TASK ORDER NO. 5

This Task Order is issued pursuant to that Professional Services Agreement (Agreement) between the City of KYLE, Texas (Owner) and Pape-Dawson Engineers, Inc. (Professional) effective September 23, 2020 and constitutes authorization by Owner for Professional to proceed with the following described construction and engineering design services.

Construction and Engineering Design Services

A. PROJECT DESCRIPTION

The scope of the Agreement is to provide professional construction and engineering design services (Services) for the Owner based on the scope of services listed below in Item B. Professional services may include performing preliminary engineering and planning; generating plans, specifications and estimates; researching, analyzing, and providing technical recommendations; providing construction phase services; and providing general consulting services in the areas identified herein.

B. SCOPE OF SERVICES AND DELIVERABLES

Pursuant to the Agreement, this Task Order authorizes Professional to perform the Services shown in Attachment A.

C. BASIS OF COMPENSATION

The total compensation for the Services shall be based on the hourly rates as defined in Compensation Table provided on pages 3 and 4 of this document, and on the corresponding rates and hours in the Fee Estimate attached as Attachment B. Attachment B shall use the template provided by the Owner. Owner will make payments to Professional for performing the Services described on a monthly billing basis in accordance with monthly statements submitted by the Professional and approved by Owner. Final payment shall be due upon completion of the Services described.

D. TIME FOR COMPLETION

Professional will work expeditiously to complete the Services described herein by April 2024.

Pape-Dawson Engineers, Inc. shall begin work as soon as authorized in this Task Order No. 5.

APPROVED:

CITY OF KYLE, TEXAS

By _____

Title: _____

Attest _____

Date _____

ACCEPTED:

PAPE-DAWSON ENGINEERS, INC.

By Gilmer Gaston, P.E., PTOE

Title Sr. Vice President

Attest _____

Date March 13, 2023

COMPENSATION

Compensation for the services provided pursuant to the Professional Services Agreement between the City of Kyle and Pape-Dawson Engineers, Inc. executed the 23rd day of September 2020 will be paid on a lump sum basis and calculated based on the amounts reflected below.

Pape Dawson

Professional Staff	Hourly Bill Rate
GIS Technician	$120
Historian	$213
Archaeologist III	$99
Archaeologist I/II	$123
Archeologist – Principal Investigator	$161
Biologist - Senior	$195
Biologist III	$140
Sr. Env Scientist	$300
Survey Crew (3 person)	$255
Survey Crew (4 person)	$310
S.I.T./Survey Technician	$165
Project Surveyor	$250
Survey Manager	$320
Administrative Assistant	$130
E.I.T./Designer	$150
Project engineer	$200
Project Manager	$280
Vice President	$375

Raba Kistner

Professional Staff	Hourly Bill Rate
Admin	$70
Engr. Tech	$100
Sr. Engr. Tech	$110
EIT	$135
Engineer	$165
Senior Engineer	$185
Project Manager	$195
Principal	$220

Binkley & Barfield

Professional Staff	Hourly Bill Rate
Admin	$92
CAD Operator	$117
Sr. Engr. Tech	$142
Designer	$142
Sr. Designer	$157
Engineer in Training	$127
Project Engineer	$161
PM	$225
Sr. PM	$290
Principal	$318

ATTACHMENT A

TASK ORDER NO. 5 (SCHEMATIC PHASE)

SERVICES TO BE PROVIDED BY THE ENGINEER

Pape Dawson Engineers, Inc. (Engineer) will provide staff to support the City of KYLE (Owner) with general construction and engineering support services for the construction of FM 150 from Veterans Drive to Main Street. The Owner also includes the City's General Engineering Consultant (GEC), K Friese & Associates, Inc., which the Owner has secured to act on its behalf as an Owner's Representative. The Engineer is required to coordinate with the GEC for completion of this work. Specific tasks may include, but are not limited to, the following:

The work to be performed by the Engineer shall consist of providing preliminary engineering services for the development of a final design schematic. These services may include, but are not limited to, preparing a design schematic based on the preferred alternative from the Task Order No. 3 Preliminary Engineering Report, environmental documents/studies in support of the schematic work, public involvement support, permit procurement, data collection analysis, mitigation and remediation, monitoring, drainage, conceptual traffic control, traffic studies, traffic signal warrants, 3-D modeling, surveying and mapping, subsurface utility engineering (SUE), environmental clearance, utility coordination, storm drain design, bridge design, and cross sections.

The Engineer shall complete the services to be provided by the Engineer according to the milestone work schedule established in the task order. The Engineer shall submit a written progress report to the Owner monthly indicating the actual work accomplished during the month, scheduled work to be accomplished for the month, and the estimated work to be accomplished for the coming month. The progress report will use a bar chart diagram to indicate the percentage complete of each task shown on the previous report and the percentage complete of each task. The Engineer is required to meet with the designated Owner project manager and environmental coordinator bi-weekly for progress tracking purposes unless prior agreement is made with Owner not to hold a scheduled meeting. The Engineer shall submit minutes of the meeting, summarizing the events of the meeting within seven calendar days after each meeting.

The Engineer shall prepare a project work schedule. The work schedule must incorporate an allocation of time for stage reviews of the design schematic, survey, ROW Mapping, and the environmental documents by Owner personnel. The Engineer shall present the work schedule to the Owner for review and acceptance and provide assistance in interpreting the proposed work schedule.

GENERAL REQUIREMENTS

1.1. Design Criteria.

Design Criteria. The Engineer shall prepare all work in accordance with the latest version of applicable Owner's procedures, specifications, manuals, guidelines, standard drawings, and standard specifications or previously approved special provisions and special specifications, which include:

- Kyle Connected 2040 Transportation Master Plan (2015)
- Kyle Transportation Master Plan Update (2021)
- The Vybe Kyle: Trail-Oriented Development (2021)

- Kyle Drainage Master Plan (2018)
- City of Kyle standard detail sheets and general construction notes
- Texas Department of Transportation (TxDOT) PS&E Preparation Manual
- TxDOT Roadway Design Manual
- TxDOT Hydraulic Design Manual
- Texas Manual on Uniform Traffic Control Devices (TMUTCD)
- Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges (latest Edition)
- Other Owner approved manuals
- TxDOT ROW Acquisition Manual
- TxDOT Utilities Manual
- Texas Transportation Administrative Code – Utility Accommodation
- City of Austin Utility Criteria Manual
- City of Kyle utility standards
- Texas Commission on Environmental Quality (TCEQ)

When design criteria are not identified in Owner's manuals or TxDOT criteria, or if conflicting guidance is found, the Engineer shall notify the Owner and refer to City of Austin policies and the American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Street (latest Edition).

The Engineer shall use applicable standards and guidance to tailor the Design Summary Report (DSR) template (provided by the City) to their project. The Engineer shall obtain approval from the City on all information contained in the DSR prior to schematic development.

The Engineer shall identify, prepare exhibits and complete all necessary forms for each Design Exception and Waiver required within project limits prior to the 50% project completion submittal. The Engineer shall submit each exception and waiver to the Owner for coordination and processing of approvals. If subsequent changes require additional exceptions, the Engineer shall notify the Owner in writing as soon as possible after identification of each condition that may warrant a design exception or waiver.

The Engineer shall prepare a design time schedule and an estimated construction contract time schedule, using the latest version of MS Project, Primavera, or any Owner approved programs. The schedules shall indicate tasks, subtasks, critical dates, milestones, deliverables and review requirements in a format that depicts the interdependence of the various items. The Engineer shall provide assistance to Owner's personnel in interpreting the schedules. The Engineer shall schedule milestone submittals at 50%, 90% and final project completion phases unless directed by Owner otherwise. The Engineer shall advise the Owner in writing if the Engineer is not able to meet the scheduled milestone review date.

Once the schematic has been completed and accepted by the Owner, the Engineer shall deliver all electronic files to the Owner within 30 calendar days of Owner's written request.

Milestone submittals shall include, but shall not be limited to, the following to be considered complete:

1. 50%

- Design Summary Report (DSR)
- Draft Schematic of preferred alternative using border file provided by the Owner for the Kyle 2022 Road Bond Program
- Cross Sections on 11X17 sheets
- Draft Drainage Report
- Draft Traffic Study (or Studies) including traffic signal studies/warrants
- Draft Traffic Control Layout
- Draft Geotechnical Report
- Draft Environmental Documents
- Construction Cost Estimate
- ROW Cost Estimate
- Utility Conflict Matrix
- Utility Relocation Cost Estimate including compensable and non-compensable subtotals

2. 90%
    - All 50% items with review comments addressed
    - Comment resolution matrix
    - Draft ROW Acquisition Documents
    - Final versions of 50% items
3. Final
    - All 90% items with review comments addressed
    - Comment resolution matrix
    - Final signed and sealed versions of 90% items

Submittals shall be provided electronically to the Owner using the Procore platform.

1.2. Right-of-Entry. The Engineer shall notify the Owner and secure permission to enter private property to perform any surveying, environmental, engineering, or geotechnical activities needed off Owner right-of-way. In pursuance of the Owner's policy with the general public, the Engineer shall not commit acts which would result in damages to private property, and the Engineer shall make every effort to comply with the wishes and address the concerns of affected private property owners. The Engineer shall contact each property owner prior to any entry onto the owner's property and shall request concurrence from the Owner prior to each entry.

1.3. Progress Reporting and Invoicing. The Engineer shall invoice according to Function Code breakdowns shown in Exhibit "A" of the Professional Services Agreement and Attachment "B" - Fee Schedule, of the Task Order. The Engineer shall submit each invoice in a format acceptable to the Owner.

The Engineer shall complete the services according to the milestone work schedule established in the task order. With each invoice the Engineer shall submit a monthly written progress report to the Owner's Project Manager regardless of whether the Engineer is invoicing for that month. Requirements for progress reports are included in Sections 145.2.b. and 145.2.c. of this scope of services.

The Engineer is required to meet with the designated Owner project manager or environmental

coordinator bi-weekly for progress tracking purposes unless prior written agreement is made with Owner not to hold a meeting in any given month. The Engineer shall submit minutes of the meeting summarizing the events of the meeting within five (5) business days after each meeting.

The Engineer shall prepare a project work schedule, using the latest version of Microsoft Project or Primavera software or another scheduling program approved by the Owner in writing. Requirements for schedules are included in Section 145.2.b. of this scope of services.

Condition precedents to final payment by the Owner are the Owner's receipt of all electronic files and confirmation by the Owner's Project Manager that (1) the electronic files can be opened and are usable by the Owner utilizing the Owner-owned version of the intended software, and (2) all of the Owner's review comments have been addressed.

The Engineer shall prepare a letter of transmittal to accompany each document submittal to the Owner. At a minimum, the letter of transmittal must include the project name, project limits, Owner's contract number, and Owner's task order number.

1.4. Traffic Control. The Engineer shall provide all planning, labor, and equipment to develop and to execute each Traffic Control Plan (TCP) needed by the Engineer to perform services under each task order. The Engineer shall comply with the requirements of the most recent edition of the TMUTCD. The Engineer shall submit a copy of each TCP to the Owner for approval prior commencing any work on any Owner roadway. The Engineer shall provide all signs, flags, and safety equipment needed to execute the approved TCP. The Engineer shall notify the Owner in writing five (5) days (in advance of executing each TCP requiring a lane closure and shall have received written concurrence from the Owner prior to beginning the lane closure. The Engineer's field crew shall always possess a copy of the approved TCP on the job site and shall make the TCP available to the Owner for inspection upon request. The Engineer shall assign charges for any required traffic control to the applicable function code. The Owner requires Public Notice of lane and Road closure 7 days in advance of closure through use of message boards, thus notice to Owner would need to be about 10 days prior of closure.

1.5. State-Controlled Waters. The placement of a new structure or modification of an existing structure(s) within State-Controlled waters will require confirmation that said structure(s) lie within the General Land Office (GLO) state owned land and whether the crossing is tidally influenced or not. Consequently, the Engineer shall request, as early in the design process as possible, that the State determine whether the proposed improvements are found within the tidal GLO, is a submerged GLO property or a non-tidal GLO property. The Owner may request assistance from the Engineer to prepare an exhibit demonstrating the location of the proposed improvements on the GLO State Owned Map for the project location.

1.6. Coordination. The Engineer shall coordinate issues and communications with Owner's internal departments through the Owner's Project Manager. The Owner will communicate the resolution of issues and provide the Engineer direction through the Owner's Project Manager.

Where applicable, the Engineer shall notify the Owner and coordinate with adjacent engineers and surveyors on all controls at project interfaces. The Engineer shall document the coordination effort, and each engineer must provide written concurrence regarding the agreed project controls and interfaces. In the event the Engineer and the other adjacent engineers are unable to agree, the Engineer shall meet jointly with the Owner and each adjacent engineer to resolve disagreements. If the engineers are unable to resolve an issue with the Owner as mediator, the Owner may decide the issue and the decision will be final.

The Engineer shall prepare each exhibit necessary for approval by each railroad, utility, and other governmental or regulatory agency in compliance with the applicable format and guidelines required by each entity and as approved by the Owner. The Engineer shall notify the Owner in writing prior to beginning any work on any outside agency's exhibit.

1.7. Level of Effort. For each task order, the Engineer shall base the level of effort at each phase on the prior work developed in earlier phases without unnecessary repetition or re-study. As directed by the Owner, the Engineer shall provide written justification regarding whether or not additional or repeated level of effort of earlier completed work is warranted, or if additional detail will be better addressed at a later stage in the project development.

1.8. Quality Assurance (QA) and Quality Control (QC). The Engineer shall provide peer review at all levels. For each deliverable, the Engineer shall have some evidence of their internal review and mark-up of that deliverable as preparation for submittal. A milestone submittal is not considered complete unless the required milestone documents and associated internal red-line mark-ups are submitted. The Owner's Project Manager may require the Engineer to submit the Engineer's internal mark-up (red-lines) or comments developed as part the Engineer's quality control step. When internal mark-ups are requested by the Owner in advance, the Owner, at its sole discretion, may reject the actual deliverable should the Engineer fail to provide the evidence of quality control. The Engineer shall clearly label each document submitted for quality assurance as an internal mark-up document.

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

1.11. Organization of Design Project Folder and Files (Electronic Project Files). The Engineer shall organize the electronic project files in accordance with the Owner's File Management System (FMS) format. The Engineer shall maintain the project files in the Owner's file structure.

1.12. Personal Protective Equipment (PPE). The Engineer shall, and shall require its subcontractors to, (1) provide personal protective equipment (PPE) to their personnel, (2) provide business vehicles for their personnel, and (3) require their personnel to use PPE and drive only business vehicles while performing work on or near roadways. The PPE must meet all (1) current standards set by the Occupational Safety and Health Administration (OSHA) and (2) TxDOT requirements (e.g., safety glasses, Type 3 (TY 3) pants for night work). Each business vehicle must be clearly marked with the Engineer's business name, or the name of the appropriate subcontractor, such that the name can be identified from a distance.

1.13. Data Classification. Unless otherwise clearly labeled or otherwise specifically excepted through a provision of this contract or its attachments, all data provided to or generated by the Engineer under this contract is considered public data for the purposes of applying the Owner's data security standards. The Engineer shall manage all data and work products according to the terms of the contract, including specifically Attachment I, Information Resources and Security Requirements.

TASK DESCRIPTIONS AND FUNCTION CODES

The Engineer shall categorize each task performed to correspond with the Function Codes (FC) and Task Descriptions.

FUNCTION CODE 102(110) – FEASIBILITY STUDIES

ROUTE AND DESIGN STUDIES

The Engineer shall collect, review, and evaluate data described below. The Engineer shall notify the Owner in writing whenever the Engineer finds disagreement with the information or documents provided.

The Engineer shall finalize an alignment and proposed roadway schematic layout that includes projected traffic volumes, when available, and existing and proposed typical sections. The Engineer shall furnish Microsoft Office and MicroStation, GEOPAK, and OpenRoads computer generated media containing the roadway schematic layout to the Owner. All supporting attachments and exhibits must accompany the schematic layout. All MicroStation, GEOPAK, and OpenRoads computer generated files containing the roadway design schematic must be fully compatible with the software used by the Owner without further modification or conversion. The Engineer shall be required to convert files to AutoCAD if requested by the Owner.

The Engineer shall produce, obtain, review, and evaluate available existing and twenty-year projected traffic data for use in the preparation of the schematic design layout. The data must be utilized in accordance with the requirements for schematic development and consistent with the policies of the Owner.

The Engineer shall prepare preliminary drawings to identify any potential impacts and constraints within the project corridor, including impacts to the nature, cultural, and human environment. The potential impacts and constraints identified must include all existing and proposed utilities (both public and private), structures, burial grounds, neighborhood communities, historical landmarks, and undeveloped areas. Any potential utility conflicts and structural impediments must be identified as such. The Engineer shall propose alternative alignments that avoid or minimize displacements and damages and prepare any additional attachments or exhibits required to illustrate a preferred alternative alignment. The Engineer shall assist the Owner with agency meetings during the development of the schematic design as requested by the Owner. If requested by the Owner, the Engineer shall assist the Owner with stakeholder meetings, public meetings, and a public hearing.

An itemization of the schematic design and engineering work activity to be performed under this contract is detailed below. The Engineer shall prepare all designs in accordance with the latest version of:

A. Kyle Connected 2040 Transportation Master Plan (2015)
B. Kyle Transportation Master Plan Update (2021)
C. The Vybe Kyle: Trail-Oriented Development (2021)
D. Kyle Drainage Master Plan (2018)
E. City of Kyle standard detail sheets and general construction notes
F. Texas Department of Transportation (TxDOT) PS&E Preparation Manual
G. TxDOT Roadway Design Manual

H. TxDOT Hydraulic Design Manual
I. Texas Manual on Uniform Traffic Control Devices (TMUTCD)
J. Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges (latest Edition)
K. Other Owner approved manuals and guides.

When design criteria are not identified in Owner manuals or TxDOT criteria, or when conflicts are found, the Engineer shall notify the Owner and refer to City of Austin policies and the American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Street, (latest Edition).

The design schematic horizontal layout must adhere to a design scale of 1 inch = 100 foot (or 1 inch = 200 foot, when directed by the Owner.) The Engineer shall develop the schematic layout, exhibits, and attachments in English units. All Microsoft Office, MicroStation, Keyhole Markup Language (KML), Keyhole Markup Language Zipped (KMZ), and Bentley OpenRoads computer graphic files furnished to the Owner must be uploaded to the Owner's file management system in their native format, which must be fully compatible with the programs currently used by the Owner. Schematics must follow TxDOT and Federal Highway Administration (FHWA) standards. The schematic must follow TxDOT's computer-aided design and drafting (CADD) standards. The Engineer shall submit the schematic as an original document, accompanied with an original MicroStation formatted graphics file. Final copies of the schematic design must be signed and sealed by a professional engineer licensed in the State of Texas.

110.1. Schematic Design Work Outline:

A. Develop Base Maps

The Engineer shall finalize the schematic for the preferred alternative from Task Order No. 1. The Engineer shall develop the base maps to be used for the analysis and proposed schematic layout from existing construction and right of way (ROW) plans as available. The Engineer shall re-establish the existing centerline horizontal alignments for all roadways, identify existing ROW and easements, property owners, and the approximate location of major utilities based on a Subsurface Utility Engineering (SUE) in the preparation of base maps.

B. Planimetrics and Aerial Mapping

The Engineer shall obtain planimetrics, digital terrain modeling (DTM), and aerial photographs from the Owner, if available.

C. Analyze Existing Conditions

Using collected data and base maps, the Engineer shall develop an overall analysis of the existing conditions to develop the schematic design. The written analysis must include the following:

1. ROW and easement determination
2. Horizontal alignment
3. Vertical alignment
4. Pavement cross slopes and pavement type

5. Geotechnical testing
6. Sight distance
7. Large guide signs and roadside signing
8. Level of service
9. Safety (i.e., crash data)
10. Drainage

D. Schematic

The Engineer shall identify, analyze, and minimize potential adverse operational impacts, crash impacts, ROW impacts, environmental impacts, major utility conflicts, structural impediments, or exceptions to the Owner, State and FHWA design criteria. Schematics will be developed to the 50%, 90%, and 100% level of completion.

E. Deliverable Schematic

The Engineer shall evaluate and document the following in the analysis to optimize the design:

1. Efficient use of the allocated ROW
2. Control of access (COA) and driveway locations
3. Roadway and intersection geometry
4. Cross sections
5. Bicycle and pedestrian design
6. Drainage and hydraulic design
7. Water quality design
8. Stopping sight distance
9. Level of service
10. Safety
11. Traffic and signal operations
12. Construction, ROW, easement, and utility costs
13. Construction sequencing
14. Traffic control during construction
15. Roadside safety appurtenances
16. Large guide signage
17. Environmental mitigation (e.g., noise walls, storm water best management practices (BMPs))
18. Bridge layouts and clearance
19. Railroads (if applicable)
20. Accommodation of ultimate corridor configuration.
21. Accommodation of future cross street expansion as described in local thoroughfare plan (if applicable)
22. Avoidance of utility lines (if feasible)
23. Impact of construction delays from utility relocations

F. Project Management and Coordination

1. The Engineer shall direct and coordinate the various elements and activities associated with developing the design schematic.
2. The Engineer shall prepare the detailed graphic project work schedule indicating tasks, critical dates, milestones, deliverables, and Owner review requirements. The project work schedule must depict the order of the various tasks, milestones, and deliverables. The Engineer shall review the schedule monthly and provide updates regarding its progress on the schedule to the Owner.
3. The Engineer shall submit written monthly progress reports to the Owner.
4. The Engineer shall provide ongoing quality assurance and quality control to ensure completeness of product and compliance with the Owner procedures.
5. The Engineer shall conduct site visits in both the AM and PM peak hour and develop a technical report that includes photographs outlining the findings and observations.

G. Data Collection and Field Reconnaissance

The Engineer shall collect, review, and evaluate data described below. The Engineer shall notify the Owner in writing whenever the Engineer finds disagreement with the information or documents:

1. Data, if available, from the Owner, including "as-built plans", existing schematics, right-of-way maps, Subsurface Utility Engineering (SUE) mapping, existing cross sections, existing planimetric mapping, environmental documents, existing channel and drainage easement data, existing traffic counts, accident data, Bridge Inspection records, identified endangered species, identified hazardous material sites, current unit bid price information, current special provisions, special specifications, and standard drawings.
2. Documents for existing and proposed development along proposed route from local municipalities and local ordinances related to project development.
3. Utility plans and documents from appropriate municipalities and agencies.
4. Flood plain information and studies from the Federal Emergency Management Agency (FEMA), the United States Army Corps of Engineers (USACE), local municipalities, and other governmental agencies.
5. Conduct field reconnaissance and collect data including a photographic record of notable existing features.

The Engineer shall conduct field reconnaissance and collect data as necessary to complete the schematic design. Data must include the following information. Items 1 through 5 must be obtained from the Owner, if available. Items 6 through 13 must be obtained from other agencies as required.

1. Local major thoroughfare plan
2. Plat research for adjacent properties (if available)
3. Available corridor major investment studies
4. Design data from record drawings of existing and proposed facilities
5. Previously prepared drainage studies
6. Public and private utility information (It is necessary for the Engineer's Surveyor to locate public and private utilities, even if the City has permits)
7. Existing and future design year traffic data

8. Historical crash data
9. Roadway inventory information, including the number of lanes, speed limits, pavement widths and rating, bridge widths and ratings, and ROW widths
10. Aerial photos, planimetric mapping, and DTM
11. Environmental data
12. Adopted land use maps and plans (if available)
13. Federal Emergency Management Agency (FEMA) flood boundary maps and flood insurance studies and models

H. Roadway Design Criteria

The Engineer shall develop the roadway design criteria based on the City of Kyle Transportation Master Plan Update (2021), TxDOT Roadway Design Manual and AASHTO Policy on Geometric Design of Highways and Streets guidelines. The design criteria must include the following roadway design elements: design speed, lane and shoulder widths, pavement structure and slopes, horizontal curvatures, horizontal and vertical clearances, range of vertical profile grades, and side slopes. If there is a discrepancy between the two sources, the Roadway Design Manual will govern unless otherwise directed by the Owner.

The Engineer shall prepare and submit preliminary design criteria to the Owner for review and approval and shall attend an initial kick-off meeting to establish and agree on fundamental aspects, basic features, concepts, and design criteria. This meeting will be coordinated with any adjacent roadway projects to ensure continuity with the design of the adjacent roadway projects.

110.2. Schematic Design – General Tasks

A. ROW Property Base Map

The Engineer shall obtain information on existing ROW, easements, and property information from as-built plans, ROW maps, and tax records. The Engineer shall prepare a base map depicting the information.

B. Typical Sections

The Engineer shall develop both existing and proposed typical sections that depict the number and type of lanes, shoulders, median width, curb offsets, cross slope, border width, clear zone widths, and ROW limits.

C. Environmental Constraints

The Engineer shall evaluate and document impacts to environmentally sensitive sites (as identified by the Engineer and verified by the Owner) during the schematic design process. Environmentally sensitive sites include natural, cultural, and the human environment. Examples are historic and archeological resources, burial grounds, neighborhood communities and residential areas, farmland, floodplains, wetlands, endangered species, rare habitats, wildlife corridors, wildlife crossings, parks and nature preserves, geologic features, undeveloped areas, and significant trees.

D. Drainage

The City of Kyle adopted the City of Austin DCM and ECM per the City of Kyle Code of Ordinances 41-134(a)(7). Distinctions from these codes are provided in the City of Kyle Drainage Design Criteria available on the City of Kyle website.

Engineer shall evaluate and refine design to make the proposed project compatible with anticipated drainage projects identified in the City of Kyle Drainage Master Plan.

The Engineer shall use data from as-built plans and FEMA maps to locate drainage outfalls and to determine existing storm sewer and culvert sizes, design flows, and water surface elevations for use in the design of roadway geometry.

All hydrologic studies shall be based on Atlas 14 rainfall. City of Kyle Drainage Criteria Table 5 of Attachment 1– COK for Intensity Duration Frequency (IDF) curve coefficients shall be used to replace City of Austin DCM Table 2-2A (zone 1), IDF curve coefficients.
The Engineer shall conduct a preliminary drainage study to determine and evaluate the adequacy of the ROW needed to accommodate the proposed roadway and drainage system. The drainage study must (1) identify the impacts to abutting properties and the 100-year floodplain due to proposed highway improvements; (2) identify the water surface elevations for the 2, 10, 25, and 100-year storm events; (3) identify and locate outfalls; (4) provide drainage outfall descriptions; (5) provide overall drainage area map, sub-drainage area map, and storm water detention facilities; and provide a drainage study report identifying the results of the study. The drainage report, which must be signed and sealed by a professional engineer licensed in Texas, must include applicable hydrologic and hydraulic models (Geopak Drainage, HEC-RAS, HEC-HMS, XP-SWMM). The Engineer shall prepare a final drainage study in accordance with one or more of the following: City of Kyle Drainage Criteria, TxDOT Hydraulic Design Manual, local TxDOT district criteria, and any other specific guidance provided by the Owner. If requested by the Owner, the Engineer shall evaluate the adequacy of the existing drainage structures; otherwise, the Engineer shall not evaluate the adequacy of the existing drainage structures.

Water Quality: shall be provided in accordance with City of Kyle Code 41-134(a)(7). This water quality shall be designed in accordance with the latest version of the Texas Commission on Environmental Quality – Edwards Aquifer Technical Guidance Manual (TCEQ RG-348).

The Engineer shall design water quality Best Management Practices (BMP) in accordance with the latest editions of RG-348 – Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices (July 2005); RG-348 Addendum Sheet (July 2012), or latest edition. As part of this work, the Engineer shall perform the following:

1. BMP analysis: The Engineer shall locate all BMPs previously permitted under the TCEQ Edwards Aquifer rules that might be impacted by the project. The Engineer shall determine the amount of total suspended solids (TSS) being treated under these permitted BMPs.

2. TSS load calculations: The Engineer shall develop TSS load calculations to determine the TSS amount required to be treated under the Edwards Aquifer rules. This calculation is based on the increase in the amount of impervious cover within the project area. The Engineer will determine 80% of the increase in TSS load resulting from the development on the project.
3. TSS removal determination: The Engineer shall utilize the TCEQ calculation spreadsheet to determine the total amount of TSS removal required for the project.
4. Design coordination and water quality report: After the 30% submittal, the Engineer shall meet with the Owner to discuss the TSS removal required for the project and delineate the design approach for the water quality BMPs. As geometry allows, the Engineer shall first maximize treatment via features in the roadway section (vegetative filter strips and grassy swales). For all other permanent BMP treatment options, the Engineer shall coordinate with the Owner for preferred treatment options and determine any necessary drainage easements required for the water quality BMP. The Engineer shall identify and document BMPs in the schematic water quality report. The Engineer shall submit a draft schematic water quality report with the 60% submittal, and a final schematic water quality report with the 100% submittal. The Engineer shall provide cost estimates for the BMPs and necessary drainage easements.

E. ROW Requirements

The Engineer shall determine the ROW requirements based on the proposed alignment, typical sections, design cross sections, access control, terrain, construction requirements, drainage, clear zone, maintenance, intelligent transportation system (ITS), and environmental constraints and mitigation requirements.

F. Design Exceptions

Design exceptions are not anticipated and shall not be included. If the Engineer determines a design exception is required this service can be provided through a supplemental work authorization.

G. Traffic Data and Projections – **Excluded**
H. Traffic and Operational Analysis
I. The Engineer developed traffic projections and a traffic study as part of the PER phase of the project. The Engineer will coordinate this traffic study with TxDOT during the schematic phase. After meeting with TxDOT, if they require formal traffic projections developed per the TxDOT Traffic Projection SOP, additional traffic analysis, or a safety study an additional service request or supplement task order/work authorization will be prepared and submitted for that effort. Safety Analysis - **Excluded**
J. Traffic Warrant Studies.
   The Engineer shall prepare a traffic signal warrant study to support their recommendation for the continuous activation of an existing traffic signal or a proposed traffic signal based on projected volumes. Each warrant study must include addressing pedestrian signals along with obtaining both traffic and pedestrian counts. Signal warrant studies will be prepared for FM 150/Veterans Drive and FM 150/Burleson Street intersections only.

The Engineer shall implement each proposed traffic signal improvement within existing Owner ROW unless otherwise approved by the Owner. The Engineer shall refer to latest version of the TMUTCD, Traffic Signal Manual, and the Owner and TxDOT's roadway and traffic standards for work performed for either temporary or permanent traffic signals. The Engineer shall develop and include a timing plan for each signal improvement.

K. Bicycle and Pedestrian Accommodations

The Engineer shall comply with City of Kyle design criteria and planned improvements for bicycle and pedestrian accommodations, including the 2015 and 2021 Transportation Master Plans and The Vybe Kyle: Trail Oriented Development, and the United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations. The inclusion of bicycle and pedestrian facilities must be evaluated when the project is scoped.

110.4. Geometric Design Schematics

The Engineer shall develop geometric design schematics based on the conceptual schematics developed in Task Order No. 1, after the basic layout, lane arrangement, and anticipated ROW and easement impacts depicted on the conceptual schematics are approved. The Engineer shall use Bentley OpenRoads tools in performing this task. The geometric design schematics must include both a plan view and profile view.

A. The geometric schematic plan view must contain the following design elements:

1. Bentley OpenRoads calculated roadway alignments for mainlanes, general purpose lanes, ramps, direct connectors, bridges, HOV lanes, managed lanes, express lanes, collector distributor roads, frontage roads and cross streets at major intersections and grade separations
2. Horizontal curve data shown in tabular format
3. Pavement edges, curb lines, sidewalks for all roadway improvements
4. Typical sections of existing and proposed roadways
5. Proposed retaining walls and sound walls
6. Proposed cross-drainage structures with outfall flow arrows and significant drainage features or waterways identified
7. Existing utilities and proposed utilities
8. Existing property lines and respective property ownership information
9. Existing ROW and easements
10. Proposed ROW and easements adequate for preparation of ROW maps
11. Existing and projected traffic volumes
12. Lane lines, shoulder lines, small signs, and direction of traffic flow arrows indicating the number of lanes on all roadways

B. The geometric schematic profile view must contain the following design elements:

1. Calculated profile grade and vertical curve data including "K" values for all curves and sight distance values for crest vertical curves on the mainlanes
2. Existing ground line profiles along the mainlanes

3. Anticipated cross-drainage structures with approximate inlet and outfall elevations
4. Proposed ditch grading (special grading), if it does not follow the typical section.
5. Approximate locations of existing and proposed major utility crossings
6. The calculated profile grade for frontage roads, connectors, ramps and cross streets will be shown on separate Supplemental Profile rolls

110.5. Cross-Sections

The Engineer shall use a Bentley 3D OpenRoads model to generate preliminary cross-sections at 50 feet intervals (unless otherwise directed by the Owner) and at culvert locations in conjunction with the geometric schematic. The Engineer shall determine earthwork volumes for use in the cost estimate. The Engineer shall prepare 11inch x17inch or roll plots of the cross-sections.

110.6. Retaining Walls

The Engineer shall determine if any additional walls are required and verify the need for and length of the retaining wall as shown on the ultimate schematic. Preliminary retaining wall concepts shall not be shown on typical sections or cross sections.

110.7. Renderings and Traffic Simulation

The Engineer shall not develop 3D exhibits or visualizations. If required, this can be added through a supplemental work authorization.

110.8. Preliminary Construction Sequence

The Engineer shall evaluate and document 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 prepare preliminary construction sequence roll plots in conjunction with the geometric design schematic depicting the phasing and traffic detours anticipated to safely convey traffic. The roll plots must demonstrate that adequate horizontal and vertical alignments are maintained, sufficient lane widths and shoulder widths or barrier offsets are feasible, and construction zones are adequate for constructability of all proposed features. Proposed construction detours must ensure that adequate superelevation is provided. The layouts must indicate how existing pedestrian and bicycle facilities are accommodated for each phase.

110.12. Agency Coordination and Public Involvement

A. The Engineer shall assist the Owner in conducting up to two (2) meetings with property owners, stakeholders, and various agencies to discuss and review the schematic design. The Engineer shall document and respond to issues related to the schematic design.
B. The Engineer shall prepare up to two (2) exhibits and meeting materials to support stakeholder coordination and public outreach efforts.

110.13. Schematic Design Project Deliverables

In conjunction with the performance of the services included under Function Code 110 of this exhibit, the Engineer shall provide the following draft and final documents and associated electronic files as applicable:

A. Draft and final copies of the agreed upon design criteria
B. Draft and final copies of the traffic and operational analysis report and safety analysis report
C. Draft copies of the preliminary drainage study
D. Draft and final copies of the geometric schematic layouts on 11-inch x 17- inch cut sheets or rolls, as requested by the Owner
E. Draft and final copies of the conceptual design schematics roll plots
F. Draft and final copies of the geometric schematic layouts (1 inch = 100 feet)
G. Draft and final copies of the design schematic profile rolls
H. Draft and final copies of the design schematic cross-sections on 11-inch x 17-inch cut sheets or roll plot format, as requested by the Owner
I. Copy of the preliminary cross-sections in a roll plot format or 11-inch x 17-inch format, as requested by the Owner
J. Electronic 3D model copy of the preliminary cross-sections created using OpenRoads software
K. Preliminary drainage study
L. Electronic submittal of the hydrologic and hydraulic model digital files from the drainage study
M. Copies of the preliminary construction sequence layouts in a roll plot or 11-inch x 17-inch format, as requested by the Owner
N. Copies of the preliminary construction sequence typical sections in 11-inch x 17-inch format
O. Electronic files shall be uploaded to the Owner's Procore file management system
P. Traffic data schematics
Q. Traffic projections methodology memo
R. Average daily corridor traffic projections report
S. Risk management plan
T. Draft project management plan
U. Final project management plan
V. Line schematics with traffic data shown
W. Documentation of public involvement activities
X. Utility plan – electronic file in latest version of MicroStation fully compatible with OpenRoads civil design system
Y. Design exception and design waiver documents
Z. Draft hydraulic report for review and comment EE. Culvert hydraulic data sheets and preliminary culvert layouts
AA. Electronic copy of the entire drainage report in PDF format, and computer files of hydrologic and hydraulic modeling with appropriate labeling of location, and submittal date
BB. Geotechnical report
CC. Cost estimates for each milestone submittal
DD. KMZ or KML file of conceptual design schematic created from applicable DGN files for reviewing in Google Earth
EE. Final schematic 3D model created using OpenRoads software
FF. Draft and final copies of traffic analysis report

110.14. Preliminary Cost Estimates. The Engineer shall develop a preliminary cost estimate using the Average Low Bid Unit Price. The Engineer shall estimate the total project cost including preliminary engineering, final engineering, right-of-way (ROW) acquisition,

environmental compliance and mitigation, construction, utility relocation, and construction engineering inspection (CEI).

110.16. Geotechnical Borings and Investigations. The Engineer shall determine the location of proposed soil borings for bridge design, embankment settlement analysis, retaining walls, slope stability and along storm drain alignment in accordance with the latest edition of TxDOT's Geotechnical Manual. The Owner will review and provide comments for a boring layout submitted by the Engineer showing the general location and depths of the proposed borings. Once the Engineer receives the Owner review comments they shall perform soil borings (field work), soil testing and prepare the boring logs in accordance with the latest edition of the State's Geotechnical Manual and State District's procedures and design guidelines.

A. The Engineer shall perform all geotechnical work in accordance with the latest version of TxDOT's Geotechnical Manual. All testing shall be performed in accordance with the latest version of TxDOT's Manual of Test Procedures. American Society for Testing Materials (ASTM) test procedures can be used only in the absence of Owner and TxDOT procedures. All soil classification shall be done in accordance with the Unified Soil Classification System.
B. If applicable, the Engineer shall perform any retaining wall analyses to include the settlement analysis. This analysis must include the computation of the factor of safety for bearing capacity, global stability, overturning and sliding. In addition, the Engineer shall include allowable bearing pressure, passive earth pressure, friction factor, settlement analysis (consolidation report) and lateral earth pressure for the retaining walls.
C. If applicable, the Engineer shall perform soil borings, rock coring, coring for pavement removal items, piezometric readings, testing and analysis to include slope stability analysis, settlement analysis, and foundation design recommendations for retaining walls, overhead sign structures, along proposed storm sewer alignments, bridges, embankments, and any temporary soil retaining systems. Engineers shall call 811 and the City of Kyle Public Works Department (512-262-3024) for utility information prior to digging. Traffic control is required for any work that is performed for geotechnical borings and investigations within the right-of-way limits.
D. The Engineer shall provide a signed, sealed and dated geotechnical report which contains, but is not limited to, soil boring locations, boring logs, laboratory test results, generalized subsurface conditions, ground water conditions, piezometer data, analyses and recommendations for settlement and slope stability of the earthen embankments, skin friction tables and design capacity curves including skin friction and point bearing. The skin friction tables, and design capacity curves must be present for piling and drilled shaft foundation.
E. If applicable, the Engineer shall perform scour analysis to include Grain Size distribution curves with D50 value.
F. The Engineer shall sign, seal and date soil boring sheets to be used in the PS&E package. The preparation of soil boring sheets must be in accordance with Owner and TxDOT standards.
G. Foundation Studies: The Engineer shall coordinate with the Owner to determine the location of soil borings to be drilled along the retaining wall alignments. The soil borings shall extend a minimum of 35 feet below the footing elevation or deeper as soil conditions warrant. Spacing of soil borings shall not exceed 500 feet. The Engineer shall provide a boring layout for the Owner's review and comment.

H. The Engineer shall incorporate soil boring data sheets prepared, signed, sealed, and dated by the Geotechnical Engineer. The soil boring sheets shall be in accordance with WINCORE software as can be found on the Texas Department of Transportation (TxDOT) website.

FUNCTION CODE 120(120) – SOCIAL/ECON/ENVIRON STUDIES

SOCIAL, ECONOMIC AND ENVIRONMENTAL STUDIES AND PUBLIC INVOLVEMENT

120.1. Environmental Documentation Standards

Each environmental service provided by the Engineer must have a deliverable. Deliverables must summarize the methods used for the environmental services and the results achieved. The summary of results must be sufficiently detailed to provide satisfactory basis for thorough review by the Owner and (where applicable) other agencies with regulatory oversight. All deliverables must meet regulatory requirements for legal sufficiency and adhere to the requirements for reports enumerated in the State's National Environmental Policy Act of 1969 (NEPA) Memorandum of Understanding (MOU).

A. Quality Assurance/Quality Control Review

For each deliverable, the Engineer shall perform quality assurance quality control (QA/QC) reviews of environmental documents and on all supporting environmental documentation to determine whether documents conform with:

1. Current Environmental Compliance Toolkit guidance, documentation requirements, and templates published by TxDOT's Environmental Affairs Division (ENV) and in effect as of the date of receipt of the documents or documentation to be reviewed.
2. Current state and federal laws, regulations, policies, guidance, agreements, and memoranda of understanding between the Owner and applicable state or federal agencies; and
3. Guidelines contained in Improving the Quality of Environmental Documents, A Report of the Joint AASHTO/ACEC Committee in Cooperation with the Federal Highway Administration (May 2006) for:
    a. Readability, and
    b. Use of evidence and data in documents to support conclusions.

Upon request by the Owner, the Engineer shall provide documentation that the QA/QC reviews were performed by qualified staff.

B. The Engineer shall maintain the project environmental record in TxDOT's Environmental Compliance Oversight System (ECOS), including project review, completing the work development plan screens, uploading documents, and completing activities as assigned by the District.
C. Deliverables must contain all data acquired during the environmental service and be written to be understood by the public in accordance with TxDOT's Environmental Toolkit guidance, documentation standards, and current guidelines, policies, and procedures.
D. Electronic versions of each deliverable must be written in software that is fully compatible with the software currently used by the Owner and provided in the native format of the document for future use by the Owner. The Engineer shall supplement all hard copy

deliverables with electronic copies in searchable Adobe Acrobat™ (.pdf) format unless another format is specified. Each deliverable must be a single, searchable *.pdf file that mirrors the layout and appearance of the physical deliverable. The Engineer shall upload the electronic files to the Owner's Procore file management system in both the document's native format and the PDF format.

E. When the environmental service is to apply for a permit (e.g., USCG permit or USACE permit), the Engineer shall submit all required documentation to the applicable regulatory agency and copy the Owner on all correspondence.

F. Submission of Deliverables

1. Deliverables must consist of documentation to support a categorical exclusion (CE) determination, or the preparation of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), as applicable. Technical reports and documentation must be prepared to support the applicable environmental classification (e.g. CE, EA, or EIS). Additionally, an Open-Ended list Categorical Exclusion Classification Request Form must be prepared to classify the project as an Open-Ended list CE, if needed.
2. All deliverables must comply with all applicable state and federal environmental laws, regulations, procedures, and TxDOT's Environmental Compliance Toolkits, documentation requirements, and templates.
3. On the cover page of any environmental documentation, the Engineer shall insert the following language in a way that is conspicuous to the reader or include it in a CE project record:
   "The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by the City pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT."

G. The Owner will provide the Owner's and other agency comments on draft deliverables to the Engineer. The Engineer shall revise the deliverable:

1. To include any Owner commitments, findings, agreements, or determinations (e.g., wetlands, endangered species consultation, Section 106, or Section 4(f)), required for the transportation activity as specified by the State.
2. To incorporate the results of public involvement and agency coordination.
3. To reflect mitigation measures resulting from comments received or changes in the transportation activity; and
4. To include with the revised document a comment response form (matrix) in the format requested by the Owner.

H. The Engineer shall provide photographs and graphics that clearly depict details relevant to an evaluation of the project area. Comparable quality electronic photograph presentations must be at least 1200 x 1600-pixel resolution. The Owner can request images/graphics be provided in another format or quality.

Federal d-list Categorical Exclusion (CE) Environmental Clearances:

A. The Engineer shall provide documentation for applicability under a CE and ensure that:

1. Prepare environmental documentation and complete ECOS management in accordance with TxDOT's Environmental Compliance Toolkits. Information needed for the TxDOT clearance is anticipated to be required only for the work in TxDOT ROW.
2. Per TxDOT's Environmental Compliance Oversight System (ECOS), it is assumed a Work Plan Development (WPD) process would determine the appropriate technical documentation in support of and in compliance with the National Environmental Policy Act (NEPA).
3. All TxDOT environmental documentation would be performed in accordance with up-to-date Environmental Compliance Toolkits.

B. Minimum Deliverables:

1. 1. Draft WPD 1 and 2
2. 2. Final WPD 1 and 2

120.5. Environmental Technical Analyses and Documentation

A. Definition of technical analyses and documentation for environmental services

In general, technical analyses and documentation for environmental services might include a report, checklist, form, or analysis detailing resource-specific studies identified during the process of gathering data to make an environmental decision.

The Owner may determine what technical reports and documentation are necessary for any given project. The Engineer shall prepare all technical reports and documentation for the Owner with sufficient detail and clarity to support environmental determinations. All technical reports must be compliant with TxDOT's Environmental Compliance Toolkits, documentation requirements, and templates. The environmental document must reference the technical reports.

Environmental technical reports and documentation must include appropriate NEPA or federal regulatory language in addition to the purpose and methodology used in delivering the service. Technical reports and forms must use templates and documentation standards as applicable and include sufficient information to determine the significance of impacts.

B. Minimum Deliverables:

1. Draft technical analyses and documentation
2. Final technical analyses documentation
3. Environmental Public Involvement (23 CFR §771.111)

   The Engineer shall provide public involvement activities, which might include preparation of data and analyses necessary before and during public involvement activities.

4. Community Impacts Analysis

The Engineer shall provide community impact analyses. Community impacts includes environmental justice, limited English proficiency, and other issues as addressed in TxDOT environmental guidance. The Engineer shall perform community impact assessments including environmental justice analysis in accordance with Attachment A, Article 38, Sections J and K of the contract. Community impact analyses might include:

a. Community Impacts Assessment Technical Report Form; or
b. Community Technical Report. The report must follow guidance provided in TxDOT's Community Impacts Assessment Toolkit. The assessment may include:
    i. Identification of environmental justice communities within the study area.
    ii. A community profile.
    iii. A displacement analysis.
    iv. An access and travel pattern analysis.
    v. A community cohesion analysis.
    vi. Determination if the project would have disproportionately high and adverse impacts on environmental justice communities. All impacts identified in the Community Impact Assessment and other relevant studies (i.e., noise analysis) must be considered to determine if the impacts disproportionately affect environmental justice communities.
    vii. Identification possible mitigation measures to avoid or minimize any adverse impacts to the environmental justice population within the project area.
    viii. Summary of public involvement process including methods used to accommodate persons with limited English proficiency; and
    ix. Identification of possible mitigation measures including those to avoid and minimize any adverse impacts to the environmental justice population within the project area.

5. Water Resources Analysis and Documentation

The Engineer shall provide environmental documentation, conduct field surveys, and provide analysis of water resources for compliance with state and federal regulations as described in the Environmental Guide: Volume 2 Activity Instructions, http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/060-06-gui.pdf, and the associated forms, templates, and guidance found in the Water Resources section of the Natural Resources Toolkit, https://www.txdot.gov/inside-txdot/division/environmental/compliance- toolkits/natural-resources.html. The applicable water resource studies must be determined at the task order level. In the case that field surveys are required, then the Engineer shall contact Owner for clearance prior to starting fieldwork. ENV-NRM will verify that approved methods and appropriately permitted and experienced staff will be used.

At the request of the Owner, the Engineer shall provide the following water analysis:

a. Surface Water Analysis Form, including analysis of:
    i. Section 404 of the Clean Water Act
    ii. Section 303(d) of the Clean Water Act
    iii. General Bridge Act/Section 9 of the Rivers and Harbors Act
    iv. Section 10 of the Rivers and Harbors Act
    v. Section 401 of the Clean Water Act
    vi. Executive Order 11990, Protection of Wetlands
b. For all Water Resource analyses, the Engineer shall:
    i. Provide the results of the land survey in electronic DGN file format to be incorporated into the schematic and plans. GIS and KMZ files of the land survey must also be provided.

6. Biological/Natural Resources Management Analysis and Documentation.

The Engineer shall provide environmental documentation, conduct field surveys, and provide analysis of biological natural resources for compliance with state and federal regulations as described in the Environmental Guide: Volume 2 Activity Instructions, http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/060-06-gui.pdf, and the associated forms, templates, and guidance found in the Natural Resources Toolkit, https://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/natural-resources.html. The applicable natural resource studies must be determined at the task order level. In the case that field surveys are required, then the Engineer must contact ENV-NRM for clearance prior to starting work.

ENV-NRM will verify that approved methods and appropriately permitted and experienced staff will be used. At the request of the Owner, the Engineer shall provide the following biological/natural resource analysis:

a. Species Analysis Form, including:
    i. Species Analysis Spreadsheet, which can include a habitat analysis for the entire project area, field surveys for protected species, and presence/absence surveys.
    ii. Tier 1 Site Assessment, which can include early coordination or administrative coordination with TPWD.
    iii. Bald and Golden Eagle Protection Act (BGEPA) analysis and coordination assistance.

7. Initial Site Assessment (ISA) with Hazardous Materials Project Impact Evaluation Report

The Engineer shall provide an ISA with Hazardous Materials Project Impact Evaluation Report for the limits of the proposed project in accordance with Statement of Work for Hazardous Materials Processes related to NEPA in the TxDOT Hazardous Materials Management Toolkit (http://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/haz-mat.html).

8. Archeological Documentation Services

The Engineer shall provide archeological studies and documentation. All archeological studies must be sufficient to satisfy the current TxDOT Archeological Sites and Cemeteries Toolkit. An archeological background study must be performed prior to field work. If the Engineer was provided with a background study by the State, a new background study is not required.

The Engineer shall provide archeological resource identification, evaluation, and documentation services. In compliance with TxDOT's Environmental Compliance Toolkits, the Engineer shall provide the following archeological services/deliverables:

a. Archeological background study
b. Archeological reconnaissance survey
c. Archeological intensive survey

An archeological survey (reconnaissance or intensive) must be sufficient to satisfy state and federal regulations. The applicable archeological survey must be determined at the task order level. The Engineer shall contact Owner for approval prior to starting field and survey work. ENV-ARCH will verify that approved methods and appropriately permitted and experienced staff will be used.

9. Historic Resource Identification, Evaluation, and Documentation Services

The Engineer shall provide historic resource identification, evaluation, and documentation services. In compliance with TxDOT's Environmental Compliance Toolkits, the Engineer shall provide the following historic resource services/deliverables:

a. Historic Resources PCR,
b. Historic Resources Research Design, and
c. Historic Resource Survey Report, including windshield, reconnaissance, or intensive level documentation.

All services, except the historic resource PCR, must have prior approval by Owner to be performed. The historic resource PCR must be accepted by ENV-HIST prior to survey field work.

120.6. Informal Meetings. The Engineer shall provide technical assistance with preparation of exhibits for, and minutes of informal meetings that are either requested by the public to discuss the pending impacts to neighborhoods and businesses due to roadway shutdowns, detours and access restrictions, or deemed necessary by the Owner. This is not to be confused with the formal public meetings held during the National Environmental Policy Act (NEPA) process during schematic approval for Public Involvement.

120.7. Public Involvement. Based upon the issues (as determined by the Owner), additional public involvement may be required. If required, public involvement may include: i) small group meetings with local officials; ii) stakeholder meetings; The Engineer shall use the following methods for the exchange of information.

1. Small Group and Stakeholder Meetings - The meetings, not to exceed two, shall be attended by the Engineer, at the request of the Owner, to informally discuss the project. The meetings may be conducted by the Owner or Engineer. Requests for such meetings will be coordinated prior to establishing a meeting date and time. The Engineer shall be responsible for providing the meeting location and contacting the small group members and stakeholders. The Engineer must attend each meeting.

120.8. Environmental Permits Issues and Commitments (EPIC) Sheets. The Engineer shall complete the latest version of the EPIC sheets per information provided by the State. These sheets must be signed, sealed and dated by the Engineer as indicated in signature block.

120.9. Cut and Fill Exhibits. If the information is available, the Engineer shall prepare cut and fill exhibits for delineated wetland.

FUNCTION CODE 130(130) – RIGHT-OF-WAY (ROW) DATA

For Function Codes 130 and 150, the term Surveyor means the firm (prime provider or subprovider) that is providing the surveying services shown in this scope.

The Engineer shall ensure that the following general standards for survey work are followed for Function Codes 130 and 150 where applicable. The owner has indicated that the Surveyor will only be making minimal revisions to the existing ROW map, which is to be provided to the Surveyor:

Unless otherwise indicated, any reference in this attachment to a manual, specification, policy, rule or regulation, or law means the version in effect at the time the work is performed. TxDOT manuals are available at: http://onlinemanuals.txdot.gov/manuals/. All surveys must meet or exceed all applicable requirements and standards provided by:(1) Professional Land Surveying Practices Act, (2) General Rules of Procedures and Practices promulgated by the Texas Board of Professional Engineers and Land Surveyors (TBPELS), and (3) the TxDOT Survey Manual (where applicable). The Surveyor shall perform all work in an organized and professional manner. All surveys are subject to the approval of the Owner.

The Surveyor shall use TxDOT's ROW Preliminary Procedures for Authority to Proceed Manual and TxDOT Survey Manual as the basis for the format and preparation of all right of way (ROW) documents produced under this scope of work, including written parcel descriptions, and parcel plats, unless otherwise specified by the Owner. Unless otherwise directed by the Owner, the Surveyor shall use (1) the North American Datum of 1983 (NAD83), Texas Coordinate System of 1983 (State Plane Coordinates) applicable to the zone or zones in which the work is performed, with values in U.S. survey feet, as the basis for all horizontal coordinates derived and (2) the datum adjustment currently in use by TxDOT.

Project or surface coordinates must be calculated by applying a combined adjustment factor (CAF) to State Plane Coordinate values. If provided by the Owner, the Surveyor shall use a project specific CAF.

Elevations must be based on the North American Vertical Datum 88 (NAVD88), unless otherwise specified by the Owner.

All work using the Global Positioning System (GPS), whether primary control surveys or other, must meet or exceed the requirements provided by the TxDOT Survey Manual to the order of accuracy specified in the categories listed below or in a task order. If the order of accuracy is not specified in this attachment or in a task order, the work must meet or exceed the order of accuracy specified in the publication listed in this paragraph.

All conventional horizontal and vertical control surveys must meet or exceed the order of accuracy specified in the TxDOT Survey Manual unless specified otherwise in the contract.

All boundary determination surveys, whether for ROW acquisition, ROW re-establishment, or other boundary needs, must meet or exceed the accuracy specified in the TxDOT Survey Manual unless specified otherwise in the contract with the exception of the ROW map.

The Owner may authorize the Surveyor to use an Unmanned Aircraft System (UAS) to perform services under this contract. The use of UAS is regulated by the Federal Aviation Administration (FAA). All UAS operators must comply with Federal Aviation Administration (FAA) regulations and the TxDOT Unmanned Aircraft System (UAS) Flight Operations and User's Manual.

The survey data must be fully compatible with the Owner's computer system and with programs in use by the Owner at the time of the submission, without further modification or conversion. The current programs used by TxDOT are Microsoft Word, Bentley MicroStation, Bentley OpenRoads civil design system, Bentley GEOPAK Survey, Excel, and ESRI ArcGIS. Data collection programs must be compatible with the current import formats allowed by GEOPAK Survey and be attributed with current feature codes. These programs may be replaced at the discretion of the Owner.

Drawing sizes are defined, based on American National Standards Institute (ANSI) standard paper sizes, as follows: A-size means 8.5 inches by 11.0 inches, B-size means 11.0 inches by 17.0 inches, C-size means 17.0 inches by 22.0 inches, and D-size means 22 inches by 34.0 inches.

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 Owner.

The Surveyor shall perform quality control/quality assurance on all procedures, field surveys, right-of-way surveys, data, and products prior to delivery to the Owner. The Owner may also require the Surveyor to review the survey work performed by others. If, at any time, during the course of reviewing a submittal of any item it becomes apparent to the Owner that the submittal contains a substantial number of errors, omissions, and inconsistencies, the Owner may cease its review and return the submittal to the Surveyor immediately for appropriate corrective action. A submittal returned to the Surveyor for this reason is not a submittal for purposes of the submission schedule and is not a reason for additional compensation.

The standards for services that are not boundary-related but that relate to surveying for engineering projects may be determined by the construction specifications, design specifications, or as specified by the Owner.

130.1. RIGHT-OF-WAY SURVEYS

Right-of-Way Surveys includes the performance of surveys to establish land boundaries, preparation of parcel descriptions and parcel plats that represent the survey results.

The Surveyor shall prepare:

A. To prepare mapping documents suitable for use in the acquisition of real property and the issuance of a title policy (metes and bounds plus plats);
B. To prepare a preliminary map of a resurvey of existing ROW (Abstract Map) where it is necessary to update or redefine ROW lines, and only make minimal additions and revisions to the existing ROW map that is to be provided to the Surveyor by the Owner.

A. DEFINITIONS

In this attachment, the following definitions shall apply:

1. Abstract Map means a scale drawing prepared from record documents depicting proposed ROW lines, existing ROW lines, easement lines, and private property lines with relevant grantee names, recording data, and recording dates.
2. Closure/Area Calculation Sheet means a computer-generated print-out of the area and the perimeter bearings, distances, curve data, and coordinates of an individual parcel of land to be acquired, including the degree of angular and distance mis-closure for each individual parcel.
3. Denial of Access Line means a line that indicates specific location where access to the roadway is denied.
4. Owner means the current title holder of record as determined by the Real Property Records.
5. Parent Tract means a unit or contiguous units of land under single ownership, comprising a single marketable tract of land consistent with the principle of highest and best use. A parent tract may be described by a single instrument or several instruments. A single parent tract cannot be severed by a public ROW easement, or separate ownership which destroys unity of use.
6. Parent Tract Inset means a small map to an appropriate scale, of the parent tract perimeter placed upon the ROW map in the proximity of the respective parcel. Parent tract insets are used in cases where the parent tract cannot be shown to the same scale as the ROW map. Since parent tract insets are used to identify the limits and location of parent tracts, they must include public ROW, utility easements and fee strips, and identifiable water courses which bound the parent tract.
7. Point of Beginning or POB means a corner of the parcel of land to be acquired, located on the proposed ROW line and being the beginning terminus of the first course of the written property description or plat.
8. Point of Commencing or POC means a monumented property corner identifiable in the real property records that is located outside the proposed ROW corridor. For title purposes, the POC must be a monumented back corner of the parent tract. In the event a monumented back corner of the parent tract cannot be recovered, the nearest identifiable monumented property corner located outside the proposed ROW corridor may be used.
9. Preliminary ROW Layout means a scaled drawing depicting proposed ROW lines, existing ROW lines, proposed pavement, access denial lines, the proposed centerline alignment, private property lines, easement lines, visible improvements, visible utilities, and the

station and offset from the centerline alignment to each point of curvature (PC), point of tangency (PT), and angle point in the proposed ROW lines and to each PC, PT, and the angle point in the existing ROW lines in areas of no proposed acquisition.

10. Property Description means a document prepared as an exhibit for the conveyance of a property interest and issuance of a title policy, reflecting the results of a boundary survey, and signed and sealed by a registered professional land surveyor (RPLS), attached to an acquisition deed as Exhibit A, and consisting of the following two parts:
    a. Written metes and bounds description delineating the area and the boundary and describing the location of an individual parcel of land unique to all other parcels of land.
    b. Parcel plat, which is an ANSI A-size (8.5" x 11") scaled drawing depicting the information recited in the metes and bounds description in 10 a. above, which represents the parcel(s) of land to be acquired.
11. ROW Maps means a series of ANSI D-size (22" x 34") scaled drawings depicting the results of relevant elements of records research, field work, analysis, computation, and mapping required to determine title, delineate areas and boundaries, and locate and describe utilities and improvements to the extent necessary to appraise the value and negotiate the acquisition of individual parcels of private land for a proposed ROW project. The existing ROW map is to be provided and only minimal revisions are to be considered part of this scope of work. If this is not provided to the Surveyor, Owner shall be notified and the additional scope of work necessary to produce the ROW map will need to be negotiated.

B. PROCEDURE

All standards, procedures, and equipment used by the Surveyor must be such that, at a minimum, the results of the survey is in compliance with the precision and accuracy requirements set forth by the Texas Board of professional Engineers and Land Surveyors (TBPELS) rules.

1. Abstract Map

The Surveyor shall prepare an Abstract Map sufficient to determine the following:

    a. All interests of public record held in the land to be acquired.
    b. The total record holdings to be acquired from an owner contiguous to a land.
    c. All interests in land held in common to be acquired (shopping mall parking lots, subdivision reserves, etc.)
    d. All improvements proposed by other agencies that might have a bearing on project development.
    e. All called monuments, bearings, and distances in recorded information.

2. ROW Map (To be provided to the Surveyor by the Owner)

The Surveyor shall field locate items such as: property corners, existing ROW markers, improvements, and visible utilities. The Surveyor shall verify and update the planimetric file as directed by the Owner.

Using the Owner's standard title, index, and plan sheets, the Surveyor shall prepare a ROW map for each proposed ROW project. A ROW map must include a title sheet, an index sheet, a survey control index sheet, a horizontal control data sheet, and sufficient plan sheets to cover the proposed project. If requested by the Owner, the Engineer shall prepare additional sheets.

Per the TBPELS and the State, ROW maps need not be signed and sealed by a RPLS.

Plan sheets must include the following; however, under the current scope very minimal revisions will be made to the existing ROW map to be provided by the Owner):

a. Proposed ROW lines. Proposed ROW lines must be labeled with appropriate bearings, distances, and curve data. Curve data must include the radius, delta angle, arc length, and long chord bearing and distance.
b. Existing ROW lines. Existing ROW lines must be labeled with appropriate bearings, distances, and curve data to the extent necessary to describe the individual parcels of land to be acquired. Curve data must include the radius, delta angle, arc length, and long chord bearing and distance.
c. Proposed project baseline alignment. The proposed project baseline alignment must be labeled with appropriate bearings, distances, and curve data. Curve data must include the station of the curve, point of intersection (PI), radius, delta angle, arc length, tangent length, long chord bearing and distance, and the northing (N) and easting (E) coordinates of the curve PI. All alignment PCs, PTs, and even 500-foot stations must be labeled with its station value.
d. Proposed paving lines. Proposed paving lines combined with relevant existing paving lines must be shown to the extent necessary to compile a complete picture of proposed traffic movements. Proposed paving on the final map submitted to the Owner must be shaded with a dot pattern or highlighted by some other means acceptable to the Owner.
e. Denial of Access lines. Denial of Access lines must be drawn to clearly indicate areas where access is to be denied permitted.
f. Private property lines. Private property lines must be delineated with appropriate bearings, distances, and curve data to the extent necessary to describe the individual parcels of land to be acquired. Curve data must include the radius, delta angle, arc length, and long chord bearing and distance.
g. League lines and survey lines. League lines and survey lines must be shown and identified by name and abstract number.
h. County lines and city limit lines. County lines and city limit lines must be located and identified by name.
i. North arrow. A north arrow must be shown on each sheet, in the upper right corner of the sheet.
j. Monuments. Monumentation must be shown with a description of material and size and if the monument is found or set.

k. PC, PT, and angle points. Station and offset must be shown for each PC, PT, and angle point in the proposed ROW lines. Stations and offsets must be shown with respect to the proposed centerline alignment.
l. Intersecting and adjoining public ROW. Intersecting and adjoining public ROW must be shown and identified by name, ROW width, and recording data.
m. Railroads. Railroads must be shown and identified by name, ROW width, and recording data.
n. Utility corridors. Utility corridors must be identified as to easement or fee.
o. Easements and fee strips. Easements and fee strips must be shown and identified by width, owner, and recording data. (If referenced in title commitment)
p. Set-back lines. Set-back lines (e.g., building lines) must be shown and identified.
q. Improvements. Visible improvements located within the proposed ROW corridor or within 50 feet of a proposed ROW line must be shown and identified.
r. Structures
    i. Structures must be identified as commercial or residential, by number of stories, and as to construction material type (e.g., brick, wood frame).
    ii. Structures that are severed by a proposed ROW line must be dimensioned to the extent necessary to completely delineate the severed parts.
    iii. Parking areas, billboards, and other on-premise signs that are severed by a proposed ROW line must be dimensioned to the extent necessary to delineate that portion of the parking area, billboard, or sign that is located within the proposed ROW corridor.
    iv. For a structure outside of, but within ten feet of, the proposed ROW line, the distance of the structure to the proposed line must be shown. If the location of the structure is determined using a TxDOT supplied planimetric map, any structure within three feet of the proposed ROW line must be verified by field survey.
s. Utilities. Visible utilities located within the proposed ROW corridor or within 50 feet of a proposed ROW line must be shown and identified.
t. Points of commencing and points of beginning. POCs and POBs must be shown and labeled. POBs must be shown with their respective N and E surface coordinates. As an exception, a POC will not be required in the case of a total taking without a remainder.
u. Parcels. Each parcel of land to be acquired must be identified by a parcel number, which must appear in the ownership tabulation and on the ROW map in the proximity of the respective parcel. If the Surveyor is unfamiliar with the criteria used by the Owner to assign parcel numbers, the Surveyor shall seek the assistance of the Owner at the time the Abstract Map is complete.
v. Ownership tabulation. An ownership tabulation must be shown that includes the parcel number, existing area of the parent tract, lots and blocks constituting the parent tract when applicable, owner's name, type of conveyance, film code, county clerk's file number, taking area, and remaining area of the parent tract located left or right of the centerline alignment or both. The Surveyor shall provide several blank lines in the tabulation block to facilitate future map additions.

w. Parent tract inset. A parent tract inset must be shown for each parent tract that cannot be shown to scale on the ROW map. When parent tract insets are used, the point of commencing with the appropriate bearing and distance to the point of beginning may be shown on the parent tract inset.
x. Data sources. A note must be included on the title sheet and each map sheet stating the source of bearings, coordinates, and datum used. The note must also include the National Geodetic Survey (NGS) or other basis monument(s) name or identification number, Texas Coordinate System Zone information, epoch information, grid or surface values and the combined adjustment factor or surface adjustment factor.
y. Notes. Appropriate notes must be included on the title sheet and each map sheet stating the following:
    i. Month (or months) and year of the abstracting upon which the map is based.
    ii. Month (or months) and year the field surveys were conducted upon which the map is based.
    iii. Month and year the map was completed by the Surveyor.
z. Tick marks. The Surveyor shall place four tick marks, one in each quadrant of the map sheet, showing the latitude and longitude (Lat/Long) in decimal degrees and the surface coordinate of each mark. The tick marks may be placed on the match lines of each map sheet, if convenient. A foot note must also be placed on the sheet defining the tick marks as Lat/Long in decimal degrees.

3. Property Descriptions

The Surveyor shall prepare a Property Description for each parcel (or tract for surplus property) consisting of two parts: (1) a metes and bounds description of the property and (2) a parcel plat. Each part of a Property Description must be signed and sealed by a RPLS.

a. Metes and bounds description
   The Surveyor shall prepare a metes and bounds description for each parcel of land to be acquired. The Surveyor shall use the TxDOT standard format for metes and bounds descriptions. Metes and bounds descriptions must be submitted in Microsoft Word format and must include the following information:
    i. State, county, and original land grant survey within which the proposed parcel of land to be acquired is located.
    ii. Reference to unrecorded and recorded subdivisions by name, lot, block, and recording data to the extent applicable.
    iii. Reference by name to the grantor and grantee, date and recording data of the most current instrument(s) of conveyance describing the parent tract.

    The Surveyor shall use the execution date when citing deed references. The Surveyor shall use the recording or filing dates, making clear which date is being used if the execution date is not explicit on the face of the document.
    iv. A POC.

v. A POB with the N and E surface coordinates.
vi. A series of courses, identified by number and proceeding in a clockwise direction, describing the perimeter of the parcel of land to be acquired, and labeled with appropriate bearings, distances, and curve data.
vii. Curve data must include the radius, delta angle, arc length, and long chord bearing and distance.
viii. Each course must be identified either as a proposed ROW line, an existing ROW line, or a property line of the parent tract. Each property line of the parent tract must be described with an appropriate adjoiner call.
ix. A description of all monumentation set or found, which must include size and material.
x. A reference to the source of bearings, coordinates, and datum used.

b. Parcel plat
The Surveyor shall prepare a parcel plat for each parcel of land to be acquired using the Owner's standard format. Parcel plats must include each and every item of information 1) written in the metes and bounds description and 2) shown on the ROW map (if requested by the Owner) for the individual parcel.

C. ADHERENCE TO STANDARDS

For purposes of clarity, consistency, and ease of understanding, the Owner as an acquiring agency of private property for public use, has adopted TxDOT's standards and formats for a ROW map to facilitate the processes of negotiation, appraisal, relocation assistance, and condemnation with the notable exception of the Surveyor will only be making minimal revisions to the existing ROW map that will be provided by the Owner. The Surveyor shall adhere to these standards and formats to every extent possible.

D. GENERAL SPECIFICATIONS

The following general specifications for 1) description, 2) plat, and 3) ROW mapping apply:

1. Completed ROW maps must be submitted to the Owner in both Bentley MicroStation Design File (DGN) and Adobe Portable Document Format (PDF) format. The maps must have a layout that will produce a D-size final print with a 0.5-inch border.
2. Parcel plats must be submitted to the Owner on A-size bond paper with a 0.5-inch border. Match lines must be used where more than one sheet is required.
3. ROW maps must be drawn to a scale of 1 inch = 50 feet. Scales other than 1 inch = 50 feet may be used with prior approval by the Owner.
4. The minimum lettering size for ROW maps is 0.1 inches at print scale.
5. Parcel plats must be drawn to a scale of 1 inch = 50 feet. Scales other than 1 inch = 50 feet may be used with prior approval by the Owner. In the case of large parcels which are difficult to fit on a single A-size sheet, the Surveyor shall use multiple A-size sheets with match lines.
6. The minimum size lettering for a parcel plat is 0.3 inches at print scale.
7. Property Descriptions shall be submitted on A-size bond paper.

E. GENERAL REQUIREMENTS

The Surveyor shall adhere to the following general requirements:

1. Copies of instruments of record submitted to the Owner must be indexed by parcel number.
2. Coordinates appearing on ROW maps, on parcel plats, and in written property descriptions must be surface coordinates based on the Texas State Plane Coordinate System. The appropriate combined adjustment factors (sea level factor multiplied by the scale factor) for each zone of the coordinate system, which have been developed by TxDOT, must be noted.
   To obtain surface coordinates, the Surveyor shall multiply grid coordinates by the appropriate combined adjustment factor for each zone, as provided by TxDOT.
3. Line and curve tables may be used when necessary.
4. The number of centerline alignment stations shown on a single plan sheet shall be limited to allow approximately four inches between match lines and sheet borders for future details and notes.
5. A minimum four-inch by four-inch space must be reserved at the bottom right corner of each map sheet for future revision notes.
6. If requested by the Owner, the Surveyor shall set a 5/8-inch rebar with a TxDOT aluminum ROW cap (or other appropriate monument) on the proposed ROW line and replace the rebar later with a TxDOT Type II ROW marker.

When the 5/8" rebar with a company rod cap is set for PCs, PTs, PIs, and 1500 foot stations, the double asterisk symbol (**) must be shown on the map sheets and written into and shown in the Property Description and must be accompanied by the following note:

**The monument described, and set may be replaced with a Type II ROW marker upon the completion of the construction project, under the supervision of a RPLS, either employed or retained by the Owner.

When new ROW lines intersect boundary lines of properties creating new boundary corners in the new ROW line, the Surveyor shall place a 5/8- inch rebar with the State's 2-inch aluminum property corner rod cap.

F. ELECTRONIC ROW MAP STANDARDS

The primary purpose of this section is to provide instructions on the graphics standards, file management structure, and naming conventions, for ROW mapping electronic deliverables submitted to the TxDOT Right of Way Division by surveying services providers, as part of the ROW package.

The Surveyor shall adhere to the following requirements for electronic map submittals:

1. Bentley MicroStation
   All graphic files for map sheets and parcel plats must be native Bentley MicroStation DGN files created using Bentley OpenRoads civil design system with TxDOT's current seed files, resource files, workspace environment, and settings.

2. Level Library Files
   The Surveyor shall use the TxDOT's current MicroStation level library files for ROW mapping. The files contain all the predefined levels that are typically needed for ROW mapping and include levels for existing utilities.

3. Separate DGN Files for Each Map Sheet
   The Surveyor shall provide one DGN file for each map sheet. Each file must be spatially registered to the project coordinate system.
   The sheet file naming convention is "Highway Name Sheet Number.dgn(e.g., ROAD_S01.dgn).
4. Naming convention for the Master Design File or Master ROW Files and Map Sheet.

The recommended naming prefix for design files is MDF (for master design file). Therefore, the prefix must be different for the ROW files because the location of the existing and proposed ROW in the design files from the schematic will change to some degree after an on-the- ground survey is made for a ROW map. Therefore, the prefix might be MRF for master ROW file.

The Surveyor shall provide the corrected Master ROW Files to the design engineer to be used in the final plans, specifications, and estimate (PS&E) so that all features of construction and the relocation of utilities will be correctly placed in relation to the highway ROW and the ROW of cross streets or roadways.

The master ROW file naming convention is: "MRF ROW Logical Name.dgn", with examples as follows:

MRF212104065_Schematic90.dgn (for schematic layout 90% submittal)

MRF212104065_Schematic100.dgn (for schematic layout 100% submittal)

MRF212104065_SchemApprov.dgn (for City projects on State ROW)

MRF212104065_PSEDesign.dgn (for final PS&E design)

MRF212104065_ExROW.dgn (for existing ROW determined by RPLS)

MRF212104065_PropROW.dgn (for proposed ROW of final design) MRF212104065_DeedPlot.dgn (for deed record) MRF212104065_Planimetric.dgn (for aerial mapping topography) MRF212104065_ROWTopo.dgn (for improvements data collection) MRF212104065_DesignTopo.dgn (for design level data collection topography)

MRF212104065_ExUtil.dgn (for existing utilities)

All sheet files with a plan view must have the MRF referenced to allow more than one sheet file to be worked on at the same time.

5. File Structure of Master and Reference DGN Files

If possible, the file structure should not contain subfolders.

6. Lines Weights, Line Styles, Colors, Text Size, Text Fonts, Scale, and Annotations

Legibility is the primary concern when choosing the scale, line weights and text size. Sheets must be legible at full scale sheet size (i.e., D-size drawing) and when reduced to half scale sheet size (B-size drawing size). It is not sufficient that originals or first-generation plots are legible, reproductions (copies) must retain legibility.

The normal scales for a full-sized sheet (i.e., D-size) is 1 inch = 50 feet (urban) and 1 inch = 100 feet (rural). For a half-sized sheet (i.e., B-size) the scale is 1 inch = 100 feet (urban) and 1 inch = 200 feet (rural).

The standard cell library is: TxdotSurv_04.cel or current State cell files; The standard font is Leroy. The standard State color table is: V256COLR.ctb or Txgpk.ctb.

The Surveyor shall use the TxDOT's current GEOPAK Survey SMD file that sets up new feature codes in SMD file for alignment chains, parcel chains and survey chains that can be drawn by GEOPAK Survey from the GPK file with the correct line styles, colors and weights to the designated levels loaded into the DGN by the TxDOT's current level library files.

The Surveyor shall use MicroStation Packager for the submission of electronic deliverables, which captures any non-State standard files (e.g., rsc, cel, text) that were used in the map that look and plot differently in the TxDOT's MicroStation workspace.

7. Text and Line Color considerations

Text and line colors must be legible when using background imagery.

8. Required Data in the GEOPAK ROW GPK File

Alignments, chains of proposed and existing ROW lines, parent tracts and taking parcels, and all other points collected in the field (start with schematic or design GPK file) are required.

If the design GPK file is too detailed for ROW use, the Engineer shall create input files for the information needed for the design GPK file to load into the ROW GPK file.

9. Surface Coordinate

Surface adjustment factors and basis of datum must be well documented in the electronic deliverables "file structure/deliverables read me" file.

10. Requirements for Electronic Deliverables
    a. Native MicroStation DGN files (reference files, sheets files, and parcel plats files);
    b. GEOPAK Survey GPK files.
    c. Separate comma delimited point files (ASCII file) in the following coordinate systems: Surface or Projected Coordinates, Grid Coordinates (Texas Coordinate System of 1983 in U.S. Survey feet) and Geographic Coordinates (WGS-84 in decimal degrees). The file will have the following format: point number, northing or latitude, easting or longitude, elevation, feature code, and point description.

File naming convention is: Road Name_Type of Coordinates.csv (e.g., Road_Surface.csv, 212101065_Grid.csv, and 212101065_WGS84.csv);

d. PDF files created in MicroStation of map sheets (both D-size and B-size sheets), one set in black and white and another set-in color if there is orthoimagery for the background.
e. PDF files and Microsoft Word documents of signed and sealed Property Descriptions and Surveyor's Reports.
f. Raw and processed GPS files including adjustment reports.

G. ROW MAPPING TASKS TO BE COMPLETED

The Surveyor shall perform the following tasks:

1. Abstracting

The Surveyor shall obtain copies of all existing ownership documents for the parent tracts along with all subdivision plats and recorded documents defining existing easements (as referenced in title commitment, to be provided by client) within, along or intersecting the existing ROW, and prepare an Abstract Map. The surveyor shall prepare an Abstract Map sufficient to determine the following:

a. All interests of public record held in the land to be acquired.
b. The total record holdings to be acquired from an owner contiguous to a land.
c. All interests in land held in common to be acquired (shopping mall parking lots, subdivision reserves, etc.)
d. All improvements proposed by other agencies that might have a bearing on project development.
e. All called monuments, bearings, and distances in recorded information.

2. Field Surveys

The Surveyor shall locate and set additional horizontal and vertical control points, as necessary, at the maximum spacing distance of 1,500 feet; field locate property corners, existing ROW markers, improvements, and visible utilities; verify and update the planimetric file; and as directed by the Owner, perform the following:

a. Obtain right-of-entry to survey on private property and prepare a spreadsheet of the information.
b. Locate existing horizontal and vertical control and verify the control information, locate property corners, and update the planimetric information with any missing visible improvements or visible utilities.

The Surveyor shall base all field work and calculations on the current controls and datum provided by the Owner.

3. Property Descriptions

a. The Surveyor shall prepare a Property Description(s) for each parcel or tract in the form of a preliminary and a final deliverable(s). Each part of a Property Description shall be signed and sealed by an RPLS. The Surveyor shall prepare preliminary Property Description(s)- for review by the Owner.

Metes and bounds descriptions

The Surveyor shall prepare a metes and bounds description for each parcel of land to be acquired. The Surveyor shall follow the standard formats for metes and bounds descriptions that TxDOT has developed.

Parcel plats

The Surveyor shall prepare a parcel plat for each parcel of land to be acquired. The Engineer shall follow the standard formats for parcel plats that the State has developed.

Parcel plats must include all items of information shown on the ROW map that concerns the individual parcel.

b. The Surveyor shall prepare final deliverables.

The Surveyor shall set appropriate monuments on the proposed ROW lines at intersecting property lines, and at all points of curvature (PC), points of tangency (PT), angle points, intersecting ROW lines of side streets, and at 1,500-foot stations.

The Surveyor shall set appropriate monuments on the existing ROW lines in areas of no acquisition at all PCs, PTs, angle points, and 1,500-foot stations, and as directed by the Owner.

The Surveyor shall set appropriate monuments at intersecting property lines with the new ROW lines.

The Surveyor shall prepare final, signed, sealed, and dated Property Descriptions.

4. ROW Map

The Surveyor shall make minimal revisions to the existing ROW map to be provided by the Owner.

The Surveyor shall conduct a QA/QC review and prepare a check list for each task performed.

H. ROW MAPPING DELIVERABLES

The Surveyor shall provide the following:

1. Scanned copies of the ownership documents and one D-size paper copy of the Abstract Map and the associated MicroStation graphics files for review purposes.

2. Field Survey Data
    a. A spreadsheet of the property owners and right-of-entry information.
    b. Scanned copies of the field notes, control data sheets, and a graphics file of all field survey data.

3. Property Description Submittals
    a. Preliminary Property Description Submittals

    One paper copy of the preliminary Property Description(s) for review purposes marked "Preliminary – Not to be used for recording purposes", and an electronic copy of each Property Description in PDF format.

    The ROW (ArcGIS) database template "ROW_Parcels_Edits" populated with the preliminary parcels, alignment, and project control points in ArcGIS 10.6.1 format or the current version in use by TxDOT.

    b. Final Property Description Submittals

    Two paper sets of the final Property Description(s) showing the metes and bounds descriptions and parcel plats, signed and sealed by a RPLS, and the associated electronic files in PDF and Word formats.

    Bentley MicroStation parcel plat graphics files and master reference files (MRF).

4. ROW Map Submittals

    a. Final R.O.W. Map Submittals
    Two D-size paper copies and one B-size half-scale paper copy of the final ROW map, and the associated Bentley MicroStation and GIS graphics files.

    b. PDFs of the final ROW map.

5. Two ANSI A-size (8.5" x 11") paper copies of the ROW project cover sheet and the associated Word document file.

6. QA/QC

7. Documentation stating that the appropriate monuments were set on the proposed ROW lines at intersecting property lines, PC's, PT's, angle points, ROW lines of side streets and at 1,500-foot stations.

130.4. ROW Hearing Services - Excluded

130.5. Utility Engineering Investigation

Utility engineering investigation includes utility investigations subsurface and above ground prepared in accordance with ASCE/CI Standard 38-02 [(http://www.fhwa.dot.gov/programadmin/asce.cfm)] and Utility Quality Levels.

A. Utility Quality Levels (QL)

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

1. Quality Level D - Quality level value assigned to a utility segment or utility feature after a review and compilation of data sources such as existing records, oral recollections, One-Call markings, and data repositories.
2. Quality Level C - Quality level value assigned to a utility segment or utility feature after surveying aboveground (i.e., visible) utility features and using professional judgement to correlate the surveyed locations of these features with those from existing utility records.
3. Quality Level B - Designate: Quality level value assigned to a utility segment or subsurface utility feature whose existence and position is based upon appropriate surface geophysical methods combined with professional judgment and whose location is tied to the project survey datum. Horizontal accuracy of Designated Utilities is 18" (including survey tolerances) unless otherwise indicated for a specific segment of the deliverable. Quality Level B incorporates quality levels C and D information. A composite plot is created.
4. Quality Level A – Quality level value assigned to a portion (x, y, and z geometry) of a point of a subsurface utility feature that is directly exposed, measured, and whose location and dimensions are tied to the project survey datum. Other measurable, observable, and judged utility attributes are also recorded (per District Best Practices). The utility location must be tied to the project survey datum with an accuracy of 0.1 feet (30-mm) vertical and to 0.2 feet (60-mm) horizontal. As test holes may be requested up front or during the project, test holes done prior to completion of QL D, C, or B deliverables must be symbolized on the QL B deliverable with a call out indicating test holes number. This is in addition to and not in lieu of the test hole.

B. Utility Investigations Methodology

1. Utility Investigation Quality Level D The Engineer shall:
    a. Perform records research from all available resources. Sources include, but are not limited to: Texas811, Railroad Commission of Texas (Texas RRC), verbal recollection, as-built information from plans, plats, permits and any other applicable information provided by the utility owners or other stakeholders.
    b. Document utility owners and contact information.
    c. Create a utility drawing of information gathered.

2. Utility Investigation Quality Level C

The Engineer shall:

    a. In combination with existing Quality Level D information, utilize surveyed above-ground utility features and professional judgement to upgrade Quality Level D

information to Quality Level C. For those utilities unable to be upgraded, retain as Quality Level D.

b. Storm and sanitary sewer information must be gathered from Level D and upgraded to Level C as possible, unless otherwise directed by the Owner.
c. Create composite utility drawing of information gathered.

3. 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. Designating (Quality Level B) services are inclusive of Quality Levels C and D.

The Utility Engineer must:

a. As requested by the Owner, compile "as-built" information from plans, plats and other location data as provided by the utility owners.
b. 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.
c. Designate, record, and mark the horizontal location of the existing utility facilities using non-destructive surface geophysical techniques.
d. Using both active and passive scans to attempt to locate any additional utilities, including unrecorded and abandoned storm and sanitary sewer facilities, at the direction of the Owner, utilities maybe investigated using additional methods such as rodding that would then classify them as Quality Level B. A non-water based pink paint or pink pin flags must be used on all surface markings of underground utilities.
e. Correlate utility owner records with designating data and resolve discrepancies using professional judgment. The Utility Engineer must prepare and deliver to Owner a color-coded composite utility facility plan with utility owner names, quality levels, line sizes and subsurface utility locate (test hole) locations. The Utility Engineer and Owner acknowledge that the line sizes of designated utility facilities detailed on the deliverable will be from the best available records and that an actual line size is normally determined from a test hole vacuum excavation. A note must be placed on the designate deliverable only that states "lines sizes are from best available records". All above-ground utility feature locations must be included in the deliverable to the Owner. This information must be provided in the latest version of OpenRoads civil design system used by the Owner. The electronic file will be uploaded to the Owner’s Procore file management system, as required by the Owner. A hard copy is required and must be signed, sealed, and dated by the Utility Engineer. When requested by the Owner, the designated utility information must be over laidoverlaid on the Owner’s design plans.
f. Determine and inform the Owner of the approximate electronic utility depths at critical locations as determined by the Owner. The limits of this additional information should be determined prior to the commencement of work. This

depth indication is understood by both the Engineer and the Owner to be approximate only and is not intended to be used preparing the right of way and construction plans.

g. Provide a monthly summary, with weekly updates, of work completed and in process with adequate detail to verify compliance with agreed work schedule.
h. Provide documentation to show that permits have been closed out as required.
i. Clearly identify all utilities that were discovered from Quality Levels C and D investigation but cannot be depicted in Quality Level B standards. These utilities must have a unique line style and symbology in the designate (Quality Level B) deliverable.
j. Comply with all applicable TxDOT policy and procedural manuals.

130.6. Utility Adjustment Coordination. (18.3.1)

Utility Adjustment Coordination shall include utility coordination meetings with individual utility companies, communication, and coordination with utilities, limited to one (1) meeting with each affected utility to inform them of the conflict and provide notice of required relocations.

Utility Adjustment Coordination shall not include preparation of utility agreement assemblies including utility agreements, joint use agreements, or advanced funding agreements.

The Engineer is responsible for designating and providing the services of the following individuals or entities:

1. Utility Coordinator: individual or entity performing Utility-related Services that are not required to be performed by a licensed engineer under Texas law.
2. Utility Engineer: individual or entity performing Utility-related Services that are required to be performed by a licensed engineer under Texas law.

A. Utility Coordination

The Utility Coordinator shall perform utility coordination and liaison activities with involved utility owners to achieve timely project notifications, formal coordination meetings, and preliminary conflict analysis.

a. The Utility Coordinator shall coordinate all activities with the Owner, or their designee, to facilitate the orderly progress and timely completion of the project schematic phase. The Utility Coordinator shall be responsible for the following:
    i. Initial Project Meeting. Attend an initial meeting with the utility owners to ensure familiarity with existing conditions, project requirements, anticipated conflicts, anticipated relocations, and prepare a written report of the meeting.
    ii. The Utility Coordinator shall provide initial project notification letters to all affected utility companies, owners, and other concerned parties.
    iii. The Utility Coordinator shall advise utility companies and owners of the general characteristics of the Project and provide an illustration of the

project footprint for mark-up of the utility facility locations that occupy the project area.

FUNCTION CODE 145(145, 164) – MANAGING CONTRACTED/DONATED PE

CONTRACT MANAGEMENT AND ADMINISTRATION

145.1. Contract Management and Administration

The Engineer shall:

A. Act as an agent for the Owner when specified in a task order.
B. Produce a complete and acceptable deliverable for each environmental service performed for environmental documentation.
C. Incorporate environmental data into identification of alternatives.
D. Notify the Owner of its schedule, in advance, for all field activities.
E. Notify the Owner as soon as practical, by phone and in writing, if performance of environmental services discloses the presence or likely presence of significant impacts (in accordance with 40 Code of Federal Regulations (CFR) 1500-1508). Inform the Owner of the basis for concluding there are significant impacts and the basis for concluding that the impacts might require mitigation.
F. Notify the Owner as soon as practical, by phone and in writing, if performance of environmental services results in identification of impacts or a level of controversy that might elevate the transportation activity's status from a categorical exclusion or environmental assessment. The Owner will reassess the appropriate level of documentation.

145.2. Project Management and Administration

The Engineer, in association with the Owner's Project Manager shall be responsible for directing and coordinating all activities associated with the project to comply with Owner policies and procedures, and to deliver that work on time.

Project Management and Coordination. The Engineer shall coordinate all subconsultant activity to include quality of and consistency of plans and administration of the invoices and monthly progress reports. The Engineer shall coordinate with necessary local entities.

The Engineer shall:

- Prepare monthly written progress reports for each project.
- Develop and maintain a detailed project schedule to track project conformance to Exhibit C, Work Schedule, for each task order. The schedule submittals shall be hard copy and electronic format unless otherwise specified by the Owner.
- Meet on a scheduled basis with the Owner to review project progress.
- Prepare, distribute, and file both written and electronic correspondence.
- Prepare and distribute meeting minutes.
- Document phone calls and conference calls as required during the project to coordinate the work for various team members.
- Provide QC/QA documentation for all submittals, including the sub consultantssubconsultants.

a. **Perform Project Management tasks.** All firms participating in Kyle 2022 Road Bond Projects, either as a Prime Contractor or Subcontractor, must fully utilize Procore construction management software for full project implementation, as directed by the Owner. The Owner will provide Procore access to all firms. The Engineer shall:
   i. Meet on a scheduled basis with Owner to review Project progress. The Engineer will provide meeting summaries within five (5) working days of the meeting to all attendees.
   ii. Conduct internal meetings with the consultant design team on a monthly basis or as needed for the duration of the Project.
   iii. Provide Contract Administration
   iv. Provide Project Management
   v. Attend a kick-off meeting with the Owner.
   vi. Attend and direct 50%, 90%, and 100% design review meetings.
   vii. Update Project design schedule on a monthly basis
   viii. Prepare monthly invoice and monthly progress report including monthly updates to design schedule

b. **Baseline Schedule**. Develop and submit for approval a Critical Path Method (CPM) baseline schedule within fourteen (14) calendar days of the Notice to Proceed. Schedule shall be in MS Project or Primavera P6. Modifications to the approved schedule will require approval by the Owner.
   i. Submit both pdf and native (.mpp or .xer) copies of the files.
   ii. Include all planned work activities and sequences, major milestones, and show Contract completion
   iii. Include activities that are the responsibility of the Owner, and estimate the duration for these activities. This time will not count against the Contract time, but is important to track as the critical path may run through them.
   iv. Ensure that the activities are broken out to a level of detail that clearly explains the tasks associated with delivering the work product.
   v. Provide activity durations in whole calendar days.
   vi. Provide a legend for all abbreviations, run date, data date, project start date, and project completion date in the title block of each submittal.
   vii. Begin the project schedule on the Notice to Proceed date.
   viii. Show a predecessor and successor for each activity with the appropriate activity relationships.
   ix. Ensure that all work sequences are logical and can be explained to the Owner if questions arise for clarification or understanding.
   x. Do not use activities exceeding 28 calendar days, unless agreed upon with the Owner.

c. Progress Schedule
   i. Project schedule updates shall be submitted as part of all invoice approval packages. Invoices submitted without schedule updates will be incomplete and will not be processed until schedule update is submitted.
   ii. Submit both the pdf and electronic copy of the project schedule running through the

end of each month, due no later than tenth (10th) calendar day of the following month, as it will become a record of the progress achieved on the project.

iii. Once established, the original duration and actual dates of all activities must remain unchanged.

iv. Revisions to the schedule may be made, but must be listed in a monthly update narrative in the Progress Report with the purpose of explaining the purpose of the revision and description of the impact on the project schedule's critical path and project completion date.

v. Monthly Progress Reports should include:
   1. Completed and planned work
   2. Budget status
   3. Schedule status
   4. Actual start dates for activities started
   5. Actual finish dates for activities completed
   6. The percentage of work completed and remaining duration for each activity started, but not yet completed
   7. Current delays and plans showing how they will be rectified
   8. Potential delays and plans to rectify
   9. Tracking schedule (pdf & mpp/xer)

d. Plan Development and Review Process

i. Engineer may not be compensated for any services performed without a written Notice-to-Proceed.

ii. Each deliverable must be submitted for review and approval by the Owner.

iii. The review process will take place electronically using a Bluebeam session to consolidate comments.

iv. Each submittal shall include a cover letter from the Engineer stating who from the design team performed a Quality Assurance/Quality Control ("QA/QC") check. The QA/QC certification letter must be co-signed by the QA/QC reviewer and the Project Manager. The QA/QC reviewer may not be one of the design team members.

v. Each submittal shall include a revisions log from the Engineer (exported from Bluebeam) that tracks each comment received during previous phases of work. For each comment, the log shall provide the original comment, the status, how it has been implemented into the plans, and approval by the Owner.

vi. Unless otherwise specified by Owner, allow two (2) weeks for the Owner to review and provide written comments and/or approval for each submittal. When comments are received by the Engineer, the Engineer shall schedule a Comment Resolution Meeting with Owner in order to review the comments and clarify understanding of them prior to making design changes. If the Owner requires a resubmittal, submit electronically in Procore for the Owner to review and provide written comments and/or approval.

FUNCTION CODE 150– ROADWAY DESIGN

150.1. DESIGN SURVEY

A. DEFINITIONS

1. Design Survey (15.2.1)

A design survey gathers data in support of transportation systems design. A design survey includes the research, field work, analysis, computation, and documentation necessary to provide detailed topographic (3- dimensional) mapping of a project site (e.g., locating existing ROW, surveying cross-sections or developing data to create cross-sections and digital terrain models, horizontal and vertical location of utilities and improvements, collecting details of bridges and other structures, review of ROW maps, establishing control points).

B. TECHNICAL REQUIREMENTS FOR DESIGN SURVEYS

1. Design surveys must be performed under the supervision of a RPLS currently registered with the TBPELS.

2. All control must meet the of accuracy requirements of TxDOT.

   The Surveyor shall comply with the standards of accuracy for control traverses provided in the TxDOT Survey Manual or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

3. Short traverse procedures used to determine horizontal and vertical locations must meet the following criteria:
   a. Short traverses must begin and end on horizontal and vertical ground control as described above.
   b. Required horizontal accuracy (unless otherwise stated):
      i. Bridges and other roadway structures: less than 0.1 feet.
      ii. Utilities and improvements: less than 0.2 feet.
      iii. Cross-sections and profiles: less than 1 foot.
      iv. Bore holes: less than 3 feet.
   c. Required vertical accuracy:
      i. Bridges and other roadway structures: less than 0.02 feet.
      ii. Utilities and improvements: less than 0.1 feet.
      iii. Cross-sections and profiles: less than 0.2 feet.
      iv. Bore holes: less than 0.5 feet.

C. DATA REQUIREMENTS FOR DESIGN SURVEYS

1. Planimetric DGN files must be fully compatible with the version of the MicroStation graphics program currently used by TxDOT without further modification or conversion.
2. Electronically collected and processed field survey data files must be fully compatible with TxDOT's computer systems without further modification or conversion. All files must incorporate only those feature codes currently being used by TxDOT.

3. Digital terrain models (DTMs) must be fully compatible with the version of the Bentley OpenRoads civil design system currently used by TxDOT without further modification or conversion. All DTM must be fully edited to provide a complete digital terrain model with all necessary break lines.

150.2. FIELD SURVEY

A. TASKS TO BE COMPLETED

Design Surveys

If requested by the Owner, the Surveyor shall perform one or more Design Surveys. Design Survey tasks include the following:

1. Collect data to create cross-sections and DTMs.
2. Locate existing utilities.
3. Locate existing improvements.
4. Provide details of existing bridge structures, including bridge limits, bents, columns, retaining walls, and natural ground elevations.
5. Locate details of existing drainage features including culverts, manholes, retention and detention ponds, flowlines, and associated features.
6. Locate all waters of the United States (WOTUS), including wetlands.
7. Review existing ROW maps and locate the existing ROW.
    a. Review existing ROW maps
    The Surveyor shall review ROW maps prepared by others for completeness using the current schematic and the checklist provided by the TxDOT district.
    b. Locate existing ROW
    The Surveyor shall resurvey the existing ROW where it is necessary to update or redefine ROW lines. All standard surveying procedures must be adhered to including record research, recovering existing monuments, and replacing monuments as appropriate. The Surveyor shall prepare an abstract map, preliminary map, final map, GIS graphics file, and a Surveyor's report. The final map must also include a monument table showing the property monuments that were found and set and certified by the Surveyor. The Surveyor shall prepare maps either in standard map sheets format or roll map format as requested by the Owner.
8. Locate boreholes.
9. Perform hydrographic surveys, according to details requested by the Owner
10. Verify the condition and usefulness of existing control points including verification of the values. Establish additional control as needed. Tie to other control points in the project vicinity including points established by the NGS, the Federal Emergency Management Agency (FEMA), and any other local entities as directed by the Owner.
11. Update existing control information and prepare new survey control data sheets, as directed by the Owner to be included in the construction plan set as described below:
    a. a. The Surveyor shall prepare, sign, seal, and date a survey control index sheet and horizontal and vertical control sheet(s) to be inserted into the plan set.

b. b. The survey control index sheet provides an overview of the primary project control and must include:
    i. An unscaled vicinity map showing the general location of the project in relation to nearby towns or other significant cultural features.
    ii. A scaled project map showing the extents of the project and the location of the primary control points. The map must show street networks, selected street names, control point identification, and significant cultural features necessary to provide a general location of the primary control.
    iii. A table containing the primary control point values including the point number, northing, easting, elevation, stationing, and stationing offset values.
    iv. Map annotation including a graphic scale bar, north arrow, and standard title block. The title block shall contain a section for the OWNER, city, and highway name. The title block shall also contain a section for a Texas registered engineer to sign, seal and date the sheet to include the following statement, "The survey control information has been accepted and incorporated into this PS&E." The required format of the survey control index sheet can be downloaded from the TxDOT website.
    v. In the title block under the heading "Notes", identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used, and unit of measure. The Surveyor shall include a note stating that the coordinates re State Plane and a notation specifying either grid or surface adjusted coordinates.

c. The Surveyor shall prepare horizontal and vertical control sheets providing detailed information about the construction, location, and monumentation of the primary control, which must include:
    i. An unscaled location map for each primary control point showing the location of the monument in relation to physical features located in the vicinity. The location map must include a north arrow, the monument designation, the monument northing, easting, and elevation.
    ii. Directly below the location map a text description of the monument including size, material and construction followed by a description of the location of the monument starting with the county and state followed by a description suitable to locate the monument on the ground.
    iii. Map annotation including a graphic scale bar, north arrow, and a standard title block. The title block must contain a section for the Owner, city, and highway name and contain a section for a Texas registered engineer to sign, seal and date the sheet to include the following statement, "The survey control information has been accepted and incorporated into this PS&E." The required format of the survey control index sheet can be downloaded from the TxDOT website.
    iv. In the title block under the heading "Notes", identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used,

and unit of measure. The Surveyor shall include a note stating that the coordinates are either grid or surface adjusted coordinates.

150.3. DELIVERABLES FOR DESIGN SURVEYS

The Surveyor shall prepare and submit the deliverables as specified in individual task orders for design surveys and construction surveys. The deliverables might be any combination of the following:

A. Digital terrain models (DTM) and the triangular irregular network (TIN) files in a format acceptable by the Owner.
B. Maps, plans, or sketches prepared by the Surveyor showing the results of field surveys.
C. Computer printouts or other tabulations summarizing the results of field surveys.
D. Digital files or media acceptable by the Owner containing field survey data (ASCII data files).
E. Maps, plats, plans, sketches, or other documents acquired from utility companies, private corporations, or other public agencies, the contents of which are relevant to the survey.
F. Field survey notes, as electronic copies.
G. TxDOT Form 2462 for each primary and secondary control point. This form must be submitted in printed format on letter (i.e., A-size) and submitted electronically in PDF format.
H. A digital copy of all computer printouts of horizontal and vertical conventional traverses, GPS analysis and results, and survey control data sheets.
I. All GEOPAK files and OpenRoads files.
J. Survey reports in a format requested by the Owner.

Mapping includes the geospatial data collection and mapping by means of aerial photogrammetry, terrestrial (close range) photogrammetry, terrestrial LiDAR, mobile LiDAR, and other remote sensing technologies.

A. PURPOSE

The purpose of mapping is to provide map and related data to support transportation projects including project design and other uses.

B. DEFINITIONS

1. Aerial Photogrammetry (15.3.1) – Aerial Photogrammetry means the collection and processing of photography acquired from an airborne platform to develop DGN and DTM files.
2. Terrestrial Photogrammetry (15.1.2) – Terrestrial Photogrammetry means the collection and processing of photography acquired at or near ground level to develop DGN and DTM files.
3. Airborne LiDAR (15.3.4) – Airborne LiDAR means laser scanning equipment mounted on a helicopter or other airborne platform to collect data to process for DGN and DTM files.
4. Terrestrial LiDAR (15.3.3) – Terrestrial LiDAR means laser scanning equipment operated from a stationary base on the earth's surface to collect data to process for DGN and DTM files.

5. Mobile LiDAR (15.3.4) – Mobile LiDAR means laser scanning equipment mounted on a moving vehicle operating on the earth's surface to collect data to process for DGN and DTM files.
6. UAS means Unmanned Aircraft Systems (e.g., drones).
7. UAS LiDAR means laser scanning equipment on an unmanned aerial vehicle (e.g., drones) to collect data to process for DGN and DTM files.

150.4. AERIAL MAPPING USING A NON-METRIC CAMERA AND UNMANNED AIRCRAFT SYSTEM (UAS)

Aerial mapping using an Unmanned Aircraft System (UAS) includes the collection of digital aerial imagery using either a fixed- or rotary-wing aircraft; the use of a non-metric small-format consumer-grade camera; performing relative orientation of the imagery through the collection of tie and pass points between adjacent aerial photo frames; performing a least-squares bundled absolute orientation adjustment using ground control points supplemented with airborne GPS and IMU data; and deriving data from the processed imagery including compilation of planimetric and topographic maps, creation of point cloud digital elevation model (DEM) and digital terrain model (DTM) data, and production of orthophotography as required.

The Surveyor shall provide the services of a certified Photogrammetrist or Mapping Scientist to perform or oversee the tasks under function code 150.7. The Surveyor remains ultimately responsible and shall ensure that the work is performed as required.

A. PURPOSE

The purpose of aerial mapping using UAS is to provide map and related data to support transportation projects including project design and other uses.

B. DEFINITIONS

In 150.4 and 150.5 the following definitions apply:

1. Photogrammetrist means an American Society for Photogrammetry and Remote Sensing (ASPRS) Certified Photogrammetrist with a current certification.
2. Mapping Scientist means an American Society of Photogrammetry and Remote Sensing (ASPRS) Certified Scientist-UAS with a current certification.
3. Metric Aerial Photograph means a vertical photograph taken from a manned aircraft using a large format calibrated digital metric aerial mapping camera.
4. Non-Metric aerial photograph means a vertical or oblique photograph taken from a fixed- or rotary-wing unmanned aircraft system (UAS) aircraft using a non-metric small format consumer-grade digital camera.
5. Large-format digital metric camera means a camera using charge- coupled device (CCD) or complementary metal oxide semiconductor (CMOS) technology to capture an image with a minimum final image size of 11500 by 7500 pixels.

6. Analytical triangulation means the process of developing absolute orientation parameters for individual photogrammetric stereo models through the use of image tie and pass points combined with ground control in a fully weighted least-squares bundle adjustment. Airborne GPS and IMU data may be used to reduce the number of ground control points.
7. Ground control means points established on the ground by the Surveyor and for which the Northing, Easting, and Elevation coordinates have been determined sufficient in number and geospatial distribution to allow analytical triangulation and mapping to meet the required project accuracy. Ground control can be targeted using paint or other marker material or can be non-targeted.
8. Airborne GPS/IMU – An airborne GPS receiver on-board the aircraft recording GPS and orientation data to be included in the analytical triangulation with the purpose of reducing the number of ground control points required for a metric aerial mapping task. IMU data to supplement the analytical triangulation is optional and its use is at the discretion of the Certified Photogrammetrist or Mapping Scientist.
9. KML means an uncompressed Google Keyhole Markup Language file, which is a two- or three- dimensional map showing a location on the earth.
10. KMZ means a compressed Google Keyhole Markup Language file, which is a two- or three- dimensional map showing a location on the earth.
11. DEM means digital elevation model, which is a three-dimensional DGN and/or point cloud in ASPRS LAS 1.2 file format containing all features located in the project area including features both on and above the ground surface.
12. DTM means digital terrain model, which is a three-dimensional DGN and/or point cloud in ASPRS LAS 1.2 format containing only features located on the ground surface.
13. Field Check means a ground survey validation of the deliverable map product with the purpose of ensuring that the required mapping accuracy has been met.
14. Flight Map means a map depicting the flight line and ground control layout over the project area.
15. Low Altitude Metric Aerial Photography means a metric aerial photography with a nominal ground pixel size of 5 cm or less.
16. DGN means a two or three-dimensional graphics file produced using Bentley MicroStation. The file may contain features and improvements plotted in a horizontal plane along the N and E axes which correspond to the Texas Coordinate System. The file may contain 2D or 3D elements representing topographic, existing, proposed, schematic, and general layout features.
17. Medium Altitude Photography means aerial photography with a film photo scale of 1:12,000 or a digital image with ground pixel size of 20 cm.
18. Project Photo Length means the distance over which photographs are required to be taken.

C. PROCEDURE FOR AERIAL MAPPING USING A NON-METRIC CAMERA AND UNMANNED AIRCRAFT SYSTEM (UAS)

1. Ground Control

The positioning and density of ground control is at the discretion of the Photogrammetrist or Mapping Scientist. Ground control is required to be sufficient to meet the accuracy standard required for the final mapping products. The Photogrammetrist or Mapping Scientist must determine the approximate position for ground control points. The Surveyor shall locate and mark the ground control points in the field using surveying methods.

2. Aerial Photography

The Photogrammetrist or Mapping Scientist must acquire digital aerial photography using a non-metric small-format consumer-grade digital camera. The Photogrammetrist or Mapping Scientist is responsible for ensuring that all imagery acquisition requirements including all flight parameters are met such that the imagery is suitable for intended use.

3. Analytical Triangulation

The Photogrammetrist or Mapping Scientist must process the non-metric digital aerial photography, ground control, and airborne GPS/IMU data (if collected) to develop an absolute orientation of the imagery suitable for map compilation at the required accuracy.

4. Aerial Mapping

The Photogrammetrist or Mapping Scientist must prepare the following:

a. A two-dimensional DGN file containing planimetric map features.
b. A three-dimensional DGN file containing DTM features.

5. Orthophotography

The Photogrammetrist or Mapping Scientist must provide orthorectified aerial imagery covering the project area.

D. TECHNICAL REQUIREMENTS

1. Aerial mapping using a non-metric camera UAS must be performed under the direct supervision of an ASPRS Certified Photogrammetrist or Certified Mapping Scientist-UAS.
2. Aerial mapping using a non-metric camera and UAS must be performed in compliance with the TxDOT Unmanned Aircraft System (UAS) Flight Operations and User's Manual.
3. Unless otherwise stated, aerial mapping must meet or exceed the requirements for ASPRS Class 1 mapping at a 1 inch = 40 feet equivalent scale with a one-foot indicated contour interval.

E. DATA REQUIREMENTS

1. Planimetric DGN files must be fully compatible with the Owner's current Bentley MicroStation version graphics program without further modification or conversion.
2. Electronically collected and processed field survey data files must be fully compatible with the Owner's computer systems without further modification or conversion. All files must incorporate only those feature codes currently being used by the Owner.

3. DTM must be fully compatible with the current version of Bentley OpenRoads civil design system used by the Owner without further modification or conversion. All DTM must be fully edited to provide a complete digital terrain model with all necessary break lines.
4. File features and level structure must be in accordance with the Owner's current photogrammetry mapping legend.
5. Minimum text size is 0.1 inches when plotted at a scale of 1 inch = 40 feet.

F. DELIVERABLES FOR AERIAL MAPPING USING A NON-METRIC CAMERA AND UNMANNED AIRCRAFT SYSTEM (UAS)

The Photogrammetrist or Mapping Scientist must submit the following:

1. Digital orthophotography uploaded to Owner's file management system in Tagged Image File format (TIF) compatible with Bentley MicroStation software and including georeferenced world files.
2. A photo index map in DGN and KMZ format showing the location of each digital image frame. The index map must be overlaid on a base map to provide general location information.
3. An orthophoto index map in DGN, KMZ, and PDF format showing the location of each orthophoto panel. The PDF format index map must be overlaid on a base map to provide general locational information.
4. An analytical triangulation report signed and sealed by the Photogrammetrist or Mapping Scientist providing a narrative of the aerial photography project and processing results. The report must include the number of flight strips, overall number of photo frames, the number of ground control points used, the use of airborne GPS and IMU data, and the results of the fully weighted least-squares bundled adjustment. The Photogrammetrist or Mapping Scientist must include a description and results of the analytical triangulation.
5. DGN files for the planimetric and DTM mapping.

150.5. FIELD CHECK SURVEY FOR AERIAL MAPPING USING UAS

Field checking of aerial mapping projects involves surveying a statistical sampling of discreet features shown on the map. It is a collaborative effort between the Photogrammetrist or Mapping Scientist-UAS and the Surveyor to validate that the map derived photogrammetrically meets the required accuracy standard. Because not all features shown on the map are good candidates for checking, it is necessary for the Photogrammetrist or Mapping Scientist to select discreet and unambiguous points that can then be surveyed and effectively evaluated between both the photogrammetric and field survey data sets.

The Photogrammetrist or Mapping scientist-UAS will provide a minimum of twenty 20 check point locations randomly distributed throughout the mapping area. The descriptions of the points must be sufficient to eliminate any ambiguity of the exact point to be surveyed.

A. PURPOSE

The purpose of a field check for aerial mapping is to validate that map accuracy requirements have been met.

B. DEFINITIONS

In 150.8, the following definition applies:

Check Point – A randomly distributed point captured in the DGN mapping file selected by the Photogrammetrist or Mapping Scientist and provided to the Surveyor to be used to verify that the mapping accuracy requirement has been met.

C. PROCEDURE TO FIELD CHECK SURVEY FOR AERIAL MAPPING USING MANNED AIRCRAFT OR UAS

1. The Photogrammetrist or Mapping Scientist-UAS must prepare and provide the Surveyor a listing of points to be validated in the field. Sufficient detail and description of the point is required to eliminate the possibility of a misidentification of the point during the field survey. A minimum of 20 horizontal and 20 vertical check points are required. Any single point can be used for both horizontal and vertical data as appropriate. A check point must not be part of the analytical triangulation least-squares adjustment.
2. The Surveyor shall locate and measure the provided validation points on the ground using equipment and methodologies with a higher level of accuracy than the map being checked.
3. Using the results from the field survey, the Surveyor shall prepare a map accuracy assessment report detailing the results of the field check. The report must include the number of check points used, the field surveying technique used for validation, and the results of the root mean square error (RMSE) and 95% confidence computations.
4. Using the validation data provided by the Surveyor, the Photogrammetrist or Mapping Scientist must prepare a final report detailing the results of the map check. The report must include both the following Statements of Accuracy, if applicable:
    a. "This map was compiled to meet the ASPRS Standard for Class 1 map accuracy."
    b. "This map was checked and found to conform to the ASPRS Standard for Class 1 map accuracy."

D. TECHNICAL REQUIREMENTS The Surveyor shall:

1. Determine the northing, easting, and elevations of the check points provided by the Photogrammetrist or Mapping Scientist using a surveying method of greater accuracy than that used to produce the map being checked.

2. Perform RMSE and 95% confidence computations on the check points using the following methodology:

For each horizontal coordinate, the Surveyor shall subtract the Northing value of the map coordinate from the Northing value derived from the field survey and square the resulting value. The Surveyor shall perform the same operation for the Easting coordinate and then add the two squared values. The Surveyor shall repeat the procedure for each

check point. The Surveyor shall add up all the resulting squared values and divide the sum by the number of check points used (i.e., average the squares). Finally, the Surveyor shall calculate the square root of the average. The Surveyor shall report the resulting value as the RMSE value for the horizontal check point analysis. The Surveyor shall multiply the final RMSE value by 1.7308 and shall report the resulting value as the 95% confidence value for the horizontal check point analysis.

For each vertical coordinate, the Surveyor shall subtract the elevation value of the map coordinate from the elevation value derived from the field survey and square the resulting value. The Surveyor shall repeat the procedure for each check point. The Surveyor shall add up all the resulting squared values and divide the sum by the number of check point used (i.e., average the squares). Finally, the Surveyor shall calculate the square root of the average. The Surveyor shall report the resulting value as the RMSE value for the vertical check point analysis. The Surveyor shall multiply the final RMSE value by 1.96 and shall report the resulting values as the 95% confidence for the vertical check point analysis.

3. Provide the results of the RMSE and 95% confidence computations to the Photogrammetrist.

E. DATA RQUIREMENT

The Surveyor shall deliver the result of the field check as a report in PDF format.

F. DELIVERABLES

The Photogrammetrist or Mapping Scientist must provide a map accuracy assessment report detailing the methodology used and results of the map accuracy assessment.

150.6. HORIZONTAL AND VERTICAL CONTROL FOR AERIAL MAPPING

Placement and survey of horizontal and vertical control for aerial mapping establishes ground control for aerial mapping projects.

A. PURPOSE

The purpose of an aerial photography control survey is to provide ground control for aerial mapping projects.

B. DEFINITIONS

In 150.6, Aerial Photography Control Survey means reconnaissance, field work, analysis, computation, and documentation necessary to provide horizontal and vertical position of specific ground points. The ground control points are used in photogrammetric processing.

C. PROCEDURE FOR HORIZONTAL AND VERTICAL CONTROL FOR AERIAL MAPPING

The Surveyor shall:

1. Prepare and submit for approval an aerial ground control layout in DGN and KML format based on the target positions selected by the Certified Photogrammetrist. The layout must show the location of the proposed primary project control and aerial ground control points.
2. Establish and determine the horizontal and vertical coordinates of the primary project control points and aerial ground control points.
3. Place aerial ground control targets at the point location and maintain the targets until the aerial flight has been completed.

D. TECHNICAL REQUIREMENTS

1. Aerial photography control surveys must be performed under the direct supervision of a RPLS currently registered with the TBPELS.
2. The horizontal and vertical coordinates of the aerial control points must be based on acceptable methods, conducted by the Surveyor, and must meet the standards of accuracy as set forth below:

   Survey Level 3 accuracy, as described in the TxDOT Survey Manual, latest edition, or the equivalent level of accuracy described in the TSPS Manual of Practice for Land Surveying in the State of Texas.

E. DATA REQUIREMENT

The Surveyor shall perform post processing of field data, which will be reviewed by the Owner. Data processed by standard calculators, computers, and other business hardware and software normally maintained and used by the Surveyor will be considered acceptable.

F. DELIVERABLES

The Surveyor shall submit the following:

1. A final aerial control point layout in DGN and KML format showing the location of the primary control and target points labeled with their respective alpha-numeric designation.
2. A plot and computer graphics of a B-size index map showing an overall view of the project and the relationship of primary monumentation and control used in the preparation of the project, signed and sealed by a RPLS, and as directed by the Owner.
3. A plot and computer graphics of a B-size horizontal and vertical control sheet showing the primary survey control monumentation used in the preparation of the project, signed and sealed by a RPLS, and as directed by the Owner.
4. An A-size data sheet for each aerial ground control point, which must include a location sketch, a physical description of the point, surface coordinates, elevation, and datums used.
5. Graphics files and scanned images of the control data sheets, uploaded to Owner's file management system.
6. A written statement describing the datum used along with copies of all relevant NGS and data sheets.

7. A written tabulation of all aerial control points with their respective alphanumeric designations and horizontal and vertical coordinates.

150.7. HORIZONTAL AND VERTICALCONTROL

This includes the establishment of horizontal and vertical control for survey projects.

A. OVERVIEW OF HORIZONTAL AND VERTICAL CONTROL

A horizontal control survey is performed for the purpose of placing geographic coordinates of latitude and longitude on permanent monuments for referencing lower levels of surveys. A projection is used to place the coordinates on a plane of northing and easting values for simplified measurements. Scale and elevation factors are applied to make the distance measurements applicable to the exact location on the working surface and the type of projection chosen is an "equal angle" type.

A vertical control survey is performed for accurately determining the orthometric height (elevation) of permanent monuments to be used as benchmarks for lower quality leveling. Spirit leveling is the usual method of carrying elevations across country from "sea level" tidal gauges. However, Global Positioning System (GPS) can be used indirectly but with less accuracy. Height measurements from the ellipsoid (as opposed to the "sea level" geoid) can be determined very accurately with GPS and only GPS. Trigonometric leveling, with a total station, is not acceptable for vertical control work.

B. DEFINITIONS

1. BM means benchmark, which is a relatively permanent object whose elevation above or below an adopted datum is known.
2. CORS means continuously operating reference station, which is a network of the highest quality horizontal stations, forming the National Spatial Reference System (NSRS).
3. Control Survey means a survey providing positions (horizontal or vertical) of points to which supplemental surveys are adjusted.
4. Datum means a mathematical model of the earth designed to fit part or all of the geoid.
5. Datum Point Rod or Deep Rod Monument means a monument driven to refusal by a power driver, used for major project control.
6. GPS means the Global Positioning System, which is based on a constellation of 24 satellites orbiting the earth at a very high altitude.
7. Horizontal Control Survey means placing geographic coordinates of latitude and longitude on permanent monuments.
8. Level 1 survey means RFP, CORS or major control densification.
9. Level 2 Survey means primary project control.
10. Level 3 Survey means secondary project control.
11. NGS – National Geodetic Survey
12. Type II Monument means a disk driven onto a length of 5/8-inch rebar with the hole filled flush with concrete.

13. Vertical Control Surveys means a survey performed for accurately determining the orthometric height (elevation) of permanent monuments to be used as benchmarks for lower quality leveling.

C. PROCEDURE FOR HORIZONTAL AND VERTICAL CONTROL

1. The Surveyor shall establish horizontal and vertical control points, including offsite points. The Surveyor shall prepare signed survey control data sheets, a survey control index sheet, and a composite layout of the horizontal and vertical controls, and as directed by the Owner.
2. The Surveyor shall update existing control information and prepare new survey control data sheets, as directed by the Owner, to be included in the construction plan set as described in Item 150.11, D.

D. TECHNICAL REQUIREMENTS FOR HORIZONTAL AND VERTICAL CONTROL

The Surveyor shall adhere to the following technical requirements.

1. Horizontal and vertical controls must be performed under the supervision of a RPLS currently registered with the TBPELS.
2. Horizontal ground control used for design surveys and construction surveys, furnished to the Surveyor by the Owner, or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by the Owner.
   The Surveyor shall comply with the standards of accuracy for horizontal control traverses, as described in the TxDOT Survey Manual or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.
3. Vertical ground control used for design surveys and construction surveys, furnished to the Surveyor by the Owner or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by the Owner.
   The Surveyor shall comply with the standards of accuracy for vertical control traverses, as described in the TxDOT Survey Manual or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.
4. Monuments
   The Surveyor shall install survey monuments for a horizontal and vertical control survey that are reasonably permanent and substantial. The monuments shall be easily identified and afforded reasonable protection against damage and or destruction.
   a. Offsite primary control points whether set by GPS or conventional survey methods must be set in pairs approximately 2000 feet apart outside of the project on side roads. Offsite points must be constructed approximately every 2 miles and set approximately 6 inches below natural ground and must be inter-visible between each pair of points.
   b. Secondary control points must be set approximately 6 inches below ground at a maximum distance of 1,500 feet apart.
5. Side shots or short traverse procedures for total stations used to determine horizontal and vertical locations must meet the following criteria:
   a. Short traverses and instrument setups for side shots must begin and end on horizontal and vertical ground control as described above.

b. Standards, procedures, and equipment (e.g., GPS Equipment, LiDAR, Total Stations) used must be such that horizontal locations relative to the control can be reported within the specification to allow the engineer to accurately create the design to the following limits:
    i. Bridges and other roadway structures: less than 0.02 feet.
    ii. Utilities and improvements: less than 0.2 feet.
    iii. Cross-sections and profiles: less than 0.2 feet.
    iv. Bore holes: less than 0.5 feet.
c. Standards, procedures, and equipment (e.g., GPS Equipment, LiDAR, Total Stations) used must be such that vertical locations relative to the control may be reported to within 0.02 feet.

6. The Surveyor shall update existing control information and prepare new survey control data sheets, as directed by the Owner, to be included in the construction plan set as described below:
    a. The Surveyor shall prepare, sign, seal, and date a survey control index sheet and horizontal and vertical control sheets to be inserted into the plan set.
    b. The Surveyor shall prepare a survey control index sheet that provides an overview of the primary project control and must include:
        i. An unscaled vicinity map showing the general location of the project in relation to nearby towns or other significant cultural features.
        ii. A scaled project map showing the extents of the project and the location of the primary control points. The map must show street networks, selected street names, control point identification, and significant culture features necessary to provide a general location of the primary control.
        iii. A table containing the primary control point values including the point number, northing, easting, elevation, stationing, and stationing offset values.
        iv. Map annotation including a graphic scale bar, north arrow, and standard TxDOT title block. The title block must contain a section for the district name, city, and highway name. The title block must also contain a section for a Texas registered engineer to sign, seal, and date the sheet to include the following statement, “The survey control information has been accepted and incorporated into this PS&E”.
        The Surveyor shall download the required format of the survey control index sheet from the TxDOT website.
        v. In the title block under the heading “Notes”, identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used, and unit of measure. The surveyor shall include a note stating that the coordinates are State Plane and a notation specifying either grid or surface adjusted coordinates.

E. DATA REQUIREMENTS

The Surveyor shall perform post processing of field data, which will be reviewed by the Owner. Data processed by standard calculators, computers, and other business hardware and software normally maintained and used by the Surveyor will be considered acceptable.

F. TASKS TO BE COMPLETED

The Surveyor shall perform the following tasks:

1. The Surveyor shall establish horizontal and vertical control points, including offsite points. The Surveyor shall prepare signed survey control data sheets, a survey control index sheet, and a composite layout of the horizontal and vertical controls, or as directed by the Owner.
2. The Surveyor shall set primary offsite control points in pairs, approximately 2 miles apart outside of the project area.
3. The Surveyor shall set secondary control points approximately 6 inches below ground at a maximum distance of 1,500 feet apart.
4. The Surveyor shall establish horizontal and vertical control from the TxDOT Virtual Reference Station (VRS) Network, or as directed by the Owner.
5. The Surveyor shall tie and tabulate horizontal and vertical control to other control points and datums in the vicinity established by other sources such as the National Geodetic Survey (NGS), the Federal Emergency Management Agency (FEMA), TxDOT VRS Network, or as directed by the Owner.

G. DELIVERABLES

The Surveyor shall provide the following:

1. A B-size plot and MicroStation graphics files of the index map showing an overall view of the project and the relationship of the primary monuments and control points established for the project, signed and sealed by a registered professional land surveyor (RPLS), or as directed by the Owner.
2. One A-size data sheet for each control point which shall include, but need not be limited to, a location sketch, a physical description of the point, surface coordinates, the elevation, and the datum used.
3. Graphics files and scanned images of the control data sheets uploaded to Owner's file management system.
4. A written statement describing the datum used, signed and sealed by a RPLS, along with copies of all relevant NGS and TxDOT data sheets.

FUNCTION CODE 160(160) - ROADWAY DESIGN

ROADWAY DESIGN CONTROLS

160.10. Pavement Design.

The Engineer shall prepare pavement designs for this project in accordance with the latest edition of TxDOT's Pavement Manual. Proposed pavement designs include permanent pavement, interim

condition transition pavement, and temporary detour pavement. The latest edition of TxDOT's Pavement Manual may be accessed at http://www.txdot.gov/business/resources.html.

The Engineer shall perform a subsurface exploration program consisting of soil borings, rock coring, and coring for pavement removal items. The Engineer shall coordinate with the Owner to determine the location of soil borings to be drilled along the roadway alignments. The soil borings shall extend 15 feet below the existing pavement surface elevation, unless practical refusal in intact rock is encountered shallower but shall not be less than 7 ft below the existing pavement surface. Spacing of soil borings shall not exceed 500 feet. The subsurface exploration program shall also include dynamic cone penetration (DCP) testing of the existing flexible base, subbase, and subgrade strata to depths of at least 24 inches below the existing pavement surface. The Engineers shall call 811 and the City of Kyle Public Works Department (512-262-3024) for utility information prior to digging. Traffic control is required for any work that is performed for geotechnical borings and investigations within the right-of-way limits.

All soil testing must be performed in accordance with TxDOT's Test Procedures, which are available at https://www.txdot.gov/business/resources/testing.html. American Society for Testing Materials (ASTM) test procedures may be used only in the absence of the TxDOT procedures. All soil classification must be done in accordance with the Unified Soil Classification System.

The Engineer shall submit a signed and sealed pavement design report to the Owner. The pavement design report must be reviewed and approved by the Owner prior to its implementation. The pavement design report must document assumptions and design considerations. The pavement design report must include the following:

- Cover sheet with roadway name, geographical limits, and signatures of persons involved in the preparation and approval
- Existing and proposed typical sections
- Soils map of the project area with a brief description of each type of soil located within the project area
- Design input values and output
- Conclusion consisting of recommended pavement design or designs based on the data, analyses, and procedures included in the report.
- Pavement design details specified for each location that includes structural layer materials, general specifications, and layer thicknesses
- Relevant pavement evaluation data (structural and functional) and condition information on adjacent roads
- Site conditions that might influence the design and performance of pavements
- Relevant geotechnical data and drainage requirements including boring logs, laboratory soil test results, active or passive drainage system design, ground penetrating radar (GPR) data, falling weight deflectometer (FWD) data, dynamic cone penetrometer (DCP) data, pavement coring and report log (up to 5-foot depth), and soil classifications with Atterberg limits
- Results of the field explorations and testing of pavement sections
- Recommended pavement rehabilitation methods and designs for new pavements

- Design criteria used in determining pavement designs, including traffic loads, pavement material characterization, environmental conditions, and pavement design life
- Design summary from the program used to design (e.g., FPS 21, DARWin, TxCRCP - ME, MODULUS 6.1)
- Life-cycle cost analysis, as required by TxDOT's Pavement Manual, including the periods for resurfacing, reconstruction, and other rehabilitation measures and what these activities are likely to entail
    - Traffic control plans required for subsurface geotechnical and pavement investigations
- Other considerations used in developing the pavement designs, including subgrade preparations and stabilization procedures

FUNCTION CODE 160(163) - ROADWAY DESIGN

MISCELLANEOUS (ROADWAY)

The Engineer shall provide the following services:

163.1. Utility Engineering

Utility Engineering includes the identification of utility conflicts, coordination, compliance with the TAC, and resolution of utility conflicts. The Engineer shall coordinate all activities with the Owner to facilitate the orderly progress and timely completion of the project design phase.

A. Utility Engineering Activities

1. Utility Layout (Roll Plot):

The Utility Engineer must maintain a utility layout (Roll Plot) in the current approved version of OpenRoads Civil Design system used by the Owner. This layout must include all existing utilities which are to remain in place or be abandoned, and all adjusted utilities. This layout must be utilized to monitor the necessity of relocation and evaluate alternatives. The Utility Engineer must utilize the layout of existing utilities as prepared, if available, and make a determination of the following:

a. Facilities in conflict with the proposed project that are to be relocated.
b. Facilities to be removed or abandoned in place.
c. Facilities that are going to be moved underground.
d. Facilities that an exception will be applied.
e. Facilities to remain in service and in place because of roadway design adjustments and meeting the current TAC.
f. If there are additional facilities, not shown in the SUE documents, which require relocation, the Engineer shall coordinate this information with the Owner immediately upon discovery.

B. Review of Utility's Proposed Alignments

1. Evaluate relocation alignments: The Utility Engineer must evaluate relocation alignments in the adjustment of utilities balancing the needs of both the Owner and the Utility.
2. Review estimates: The Utility Engineer must review the utility adjustment estimates for reasonableness of cost.

C. The Engineer shall not provide services under this contract that are for the sole benefit of a party or parties other than the Owner. The Engineer shall not invoice the Owner for any such services.

D. Utility Engineering VFP

The Utility Engineer must:

1. Identify potential conflicts using the AMA process, the design, and SUE.
    a. Avoid – work with designers to avoid conflicts.
    b. Minimize – Cost analyzed of safe available options to minimize cost and project delay.
2. Document all activities.
3. Track all ROW acquisitions to assist with scheduling accommodations.
4. Review documentation and justifications for Utility Exceptions.

E. Deliverables:

The Engineer shall submit the following deliverables to the Owner:

1. Identification of utility conflicts.
2. Composite DGN file showing all utilities with abandoned, removed, and added utilities.
3. Documentation showing review of engineering plans created by utility owners to ensure compliance with UAR, Buy America, etc.
4. Scheduling of accommodation to minimize issues (downtime, etc.) while maximizing the use of resources (e.g., Traffic Control) in a manner consistent with overall project timelines.
5. Documentation showing that exceptions were reviewed for viability.

163.3. Geotechnical Borings and Investigations

A. The Engineer shall determine the location of proposed soil borings for bridge design, embankment settlement analysis, retaining walls, slope stability and along storm drain alignment in accordance with the latest edition of TxDOT's Geotechnical Manual. The Owner will review and provide comments for a boring layout submitted by the Engineer showing the general location and depths of the proposed borings. Once the Engineer receives the Owner's review comments, the Engineer shall perform soil borings (field work), soil testing, and prepare the boring logs in accordance with the latest edition of TxDOT's Geotechnical Manual and the local TxDOT district's procedures and design guidelines.
B. All geotechnical work must be performed in accordance with the latest version of TxDOT's Geotechnical Manual. All testing must be performed in accordance with TxDOT's Test

Procedures, which are available at https://www.txdot.gov/business/resources/testing.html. American Society for Testing Materials (ASTM) test procedures may be used only in the absence of the TxDOT procedures. All soil classification must be done in accordance with the Unified Soil Classification System.

C. If applicable, the Engineer shall perform any retaining wall analyses including the settlement analysis. This analysis must include the computation of the factor of safety for bearing capacity, global stability, overturning and sliding. In addition, the Engineer shall include allowable bearing pressure, passive earth pressure, friction factor, settlement analysis (consolidation report), and lateral earth pressure for the retaining walls.

D. If applicable, the Engineer shall perform soil borings, coring for pavement removal items, piezometric readings, testing and analysis to include slope stability analysis, settlement analysis, and foundation design recommendations along storm drain alignment, retaining walls, overhead sign structures, bridges, embankments and any temporary soil retaining systems.

E. The Engineer shall provide a signed, sealed, and dated geotechnical report that contains soil boring locations, boring logs, laboratory test results, generalized subsurface conditions, ground water conditions, piezometer data, analyses and recommendations for settlement and slope stability of the earthen embankments, skin friction tables and design capacity curves including skin friction and point bearing. The skin friction tables and design capacity curves must be present for piling and drilled shaft foundation.

F. If applicable, the Engineer shall perform scour analysis to include Grain Size distribution curves with D50 value.

G. The Engineer shall sign, seal, and date soil boring sheets to be used in the PS&E package. The preparation of soil boring sheets must be in accordance with TxDOT's District standards.

H. Foundation Studies: The Engineer shall coordinate with the Owner to determine the location of soil borings to be drilled along the retaining wall alignments. The soil borings must extend a minimum of 35 feet below the footing elevation or deeper as soil conditions warrant. Spacing of soil borings shall not exceed 500 feet. The Engineer shall provide a boring layout for the Owner's review and comment.

I. The Engineer shall incorporate soil boring data sheets prepared, signed, sealed, and dated by the geotechnical engineer overseeing the work. The soil boring sheets shall be in accordance with the WINCORE software available on the TxDOT website.

J. Pavement Design: If applicable, the Engineer shall incorporate the pavement design developed by the Owner. If the pavement design is not available, the Owner may request the Engineer perform pavement design and submit to Owner for review and approval.

K. Deliverables

1. Preliminary Pavement Design Report
2. Geotechnical Report
3. DGN flies containing drilling log data from Geotechnical analysis

ATTACHMENT B
FEE SCHEDULE
Method of Payment:
LUMP SUM AND UNIT COSTS

PROJECT NAME: FM 150 (Center Street)

PROJECT LIMITS: Veterans to Burleson

TASK DESCRIPTION	Prime	Raba Kistner	Binkley & Barfield	TOTAL COSTS BY FC
FEASIBILITY STUDIES (FC 102 (102))	$ 146,966.00	$ -	$ -	$ 146,966.00
SOCIAL, ECONOMIC AND ENVIRONMENTAL STUDIES AND PUBLIC INVOLVEMENT (FC 120 (120))	$ 85,570.00	$ -	$ -	$ 85,570.00
RIGHT-OF-WAY DATA (FC 130 (130))	$ 61,740.00	$ -	$ -	$ 61,740.00
MANAGING CONTRACTED/DONATED PE (FC 145 (145,164))	$ 38,790.00	$ -	$ -	$ 38,790.00
DESIGN SURVEY (FC 150 (150))	$ 56,630.00	$ -	$ -	$ 56,630.00
ROADWAY DESIGN CONTROLS (FC 160(160))		$ 14,900.00	$ -	$ 14,900.00
MISCELLANEOUS ROADWAY (FC 160 (163))	$ 8,695.00	$ -	$ -	$ 8,695.00
SUBTOTAL LABOR EXPENSES	$ 398,391.00	$ 14,900.00	$ -	**$ 413,291.00**
DIRECT EXPENSES (FC 130,FC 150.5, FC 164)	$ 6,172.70	$ 2,800.00	$ 7,614.07	**$ 16,586.77**
UNIT COST EXPENSES (FC 130, FC 164)	$ -	$ 9,810.00	$ 48,970.00	**$ 58,780.00**
TOTAL	$ 404,563.70	$ 27,510.00	$ 56,584.07	**$ 488,657.77**
	82.8%	5.6%	11.6%	100%

SUMMARY		
TOTAL LABOR COSTS FOR PRIME PROVIDER	$ 398,391.00	$ 398,391.00
NON-SALARY (OTHER DIRECT EXPENSES) FOR PRIME PROVIDER	$ 6,172.70	$ 6,172.70
SUBCONTRACTS (includes labor costs, direct expenses and unit cost)	$ 84,094.07	$ 84,094.07
GRAND TOTAL		**$ 488,657.77**

Prime

PROJECT NAME: FM 150 (Center Street)
PROJECT LIMITS: Veterans to Burleson

TASKS	SHTS	Vice President	Project Manager	Project Engineer	E.I.T. / Designer	Administrative Assistant	Survey Manager	Project Surveyor	S.I.T. / Survey Technician	Survey Crew (4 person)	Survey Crew (3 person)	Sr. Env Scientist	Biologist III	Biologist - Senior	Archeologist-Principal Investigator	Archaeologist I/II	Archaeologist III	Historian	GIS Technician	TOTAL HOURS	TOTAL COST
		$375.00	$280.00	$200.00	$150.00	$130.00	$320.00	$250.00	$165.00	$310.00	$255.00	$300.00	$140.00	$195.00	$161.00	$123.00	$99.00	$213.00	$120.00		
FC 102 (102) Feasibility Studies																					
110.1 Schematic Design Work Outline																					
Coordinate with city to finalize alignment and typical sections		2	2	4	8															16	$ 3,310.00
Develop electronic submittal of all design and reference files			1	2	4															7	$ 1,280.00
Develop alignment alternatives to minimize impacts, damages, and displacements			4	4	8															16	$ 3,120.00
110.2 Schematic Design - General Tasks																					$ -
A. ROW Property Base Map																					$ -
Update schematic with surveyed ROW				1	2															3	$ 500.00
Develop ROW base maps with property owner, utilty, and easement information			1	1	4															6	$ 1,080.00
B. Typical Sections																					$ -
Develop existing typical sections				1	4															5	$ 800.00
Develop proposed typical sections			1	2	8															11	$ 1,880.00
C. Environmental Constraints																					$ -
Evaluate and document impacts to environmentally sensitive sites												8	8		16					32	$ 6,096.00
D. Drainage																					$ -
Develop preliminary drainage report		2	4	24	8															38	$ 7,870.00
Locate drainage outfalls and determine size of existing culverts and storm sewer			1	2	4															7	$ 1,280.00
Develop existing hydrology computations			2	4	8															14	$ 2,560.00
Determine existing hydraulics including ditch and culvert water surface elvations			1	2	8															11	$ 1,880.00
Identify impacts to abutting properties		1	1	1	2															5	$ 1,155.00
Develop preliminary storm drain design model		1	2	8	20															31	$ 5,535.00
Develop preliminary detention design model			2	8	16															26	$ 4,560.00
Develop proposed storm drain and culvert hydraulic computations			1	4	8															13	$ 2,280.00
Develop overall drainage area map			1	4	8															13	$ 2,280.00
Develop sub drainage area maps			1	4	12															17	$ 2,880.00
Develop storm water and detention roll plot layout			1	4	16															21	$ 3,480.00
Coordinate with TxDOT H&H engineer for drainage model approvals		2	4	4																10	$ 2,670.00
E. ROW Requirements																					$ -
Determine ROW Requirements			1	2	4															7	$ 1,280.00
F. Design Exceptions																					$ -
																					$ -
																					$ -
G. Traffic Data and Projections - Excluded																					$ -
H. Traffic And Operaitonal Analysis																					$ -
Corridnate Traffic Study preapared with PER with TxDOT			2	4	8															14	$ 2,560.00
I. Safety Analysis - Excluded																					$ -
J. Traffic Warrant Studies																					$ -
Complete traffic warrant studies (2 total)			8	16	32															56	$ 10,240.00
K. Bicycle and Pedestrian Accommodations																					$ -
Evaluate City of Kyle planned improvements for bicycle and pedestrian accomodations		1	1	2	8															12	$ 2,255.00
Develop sidewalk and trail design in accordance with City design requirements			2	4	8															14	$ 2,560.00

Prime

PROJECT NAME: FM 150 (Center Street)
PROJECT LIMITS: Veterans to Burleson

TASKS	SHTS	Vice President	Project Manager	Project Engineer	E.I.T. / Designer	Administrative Assistant	Survey Manager	Project Surveyor	S.I.T. / Survey Technician	Survey Crew (4 person)	Survey Crew (3 person)	Sr. Env Scientist	Biologist III	Biologist - Senior	Archeologist-Principal Investigator	Archaeologist I/II	Archaeologist III	Historian	GIS Technician	TOTAL HOURS	TOTAL COST
		$375.00	$280.00	$200.00	$150.00	$130.00	$320.00	$250.00	$165.00	$310.00	$255.00	$300.00	$140.00	$195.00	$161.00	$123.00	$99.00	$213.00	$120.00		
110.4 Geometric Design Schematics																					$ -
A. Schematic Plan View																					$ -
Develop Schematic roll plot and annotate design elements		1	2	4	16															23	$ 4,135.00
Address Comments from City, TxDOT, and Agencies (3 rounds of review)			4	16	24															44	$ 7,920.00
Develop horizontal geometry for FM 150				2	4															6	$ 1,000.00
Develop horizontal geometry for side streets				2	4															6	$ 1,000.00
Develop pavement edge, sidewalk, curbs, and misc roadway design				4	8															12	$ 2,000.00
Determine locations for proposed retaining walls and noise walls			1	2	4															7	$ 1,280.00
Develop proposed cross drainage structure geometry, alignments, and ditch grading				4	8															12	$ 2,000.00
Develop proposed striping linework				2	4															6	$ 1,000.00
Develop proposed signing design, sizing, and linework				2	4															6	$ 1,000.00
B. Schematic Profile View																					$ -
Develop existing roadway profile geometry				1	2															3	$ 500.00
Develop existing ROW profile geometry				1	1															2	$ 350.00
Develop proposed FM 150 profile geometry				2	8															10	$ 1,600.00
Develop proposed driveway profile geometry and determine construction easements				2	8															10	$ 1,600.00
Develop proposed ditch and culvert profiles				4	8															12	$ 2,000.00
Develop proposed utility profiles				2	4															6	$ 1,000.00
Develop proposed side street profile geometry				2	4															6	$ 1,000.00
110.5 Cross-Sections																					$ -
Develop existing terrain model using surveyed roadway and ditch topographical information				1	2															3	$ 500.00
Develop proposed roadway templates using Bentley OpenRoads				4	8															12	$ 2,000.00
Develop proposed roadway corridors and 3D geometry using Bentley OpenRoads			2	8	8															18	$ 3,360.00
Develop proposed ditch corridors and 3D geometry using Bentley OpenRoads			1	4	8															13	$ 2,280.00
Develop proposed intersection 3D geometry using Bentley OpenRoads			1	2	8															11	$ 1,880.00
Develop proposed side street and driveway 3D geometry using Bentley OpenRoads			1	2	4															7	$ 1,280.00
Develop cross section layouts with annotated centerlines, roadway elements, slopes, and ditch geometry				2	8															10	$ 1,600.00
Add cross culvert and utility linework to cross sections				1	4															5	$ 800.00
Calculate earthwork quantities using average end area method				2	4															6	$ 1,000.00
110.6 Retaining Walls																					$ -
																					$ -
																					$ -
110.7 Renderings and Traffic Simulation																					$ -
																					$ -
																					$ -
																					$ -
110.8 Preliminary Construction Sequence																					$ -
Develop TCP roll plots			1	2	8															11	$ 1,880.00
Develop TCP geometry for temp widening and constructed roadway/draiange elements by phase			2	8	16															26	$ 4,560.00
Develop pedestrian and bike routes during construction including detours and/or temp facilities			1	4	8															13	$ 2,280.00
Develop TCP temp striping by phase			2	4	8															14	$ 2,560.00
Develop TCP typical sections				2	4															6	$ 1,000.00
110.12 Agency Coordination and Public Involvement																					$ -
Assist in meetings with property owners, stakeholders, and various agencies (2 total meetings)			6	6																12	$ 2,880.00
Document and respond to design issues			4	2																6	$ 1,520.00
Prepare exhbits and meeting materials (2 total exhibits)			1	2	4															7	$ 1,280.00
110.14 Preliminary Cost Estimates																					$ -
Develop quantities for all proposed design elements		1	2	8	16															27	$ 4,935.00
QAQC quantity takeoffs			1	4	4															9	$ 1,680.00
Develop preliminary cost estimate		1	2	2	4															9	$ 1,935.00
Develop ROW acquisition cost estimate			1	2	2															5	$ 980.00
SUBTOTAL		12	79	236	447							8	8		16					806	**$ 146,966.00**

Prime

PROJECT NAME: FM 150 (Center Street)
PROJECT LIMITS: Veterans to Burleson

TASKS	SHTS	Vice President	Project Manager	Project Engineer	E.I.T. / Designer	Administrative Assistant	Survey Manager	Project Surveyor	S.I.T. / Survey Technician	Survey Crew (4 person)	Survey Crew (3 person)	Sr. Env Scientist	Biologist III	Biologist - Senior	Archeologist-Principal Investigator	Archaeologist I/II	Archaeologist III	Historian	GIS Technician	TOTAL HOURS	TOTAL COST
		$375.00	$280.00	$200.00	$150.00	$130.00	$320.00	$250.00	$165.00	$310.00	$255.00	$300.00	$140.00	$195.00	$161.00	$123.00	$99.00	$213.00	$120.00		
FC 120 (120) Social, Economic and Environmental Studies and Public Involvement																					
Federal Categorical Exclusion d-list (CE) Environmental Clearances												4	40	12					40	96	$ 13,940.00
Environmental Public Involvement (2 employees prepare and attend 1 meeting and 1 hearing)												2	8	8					10	28	$ 4,480.00
Community Impact Analysis												2	40	12						54	$ 8,540.00
Surface Water Analysis Form												4	40	12						56	$ 9,140.00
Species Analysis Form												4	40	12						56	$ 9,140.00
Archaeological Documentation Services												1			40	30	60		30	161	$ 19,970.00
Historic Resource identification, Evaluation, and Documentation Services												1						40		41	$ 8,820.00
Initial Site Assessment (ISA) with Hazardous Materials Project IMpact Evaulation report												4	40	12					20	76	$ 11,540.00
																					$ -
																					$ -
SUBTOTAL												22	208	68	40	30	60	40	100	568	**$ 85,570.00**
FC 130 (130) Right-of-Way Data																					
130.1 Right-Of-Ways Survey																					
H. Row Mapping																					$ -
1. ABSTRACTING (32 adjacent parcels)			1				2	16	64											83	$ 15,480.00
2. Field Surveys			1				2	16	30	60										109	$ 28,470.00
3. Property Descriptions (6 exhibits)			1				2	18	60											81	$ 15,320.00
4. ROW Map (Revise Existing)							1	2	10											13	$ 2,470.00
																					$ -
130.4 ROW Hearing Services																					
A. ROW Hearings (8 total)																					$ -
Develop color exhibits																					$ -
Prepare for hearing																					$ -
Attend virtual pre-hearing																					$ -
Attend in-person pre-hearing																					$ -
B. Expert Witness Services (8 hearings total)																					$ -
Attend and provide expert witness for eminent domain hearings (4 hours each + 2 hours commuting)																					$ -
Prepare for testimony at courthouse																					$ -
																					$ -
130.6 Utility Adjustment Coordination																					$ -
A. Utility Coordination																					$ -
i. Initial Project Meeting																					$ -
ii. Project Notification Letters																					$ -
iii. Utility Conflict Exhibits																					$ -
SUBTOTAL			3				7	52	164	60										286	**$ 61,740.00**

Prime

PROJECT NAME: FM 150 (Center Street)
PROJECT LIMITS: Veterans to Burleson

TASKS	SHTS	Vice President	Project Manager	Project Engineer	E.I.T. / Designer	Administrative Assistant	Survey Manager	Project Surveyor	S.I.T. / Survey Technician	Survey Crew (4 person)	Survey Crew (3 person)	Sr. Env Scientist	Biologist III	Biologist - Senior	Archeologist-Principal Investigator	Archaeologist I/II	Archaeologist III	Historian	GIS Technician	TOTAL HOURS	TOTAL COST
		$375.00	$280.00	$200.00	$150.00	$130.00	$320.00	$250.00	$165.00	$310.00	$255.00	$300.00	$140.00	$195.00	$161.00	$123.00	$99.00	$213.00	$120.00		
FC 145 (145,164) Managing Contracted/Donated PE																					
145.2 Project Management and Administration																					$ -
Prepare monthly progress reports		2	8																	10	$ 2,990.00
Develop and maintain project schedule			8	4																12	$ 3,040.00
Meet weekly with City PM (0.5 hrs/week for 8 months)		2	16																	18	$ 5,230.00
Complete QAQC for 50%, 90%, and Final submittals		3	6	12		3						6								30	$ 7,395.00
Conduct monthly internal design meetings		4	8	8			8					8								36	$ 10,300.00
Attend kickoff meeting																					$ -
Attend 50%, 90%, and final design review meetings		3	6	6								6								21	$ 5,805.00
Prepare monthly invoices		2	8			8														18	$ 4,030.00
																					$ -
SUBTOTAL		16	60	30		11	8					20								145	**$ 38,790.00**
FC 150 (150) Design Survey																					
1. Field Survey								2	6		70									78	**$ 19,340.00**
2. Deliverables for Design Survey		1					1	3	70											75	**$ 12,995.00**
3.Aerial Mapping Using Unmanned Aircraft System (UAS)		1						2	30											33	**$ 5,825.00**
4. Field Check Survey For Aerial Mapping Using UAS							1	2	10											13	**$ 2,470.00**
5. Horizontal and Verticle Control For Aerial Mapping								2	30		10									42	**$ 8,000.00**
6. Horizontal and Verticle Control								2	30		10									42	**$ 8,000.00**
SUBTOTAL		2					2	13	176		90									283	**$ 56,630.00**
FC 160 (163) Miscellaneous Roadway																					
163.1 Utility Engineering																					$ -
A. Utility Layout																					$ -
1 Utility Layout (Roll Plot)			2	4	16															22	$ 3,760.00
2 Utility Conflict Matrix		1	2	8	16															27	$ 4,935.00
SUBTOTAL		1	4	12	32															49	**$ 8,695.00**
LABOR TOTALS		**31**	**146**	**278**	**479**	**11**	**17**	**65**	**340**	**60**	**90**	**50**	**216**	**68**	**56**	**30**	**60**	**40**	**100**	**2,137**	**$ 398,391.00**
		1.5%	6.8%	13.0%	22.4%	0.5%	0.8%	3.0%	15.9%	2.8%	4.2%	2.3%	10.1%	3.2%	2.6%	1.4%	2.8%	1.9%	4.7%		

OTHER DIRECT EXPENSES	# OF UNITS	COST/UNIT	UNIT	
Mileage (125 miles round trip, 2 trips for 1 meeting, 1 hearing, and field surveys)	2,150	$0.56	mile	**$ 1,204.00**
Lodging/Hotel (2 employees for X trips for 1 meeting, 1 hearing, and field surveys)	4	$141.00	day/person	**$ 564.00**
Meals (2 employees for X trips for 1 meeting, 1 hearing, and field surveys)	4	$50.00	day/person	**$ 200.00**
Subconsultant Markup (Brinkley Barfield)	1	$2,829.20		**$ 2,829.20**
Subconsultant Markup (Raba Kistner)	1	$1,375.50		**$ 1,375.50**
				$ -
SUBTOTAL DIRECT EXPENSES (FC 164)				**$ 6,172.70**

UNIT COST EXPENSES	# OF UNITS	COST/UNIT	UNIT	
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
SUBTOTAL UNIT COST EXPENSES (FC 164)				**$ -**

SUMMARY

TOTAL COSTS FOR PRIME PROVIDER	$ 398,391.00
NON-SALARY (OTHER DIRECT EXPENSES) FOR PRIME PROVIDER	$ 6,172.70
NON-SALARY (UNIT COST EXPENSES) FOR PRIME PROVIDER	$ -
SUBCONTRACTS (includes labor costs, direct expenses, and unit costs)	$ 84,094.07
GRAND TOTAL	**$ 488,657.77**

Raba Kistner

PROJECT NAME: FM 150 - City of Kyle Schematic and PS&E
PROJECT LIMITS: Station 09+53 to 31+74

	TASKS	SHTS	PRINCIPAL	PROJECT MANAGER	SENIOR ENGINEER	ENGINEER	EIT	SR. ENGR. TECH.	ENGR. TECH.	ADMIN	TOTAL HOURS	TOTAL COST
			$ 220.00	$195.00	$185.00	$165.00	$135.00	$110.00	$100.00	$70.00		
FC 160 (160)	**Roadway Design Controls**											
	160.10 Pavement Design											
	PROJECT KICK OFF		1	1		1	1	1		1	6	$ 895.00
	BORING LAYOUT & DRILLING INSTRUCTION			1			4	4			9	$ 1,175.00
	STAKE BORINGS							6			6	$ 660.00
	UTILITIES CLEARANCE							4			4	$ 440.00
	FIELD LOGGING								12		12	$ 1,200.00
	DYNAMIC CONE PENETROMETER (DCP) TESTING								4		4	$ 400.00
	LABORATORY ASSIGNMENT					1	2				3	$ 435.00
	SOIL BORING LOGS					1	6				7	$ 975.00
	SITE PLAN					1	2	2			5	$ 655.00
	PAVEMENT DESIGN ANALYSIS			2		4	12				18	$ 2,670.00
	DRAFT GEOTECHNICAL REPORT PREPARATION		2	4		6	12			2	26	$ 3,970.00
	GEOTECHNICAL REPORT REVIEW & FINALIZATION		1	1		2	4			2	10	$ 1,425.00
SUBTOTAL			4	9		16	43	17	16	5	110	$ 14,900.00

OTHER DIRECT EXPENSES		# OF UNITS	COST/UNIT	UNIT		
	Traffic Control Services, Arrow Boards and Attenuator Truck (Medium Project)	1	$ 2,800.00			$ 2,800.00
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
SUBTOTAL DIRECT EXPENSES (FC 164)						$ 2,800.00

ATTACHMENT B
FEE SCHEDULE
Method of Payment:
LUMP SUM AND UNIT COSTS

Raba Kistner

PROJECT NAME: **FM 150 - City of Kyle Schematic and PS&E**
PROJECT LIMITS: **Station 09+53 to 31+74**

TASKS	SHTS	PRINCIPAL	PROJECT MANAGER	SENIOR ENGINEER	ENGINEER	EIT	SR. ENGR. TECH.	ENGR. TECH.	ADMIN	TOTAL HOURS	TOTAL COST
		$ 220.00	$195.00	$185.00	$165.00	$135.00	$110.00	$100.00	$70.00		
UNIT COST EXPENSES		**# OF UNITS**	**COST/UNIT**	**UNIT**							
SUBSURFACE EXPLORATION PROGRAM (6 BORINGS TO 15 FT EACH)											**$ -**
Mobilization of Drill Rig		1	$ 650.00	EACH							**$ 650.00**
3" Thin-Wall Continuous Sampling or Intermittent Sampling in Granular Soils		60	$ 19.50	FT							**$ 1,170.00**
NX Core Drilling		30	$ 35.00	FT							**$ 1,050.00**
In-Place Pavement Core (6-in. diameter)		6	$ 100.00	EACH							**$ 600.00**
Bentonite Backfill		90	$ 4.00	FT							**$ 360.00**
Pavement Surface Patch		6	$ 40.00	EACH							**$ 240.00**
Driller Cleanup		6	$ 230.00	HR							**$ 1,380.00**
											$ -
LABORATORY TESTING PROGRAM											**$ -**
Atterberg Limits		12	$ 105.00	EACH							**$ 1,260.00**
Moisture Content		36	$ 15.00	EACH							**$ 540.00**
Sieve Analysis (passing No. 4, 40, 200)		12	$ 95.00	EACH							**$ 1,140.00**
Sulfate Testing		6	$ 100.00	EACH							**$ 600.00**
Lime Series (Tex-121-E Part III)		2	$ 410.00	EACH							**$ 820.00**
											$ -
											$ -
											$ -
											$ -
											$ -
											$ -
											$ -
SUBTOTAL UNIT COST EXPENSES (FC 164)											**$ 9,810.00**

SUMMARY

TOTAL COSTS FOR SUBCONSULTANT 1	$ 14,900.00
NON-SALARY (OTHER DIRECT EXPENSES) FOR SUBCONSULTANT 1	$ 2,800.00
NON-SALARY (UNIT COST EXPENSES) FOR SUBCONSULTANT 1	$ 9,810.00
GRAND TOTAL	**$ 27,510.00**

ATTACHMENT B
FEE SCHEDULE
Method of Payment:
LUMP SUM AND UNIT COSTS

Binkley & Barfield

PROJECT NAME: **FM 150 - City of Kyle Schematic and PS&E**
PROJECT LIMITS: **Station 09+53 to 31+74**

TASKS	SHTS	Principal	Sr. PM	PM	Project Engineer	Engineer in Training	Sr. Designer	Designer	Sr. CAD Operator	CAD Operator	Admin	Category	Category	TOTAL HOURS	TOTAL COST
		$318.00	$290.00	$225.00	$161.00	$127.00	$157.00	$142.00	$142.00	$117.00	$92.00	Rate ($)	Rate ($)		
LABOR TOTALS															$ -
		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		

OTHER DIRECT EXPENSES	# OF UNITS	COST/UNIT	UNIT		
FC 130.5 Utility Engineering Investigation					$ -
Lodging (without tax)	24	$98.00	Each		$ 2,352.00
Lodging Tax	24	$45.00	Each		$ 1,080.00
Meals	24	$59.00	Day		$ 1,416.00
Mileage	4,223	$0.655	Mile		$ 2,766.07
Traffic Control		$5,150.00	Day		$ -
					$ -
SUBTOTAL DIRECT EXPENSES (FC 130)					$ 7,614.07

UNIT COST EXPENSES	# OF UNITS	COST/UNIT	UNIT		
FC 130.5 Utility Engineering Investigation					$ -
SUE QL-B Designation	24,485	$2.00	LF		$ 48,970.00
SUE QL-C Pole Inventory Survey		$0.82	LF		$ -
SUE QL-A Test Holes					$ -
0 to 5 feet deep		$1,300.00	Each		$ -
5 to 8 feet deep		$1,620.00	Each		$ -
8 to 13 feet deep		$2,050.00	Each		$ -
13 to 20 feet deep		$2,700.00	Each		$ -
Vacuum Truck Mobilization		$6.25	Mile		$ -
Two (2) Designating Person with equipment		$220.00	Hour		$ -
Coring		$480.00	Each		$ -
					$ -
					$ -
SUBTOTAL UNIT COST EXPENSES (FC 130)					$ 48,970.00

SUMMARY

TOTAL COSTS FOR SUBCONSULTANT 1	$ -
NON-SALARY (OTHER DIRECT EXPENSES) FOR SUBCONSULTANT 1	$ 7,614.07
NON-SALARY (UNIT COST EXPENSES) FOR SUBCONSULTANT 1	$ 48,970.00
GRAND TOTAL	**$ 56,584.07**

ASSUMPTIONS

1 Topgraphical or other Planimetric CADD Drawings will be provided as a background to put the SUE Drawings on.
2 Client will request the TxDOT Utility Permits from TxDOT's PM and the contact information for TxDOT Electric and ITS
3 Work will be performed within the existing Right or Way, from Station 09+53 to Station 31+74
4 Work to be Done - SUE QL-B.Designation
5 Storm Drains are not to have SUE QL-B Designation