pavement material, such that the cut not to exceed 0.10 square meters (1.076 square feet) unless unusual circumstances exist.
4. Measure and record the following data on an appropriately formatted test hole data sheet that has been sealed and dated by the ENGINEER:
   a. Elevation of top and/or bottom of utility tied to the datum of the furnished plan.
   b. Identify a minimum of two benchmarks utilized. Elevations shall be within an accuracy of 15mm (.591 inches) of utilized benchmarks.
   c. Elevation of existing grade over utility at test hole location.
   d. Horizontal location referenced to project coordinate datum.
   e. Outside diameter of pipe or width of duct banks and configuration of non-encased multi-conduit systems.
   f. Utility facility material(s).
   g. Utility facility condition.
   h. Pavement thickness and type.
   i. Coating/Wrapping information and condition.
   j. Unusual circumstances or field conditions.
5. Excavate test holes in such a manner as to prevent any damage to wrappings, coatings, cathodic protection or other protective coverings and features.
6. Be responsible for any damage to the utility during the locating process. In the event of damage, the ENGINEER shall stop work, notify the appropriate utility facility owner, the Client and appropriate regulatory agencies. The regulatory agencies include but are not limited to the Railroad Commission of Texas and the Texas Commission on Environmental Quality. The ENGINEER shall not resume work until the utility facility owner has determined the corrective action to be taken. The ENGINEER shall be liable for all costs involved in the repair or replacement of the utility facility.
7. Backfill all excavations with appropriate material, compact backfill by mechanical means, and restore pavement and surface material. The ENGINEER shall be responsible for the integrity of the backfill and surface restoration for a period of three years. Install a marker ribbon throughout the backfill.

8. Furnish and install a permanent above ground marker, as specified by the COUNTY, directly above center line of the utility facility.
9. Provide complete restoration of work site and landscape to equal or better condition than before excavation. If a work site and landscape is not appropriately restored, the ENGINEER shall return to correct the condition at no extra charge to the COUNTY.
10. Plot utility location position information to scale and provide a comprehensive utility plan sign and sealed by the responsible Engineer. This information shall be provided in the latest version of MicroStation or GeoPak format used by the COUNTY.
11. Return plans, profiles, and test hole data sheets to the County. If requested, conduct a review of the findings with the County.

Task SS2 Deliverables

The ENGINEER shall provide the following:

1. Utility Records/As-Builts obtained from utility owners.
2. Level C/D MicroStation File depicting utility line work for four alignments under consideration.
3. Level B MicroStation File depicting utility line work for final selected alignment.
4. PDF of SUE Level A Test Hole Data Sheets.
5. Utility Layout Sheets are not included in this scope.

SS3. AERIAL PHOTOGRAPHY AND LIDAR ACQUISITION

A. Feasibility Study

The ENGINEER will provide aerial photography and LiDAR acquisition for approximately 2,083 acres as outlined in Exhibit 1 below. For feasibility study, the ENGINEER will deliver preliminary mapping to include a classified to bare-earth LiDAR point cloud in LAS format.

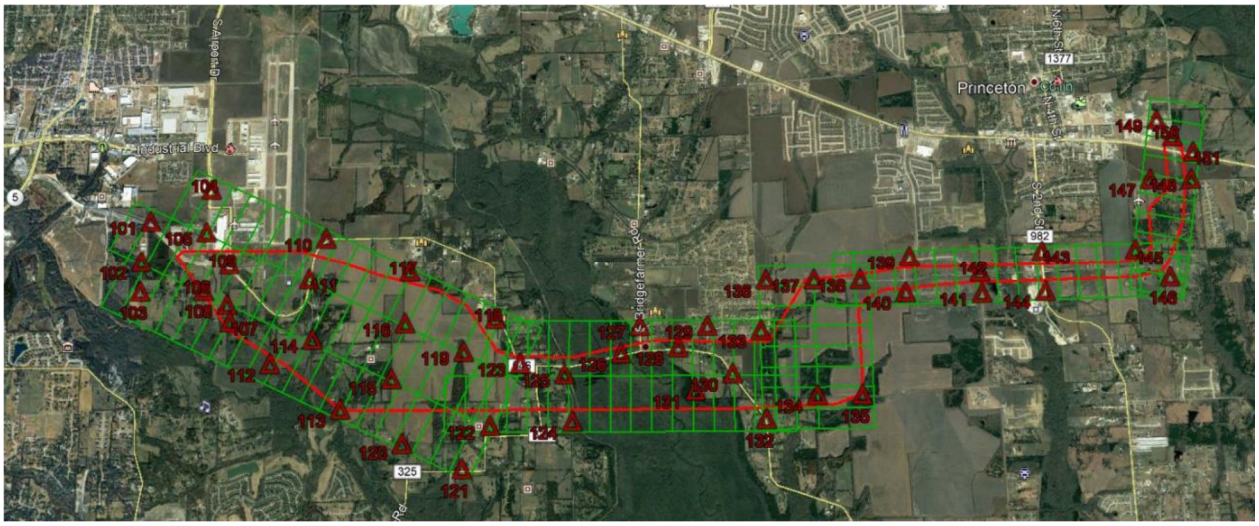

Exhibit 1: Aerial Mapping Boundary

Aerial photography will be captured using a large format metric digital camera at a flight height of 2,096-foot above ground level (AGL). This project will require approximately 9 flight lines with 150 digital frames. Aerial photography will be acquired during cloud/dust free conditions and will be 5cm or less ground sampling distance (GSD) - pixel resolution, suitable for 1" = 50' scale mapping.

The ENGINEER will acquire and process helicopter aerial LiDAR. LiDAR will be acquired at 1,000-foot AGL and will yield a point cloud with an average density of at least 20 points per square meter. Aerial LiDAR will have 0.15-foot vertical RMSE on hard surfaces. Aerial LiDAR data will be processed for a preliminary DEM that is classified to bare-earth and reduced to one point every 10 feet grid.

B. Design Schematic

Upon approval of the recommended alternative, the ENGINEER will perform digital mapping of the Project as shown in Exhibit 2 below. The corridor will have 1400-foot width (700 feet each side of centerline). Aerial mapping will use the previously acquired 5cm GSD imagery and helicopter LiDAR. Aerial photography and LiDAR will suitable for ASPRS Class I 1" = 50' scale mapping specifications and to generate 1-foot contours. Aerial mapping photogrammetry will hold to 0.167-foot vertical RMSE on hard surfaces in well-defined areas and 0.33-foot vertical RMSE on soft surfaces. Aerial LiDAR will hold a 0.15-foot vertical RMSE on hard surfaces and 0.33-foot on soft surfaces.

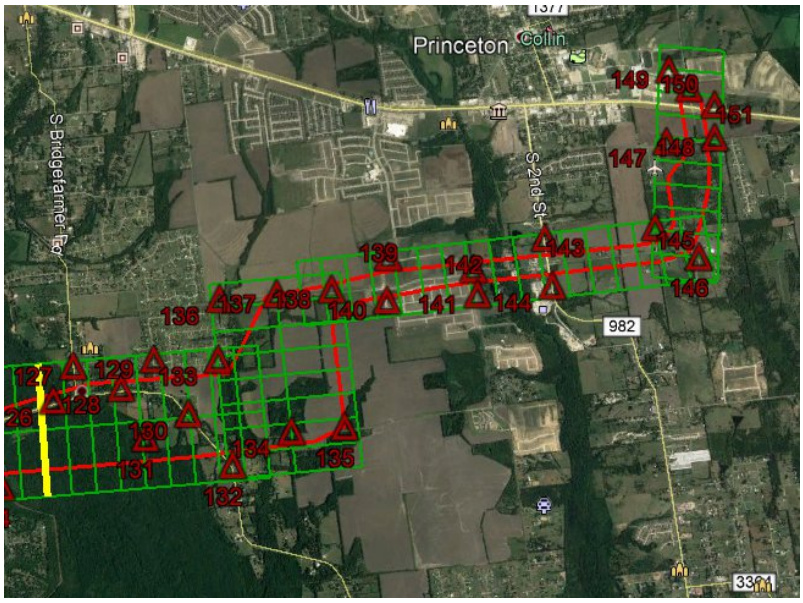

Exhibit 2: Aerial Mapping Boundary east of Yellow Line for 1" = 100' scale 2D Planimetrics only

Task SS3 Deliverables

1. Preliminary 3D LiDAR file in Power GeoPak V8i (SELECT series 4). Digital elevation model will be generated from LiDAR points and will not include breaklines.
2. 1" = 50' scale 2D planimetrics of the entire project area, in Power GeoPak V8i (SELECT series 4)
3. 3D DTM of entire project area, in Power GeoPak V8i (SELECT series 4)
4. 0.25-foot pixel resolution orthoimagery in MrSID format
5. TIN of entire project area, in GeoPak format

6. Processed and Classified LiDAR in .LAS format

SS4. GEOTECHNICAL INVESTIGATION

The geotechnical engineering services will consist of field and laboratory investigations, engineering analysis and development of a pavement geotechnical report prepared by a Licensed Professional Engineer.

A. Field Investigation

The field investigation will consist of ten (10) pavement borings, spaced evenly along the proposed roadway alignment and drilled to 15 feet below proposed grade elevations. Spacing and depths will follow TxDOT's Geotechnical Manual and may be adjusted by the Geotechnical Engineer's recommendations. A boring and TCP plan will be developed and submitted to the COUNTY for review and approval.

The ENGINEER will assist the COUNTY in obtaining the right-of-entry of the properties and assumes that the boring locations will be accessible to a conventional truck mounted drilling equipment during normal working hours.

B. Laboratory Investigation

Laboratory tests will be conducted to classify the soil to evaluate the volume change potential and strength of the soil and rock present at the site per TxDOT standards, Atterberg limits, sieve analysis and moisture contents will be performed on every stratum within each of the pavement borings. The volume change potential of the soils will also be evaluated by swell tests. The strength of the soil will be estimated using hand penetrometer tests and unconfined compressive strength tests. Unconfined compressive strength testing will also be performed on the rock cores. Sulfate testing will be performed at 0 to 2 feet and 2 to 4 feet per TxDOT standards. Lime/PI series tests will also be performed on selected clay samples.

C. Geotechnical Report

Results and field and laboratory work will be presented in a geotechnical engineering report. The report will consist of recommendations to guide design and construction of the new roadway and shall include the following:

- Generalized soils stratigraphy and groundwater levels
- Results of classification and TCP testing with Wincore format boring logs
- Site Condition and Geology
- Visually classify the soil samples by an engineer in the laboratory
- Pavement PVR Calculations
- Recommended Depth of Pavement Coverage
- Recommendations for Flexible and Rigid Pavement Sections
- Comments on the presence and effect of expansive soils on pavement construction will be provided. Up to two (2) alternative methods of reducing any anticipated shrink/swell movements associated with expansive clays will be included for pavement construction, if required.

Task SS4 Deliverables

1. Draft Pavement Geotechnical Report
2. Final Pavement Geotechnical Report

SS5. 3D VISUALIZATION SERVICES

The ENGINEER will develop and deliver a 3-D project model that shows a three-dimensional representation of the proposed designs superimposed on the surrounding existing conditions within the approximate Area of Modeling defined above. Model development services will be based on the tasks described below.

A. Modeling of Existing Conditions (Feasibility Study)

The 3-D project models will depict the existing conditions within the Area of Modeling by draping aerial photographs onto 3-D terrain surface models and simulating selected surface features. Modeling of existing conditions within the Areas of Modeling will include:

- Aerial photography draped onto the terrain surface models developed from the initial wide-area topographic data;
- Removal of "flattened" vehicles shown on aerial photography from the primary surface roads;
- Infill of areas underneath bridge structures that are obscured on aerial photography;
- Simplified three-dimensional representation of the existing corridor and associated bridge structures;
- Simplified and approximate representation of existing buildings located within the Area of Modeling, consisting of building footprints extruded to form shapes with generic facades and roofs;
- Approximation of existing trees and foliage within the Areas of Modeling based on visual inspection of aerial and street-level photography;
- Floating "billboard" labels identifying primary points of interest;
- Overlay of street name labels on primary roads.

Except as listed above, the 3-D project model will not include any other existing topographic features such as existing signs, signals, utility poles and cables, curbs, islands, lights, barriers, railings, or mailboxes.

B. Initial Modeling of Alignment Alternatives (Feasibility Study)

The 3-D project model will depict simplified representations of the proposed designs of CR 400 and CR 452 on up to four different alignments including:

- Simplified three-dimensional representation of the corridor alternatives including pavement textures, basic striping and markings, medians, curbs, gutters, and sidewalks;
- Simplified three-dimensional representation of bridge and causeway structures crossing the wetland area;

- Simplified traffic consisting of vehicles moving in both directions on each roadway at constant speeds and on non-conflicting paths, similar to the traffic that can be seen on the video found at https://www.mass.gov/north-washington-street-bridge-replacement

Except as listed above, the 3-D project model will not include driveway openings, roadside and way-finding signs, traffic signals, utility poles and cables, and other features not specifically described.

C. Modeling of Preferred Alternative (Design Schematic)

After detailed designs for the preferred alignment alternative have been developed the 3-D project model will be updated to depict a more detailed representation of the selected corridor, including:

- Updating the existing conditions to include more detailed survey data collected for the selected corridor;
- Removal of the representations of the rejected alternatives;
- Detailed three-dimensional representation of the roadway for the selected alignment including pavement textures, detailed striping and marking, medians, curbs and gutters, driveway openings, traffic signals, and other relevant roadway details;
- Detailed three-dimensional representation of the causeway and bridge structures used to cross the wetland area;
- Simplified traffic consisting of vehicles moving in both directions on each roadway at constant speeds and on non-conflicting paths, similar to the traffic that can be seen on the video found at https://www.mass.gov/north-washington-street-bridge-replacement;

D. Other / Miscellaneous (Feasibility Study and Design Schematic)

1. The 3-D project model will include the following features that can be used to facilitate review and presentation of the proposed improvements in both phases:

- Shortcuts to critical viewpoints;
- Up to ten camera animations along paths to be designated by the COUNTY, such as flyovers and drive-throughs.
- Predefined controls to easily show different view states such as Existing and Alternatives conditions.

2. The ENGINEER will also provide the following services related to usage of the 3-D project visualization model:

- Assistance in the development of a Virtual Tour hosted on the 123bim.com web collaboration systems using camera viewpoint locations selected by the COUNTY (for an example of a virtual tour see http://vtour.123bim.com/AAIY/);
- One hour of introductory training via web meeting to project team members on the use of the various 123BIM applications;
- One hour of assistance via web meeting for optimal use of the 3-D project model for specific public and stakeholder outreach events;

- Assistance in the development of “storyboard” videos with titles and captions developed from animated video clips exported from the 3-D project model, similar in quality to the example that may be seen at https://www.mass.gov/north-washington-street-bridge-replacement.

Note: The 123BIM.com subscription period will begin upon Commencement of Work.

Task SS5 Deliverables

1. Viewable and Downloadable 3D project model files via the 123BIM.com web collaboration service.