ATTACHMENT C

SERVICES TO BE PROVIDED BY THE ENGINEER

The work to be performed by the ENGINEER shall consist of providing preliminary engineering services for development of a design schematic, environmental document/studies and environmental clearance in support of the schematic work, public involvement, permit procurement, data collection analysis, drainage, conceptual traffic control, and utility conceptual design and coordination for the section of I-35 from RM 1431 to SH 45 North in Williamson County, Texas, Austin District (CSJ: 0015-09-178).

GENERAL REQUIREMENTS

1.1. Design Criteria. The ENGINEER shall prepare all work in accordance with the latest version of applicable STATE's procedures, specifications, manuals, guidelines, standard drawings, and standard specifications or previously approved special provisions and special specifications, which include: the *PS&E Preparation Manual*, *Roadway Design Manual*, *Hydraulic Design Manual*, the *Texas Manual on Uniform Traffic Control Devices* (TMUTCD), *Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges (latest Edition)*, and other STATE approved manuals. When design criteria are not identified in STATE manuals, the ENGINEER shall notify the STATE and refer to the American Association of STATE Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Street,* (latest Edition). In addition, the ENGINEER shall follow the STATE's District guidelines in developing the Plan, Specification, and Estimate (PS&E) package. The ENGINEER shall prepare each PS&E package in a form suitable for letting through the STATE's construction contract bidding and awarding process.

The ENGINEER shall identify, prepare exhibits and complete all necessary forms for each Design Exception and Waiver required within project limits prior to the 30% project completion submittal. The ENGINEER shall submit each exception and waiver to the STATE for coordination and processing of approvals. If subsequent changes require additional exceptions, the ENGINEER shall notify the STATE in writing as soon as possible after identification of each condition that may warrant a design exception or waiver.

1.2. Right-of-Entry and Coordination. The ENGINEER shall notify the STATE and secure permission to enter private property to perform any surveying, environmental, engineering or geotechnical activities needed off STATE right-of-way. In pursuance of the STATE'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 STATE prior to each entry.

The ENGINEER shall notify the STATE and coordinate with adjacent engineers on all controls at project interfaces. The ENGINEER shall document the coordination effort, and each ENGINEER shall 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 and each adjacent ENGINEER shall meet jointly with the STATE for resolution. The STATE will have authority over the

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ENGINEER's disagreements and the STATE's 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 STATE. The ENGINEER shall notify the STATE in writing prior to beginning any work on any outside agency's exhibit.

1.3. Progress Reporting and Invoicing. The ENGINEER shall invoice according to Function Code breakdowns shown in Attachment "C" of the Contract for Engineering Services and Exhibit "D" - *Fee Schedule*. The ENGINEER shall submit each invoice in a format acceptable to the STATE.

With each invoice, the ENGINEER shall include a completed Projected vs. Actual Contract Invoices form. The ENGINEER shall submit a monthly written progress report to the STATE's Project Manager regardless of whether the ENGINEER is invoicing for that month. The ENGINEER's written progress report shall describe activities during the reporting period; activities planned for the following period; problems encountered and actions taken to remedy them; list of meetings attended; and overall status, including a per cent complete by task.

The ENGINEER shall prepare a design time schedule and an estimated construction contract time schedule, using the latest version of Primavera software or any STATE's 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 STATE personnel in interpreting the schedules. The ENGINEER shall schedule milestone submittals at draft, pre-final, and final project completion phases. The ENGINEER shall advise the STATE in writing if the ENGINEER is not able to meet the scheduled milestone review date.

The ENGINEER shall prepare a letter of transmittal to accompany each document submittal to the STATE. At a minimum, the letter of transmittal must include the STATE's Control-Section-Job (CSJ) number, the highway number, County, project limits, and STATE's contract 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. 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 STATE for approval prior commencing any work on any STATE roadway. The ENGINEER shall provide all signs, flags, and safety equipment needed to execute the approved TCP. The ENGINEER shall notify the STATE in writing twenty-four (24) hours in advance of executing each TCP requiring a lane closure, and shall have received written concurrence from the STATE prior to beginning the lane closure. The ENGINEER's field crew shall possess a copy of the approved TCP on the job site at all times and shall make the TCP available to the STATE for inspection upon request. The ENGINEER shall assign charges for any required traffic control to the applicable function code.

1.5. Coordination. The ENGINEER shall coordinate issues and communications with STATE's internal resource areas through the STATE's Project Manager. The STATE will communicate the resolution of issues and provide the ENGINEER direction through the STATE's Project Manager.

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1.6. Level of Effort. 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 STATE, 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.

1.7. 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 STATE'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 STATE in advance, the STATE, 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 STATE. If, at any time, during the course of reviewing a survey submittal it becomes apparent to the STATE that the submittal contains errors, omissions, or inconsistencies, the STATE 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.

1.8. Use of the STATE's Standards. The ENGINEER shall identify and insert as frequently as is feasible the applicable, current STATE's Standard Details, District Standard Details, or miscellaneous details that have been approved for use in the plan. The ENGINEER shall sign, seal, and date each Standard and miscellaneous detail if the Standard selected has not been adopted for use in a District. The ENGINEER shall obtain approval for use of these details during the early stages of design from the STATE Project Manager or designated STATE Area Engineer. In addition, these details shall be accompanied by the appropriate general notes, special specifications, special provisions, and method of payment. The ENGINEER shall retain the responsibility for the appropriate selection of each Standard identified for use within their design.

1.11. Organization of Design Project Folder and Files (Electronic Project Files). The ENGINEER shall organize the electronic project files in accordance with the STATE's File Management System (FMS) format. The ENGINEER shall maintain the project files in the Consultant's ProjectWise container and give the STATE access to the project file.

TASK DESCRIPTIONS AND FUNCTION CODES

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

The ENGINEER shall complete the services according to the work schedule established in the Contract. The ENGINEER shall submit a written progress report to the STATE monthly indicating the actual work accomplished during the month, scheduled work to be accomplished for the month, and

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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 STATE project manager and environmental coordinator on a monthly basis or as requested by the STATE for progress tracking purposes unless prior agreement is made with the STATE not to hold a meeting in any given month. 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 and the environmental documents by STATE personnel. The ENGINEER shall present the work schedule to the STATE for review and acceptance and provide assistance in interpreting the proposed work schedule.

Each member of the ENGINEER's project team must take the following Environmental Management System (EMS) e-Learning courses prior to working on the project:

1. Environmental Management System: Awareness Training for the Contractor
2. Storm Water: Environmental Requirements During Construction

Both courses may be accessed at: http://www.txdot.gov/inside-txdot/division/environmental/ems-courses.html

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 Occupation 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.

Data Classification: Unless otherwise clearly labeled or otherwise specifically excepted through a provision of this contract or its attachments, data provided to or generated by the ENGINEER under this contract is considered public data for the purposes of applying the STATE's data security standards. The ENGINEER shall manage data and work products according to the terms of the contract, including specifically article 7.

As used throughout the scope, "ensure" means to make certain that something has happened or will happen, and includes an obligation to deploy the appropriate level of engineering or other technical expertise, consistent with the complexity, cost, and level of risk associated with a task. Ensure does not require or guarantee the completion of any task assigned to a separate entity under any other agreement.

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FUNCTION CODE 102 - FEASIBILITY STUDIES

ROUTE AND DESIGN STUDIES

The ENGINEER shall prepare an alignment and proposed roadway schematic layout to include projected traffic volumes and existing and proposed roadway, and bridge typical sections. The ENGINEER shall furnish Microsoft Office and MicroStation V8i-OpenRoads computer generated media for roadway schematic work to the STATE and shall be compatible with the software used by the STATE. Supporting attachments and exhibits shall accompany the schematic layout.

The STATE will provide existing and twenty-year projected traffic data for use in the preparation of the schematic design layout. The data shall be utilized in accordance with the requirements for schematic development and consistent with the policies of the STATE.

The ENGINEER shall perform an Analysis of Previous Design Schematics, concepts and exhibits prepared by the STATE. The ENGINEER shall then prepare preliminary drawings to identify any potential impacts within the project corridor, including impacts to the nature, cultural, and human environment. Identification should include, but not be limited to known or readily available existing and proposed utilities (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 which would avoid or minimize displacements and damages and prepare any additional attachments or exhibits required illustrating a preferred alternative alignment.

The needs of the project include the following important elements:

1. Cost Estimate
2. Construction phasing/TCP phasing with exhibits
3. Construction Schedule
4. A schematic that accommodates support facilities and ROW required to build the project
5. Identification of potential environmental impacts
6. Utility Relocation Plan
7. Technical reports

The ENGINEER shall render assistance to the STATE for agency meetings as necessary during the development of the schematic design as requested by the STATE. The ENGINEER shall also render assistance to the STATE for meetings with affected property owners (MAPOs), public meetings and a public hearing as requested by the STATE.

An itemization of the schematic design and engineering work activities to be performed under this contract is detailed below. All designs shall be prepared in accordance with the latest version of: TxDOT *Roadway Design Manual*, TxDOT *Project Development Process Manual*, *AASHTO Policy on Geometric Design of Highways and Streets*, TxDOT *Standard Specifications for Construction of Highways, Streets, and Bridges*, TxDOT *Traffic Operations Manual on Highway Operations*, *Texas Manual on Uniform Traffic Control* (TMUTCD), *Highway Capacity Manual - Transportation Research Board, TxDOT Hydraulic Design Manual, TxDOT Access Management Manual, AASHTO Guide for*

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the Development of Bicycle Facilities, AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, Public Rights-of-Way Accessibility Guidelines (PROWAG), AASHTO LRFD Bridge Design Specifications, TxDOT *Bridge Design Manual – LRFD, TxDOT Bridge Inspection Manual,* TxDOT *Geotechnical Manual, AREMA Manual for Railway Engineering, and UPRR/BNSF Guidelines for Railroad Grade Separation Projects*.

The design schematic horizontal layout will adhere to a design scale of 1 in. = 100 ft. The schematic layout, exhibits, and attachments will be developed in English units. All Microsoft Office, MicroStation, and Bentley OpenRoads computer graphic files furnished to the STATE must be submitted in electronic format by means of USB media that will be compatible to the STATE. Schematics will follow the STATE and Federal Highway Administration (FHWA) standards, the schematic will also follow the CADD standards used by the STATE and shall be submitted as an original document, accompanied with an original MicroStation V8i formatted graphics file. Final copies of the schematic design shall be signed by a professional engineer licensed in the state of Texas.

102.1 Schematic Design Work Outline

102.1.A Develop Base Maps

The base maps to be used for the analysis and proposed schematic layout shall be developed by the ENGINEER from existing construction and right-of-way (ROW) plans as available. The ENGINEER shall re-establish horizontal alignments for roadways and identify existing ROW, property owners with parcel numbers and the approximate location of major utilities based on a SUE in the preparation of base maps. The Base Maps to be prepared include: Property Base Maps, ROW Needs Base Map, Construction & TCP Phasing Base Map, and Intelligent Transportation Systems Base Map.

102.1.B Planimetrics and Aerial Mapping

Planimetrics, Digital Terrain Modeling (DTM), and aerial photographs shall be furnished to the ENGINEER by the STATE as available.

102.1.C Analyze Existing Conditions and Previous Schematic Efforts and Documentation to the Extent Practical in the Preparation of the Proposed EA.

Using collected data, available as-builts and base maps, the ENGINEER shall develop an overall analysis of the existing conditions in order to develop the schematic design. The analysis shall include, but not be limited to the following:

1. ROW determination
2. Horizontal alignment
3. Vertical alignment
4. Pavement cross slopes and pavement type
5. Soil Exploration
6. Geotechnical Testing
7. Highway - Rail Grade Crossing Studies and grade separated structures
8. Intersection design and analysis

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9. Sight distance
10. Large Guide Signs and Roadside signing
11. Level-of-service
12. Drainage
13. Traffic control and construction phasing sequence
14. Utilities
15. Intelligent Transportation Systems (ITS)

102.1.D Schematic Concepts

The ENGINEER shall identify and analyze schematic concepts to minimize potential adverse impacts, major utility conflicts, structural impediments, or exceptions to the STATE or FHWA design criteria. Major utilities include: water and waste water 24” and larger, any gas lines 10” and larger, pipelines, any electrical transmission, telecom lines of regional importance such as fiber critical to their infrastructure and large duct banks.

Concept Development:
The ENGINEER shall gather input from all stakeholders on how to improve I-35 within the corridor. The ENGINEER shall use this public input to develop potential alternatives at a conceptual level for their potential inclusion in the EA evaluation. These alternatives will be presented and refined through public input during Public Involvement with all stakeholders. Geometry and traffic models will be developed to enough level of detail to analyze each alternative for its ability to meet the Purpose and Need for the project. The alternatives identified will be described and analyzed in detail consistent with NEPA in order to meet the Purpose and Need for the roadway improvements.

The ENGINEER shall discuss and describe modal considerations and operational improvements in the alternatives section of the EA. The ENGINEER shall include a discussion of interim operational improvements planned or under construction in the project area and shall assess their effectiveness for future predicted traffic conditions. The build alternative should integrate environmental stewardship and sustainability strategies that are developed to address those problems. Stewardship and sustainability strategies may include improved service quality and quality of access to goods and services, safety, improved air quality, noise reduction, improved water quality, protection of habitat and open space, historic preservation, reduced carbon emissions, increased social equity, economic development, livability, intermodal connectivity, bicycle and pedestrian facilities, and a satisfying quality of life, consistent with the project’s Purpose and Need.

The ENGINEER shall prepare schematic level analysis, cost estimates and reports to document feasible concepts and recommendations for the locations of access ramps,

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collector-distributors, auxiliary lanes, frontage and general purpose lanes, ramp gores, retaining walls, turnarounds, managed lanes, ramp reversal analysis, and cross-street bridges.

The ENGINEER shall use OpenRoads and other design software as approved by the STATE. This information shall be used for public informational meetings, conflict resolution, feasibility analysis, aesthetic feature presentations and confirmation of design intent. All graphics shall be high-resolution and capable of being displayed or run on standard TxDOT computers.

The ENGINEER shall analyze, consider and incorporate as appropriate Bicycle-Pedestrian and Shared-Use Path (SUP) Considerations. The ENGINEER shall design a continuous SUP through the entire project limits on both sides of I-35. The SUP shall be 8' minimum width, but 10' width is preferred.

Deliverables:

102.1.D.a. Draft and Final schematic concept and preliminary cost estimate, five (5) hard copies, electronic PDF, KMZ, and native file format

102.1.E Schematic Design Considerations

The ENGINEER shall consider the following in the analysis to optimize the design:

a. Efficient use of the ROW
b. Control of Access (COA) and driveway locations
c. Roadway and intersection geometry
d. Cross Sections
e. Bicycle and pedestrian design
f. Drainage and hydraulic design
g. TCEQ Edwards Aquifer compliance / Water Quality
h. Stopping sight distance
i. Level-of-service
j. Ramp reversal Analysis
k. Traffic and signal operations
l. Construction, ROW, easement, and utility costs
m. Construction sequencing
n. Traffic control during construction including smart work zones
o. Large guide signage
p. Environmental mitigation (For example: Noise Walls, Storm Water Best Management Practices (BMPs), bat populations, etc.)
q. Bridge types, limits, and clearances
r. Widen versus replacement of existing structures

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s. Railroads (Union Pacific)
t. Interface with existing High Occupancy Vehicle (HOV) Lane, Managed Lanes, and park-and-ride facilities
u. Accommodation of future cross street expansion and or other transportation modes as described in local thoroughfare plan if applicable
v. Avoidance of utility lines if feasible and utility relocations if required
w. Impact of construction delays from utility relocations
x. Placement of sign bridge structures for Active Traffic Management

102.1.F Data Collection

The ENGINEER shall conduct field reconnaissance and collect data as necessary to complete the schematic design. Data shall include the following information. Items “1” to “7” will be obtained from the STATE, if available, while items “8” to “20” will be obtained from other agencies as required.

1. Available Corridor Major Investment Studies
2. Design data from record drawings of existing and proposed facilities
3. Existing and future design year traffic data
4. Roadway inventory information, including the number of lanes, speed limits, pavement widths and rating, bridge widths and ratings, and ROW widths
5. Aerial photos, planimetric mapping, and DTM
6. Environmental Data
7. Previously prepared roadway and drainage studies
8. Available Corridor Major Investment Studies
9. Design data from record drawings of existing and proposed facilities
10. Existing and future design year traffic data
11. Roadway inventory information, including the number of lanes, speed limits, pavement widths and rating, bridge widths and ratings, and ROW widths
12. Aerial photos, planimetric mapping, and DTM
13. Environmental Data
14. Previously prepared roadway and drainage studies
15. Adopted land use maps and plans as available
16. Federal Emergency Management Agency (FEMA) Flood Boundary Maps and Flood Insurance Studies and Models
17. TCEQ permitted facilities and associated reports
18. Public and private utility information
19. Plat research for adjacent properties as available
20. Local Major Thoroughfare Plan

102.1.G Roadway Design Criteria

The ENGINEER shall develop the roadway design criteria based on the TxDOT Roadway

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Design Manual, AASHTO Policy on Geometric Design of Highways and Streets guidelines, and other applicable guidelines as directed by the STATE. The design criteria shall 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. The pavement structure will be provided by the STATE.

Deliverables:

102.1.G.a. Draft (electronic) and Final Roadway Design Criteria, up to five (5) copies printed 8.5”x11”, and one (1) copy electronic PDF and native file format

102.1.H Preliminary Design Conference & Design Summary Report

The ENGINEER shall prepare and submit a preliminary Design Summary Report (DSR) to the STATE for review and approval and shall attend an initial Kick-Off Meeting to establish and agree on fundamental aspects and concepts and to establish the basic features and design criteria for the project. The ENGINEER shall prepare and include as an attachment to the DSR a design criteria table and stick flow diagram as outlined in a format requested by the STATE. This meeting will be coordinated with any adjacent projects to ensure continuity.

Deliverables:

102.1.H.a. Draft (electronic) and Final DSR for kickoff meeting, up to five (5) copies printed 8.5”x11”, and one (1) copy electronic PDF and native file formats

102.2 Schematic Design – General Tasks

102.2.A Typical Sections

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

Deliverables:

102.2.A.a. Draft, Pre-Final, and Final Schematic Submittals of typical sections on roll plots, five (5) hard copies, electronic PDF and native file format

102.2.B Drainage

The ENGINEER shall identify the drainage implications and impacts of the various concepts and alternatives during the Project Concept and Alternative Refinement and Screening Process. If a concept’s implementation relies on project drainage functioning correctly then a quantitative analysis needs to be performed by the ENGINEER for situations such as changing the profile of the mainlane sag to be lower, or new designs which change the drainage work performed by others. The ENGINEER shall use data

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from as-built plans and FEMA maps to locate drainage out fall(s) and to determine existing storm sewer and culvert sizes, design flows, and water surface elevations for use in the design of roadway geometry. The ENGINEER shall conduct a schematic design drainage analysis to determine and evaluate the adequacy of the ROW needed to accommodate the proposed roadway and drainage system. The drainage study shall identify the impacts to upstream, downstream and abutting properties and the 100-year floodplain due to proposed highway improvements, identify the water surface elevations for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events per Atlas 14 rainfall, identify and locate outfalls, drainage outfall descriptions, provide overall drainage area map, sub-drainage area map, storm water detention facilities, and provide a drainage report identifying the results of the study. The ENGINEER shall evaluate existing off-site drainage trunk lines as necessary before diverting flow from one location to another. The ENGINEER shall follow current directions from the STATE regarding the use of Atlas14 rainfall intensity curves. The drainage report, signed and sealed by a professional engineer, shall include applicable hydrologic and hydraulic models such as HEC-RAS, HEC-HMS, XP-SWMM, and other applicable models. The ENGINEER shall prepare a drainage report in accordance with the STATE's *Hydraulic Design Manual*.

1. Hydrologic Analysis

   The ENGINEER shall verify the effective hydrologic models developed by others and perform modifications as required. The STATE will provide files associated with previous drainage studies in their native format. The ENGINEER shall conduct a schematic design drainage analysis to verify and evaluate the adequacy of the ROW needed to accommodate the drainage features associated with the impacts from addition of the proposed work. Cross street and driveway culverts shall not be analyzed as part of this contract. Upstream detention facilities shall not be analyzed. The drainage analysis shall consider the detention facilities to not be in place unless as-built plans explicitly state design discharges.

   a. Offsite Existing Drainage Analysis

      i. The ENGINEER shall use data from previous drainage studies, as-built plans and FEMA maps to validate drainage outfalls that drain the proposed project and provide an offsite drainage area map.
      ii. The ENGINEER shall obtain existing hydrologic models and drainage studies related to the proposed project. The ENGINEER shall verify that the models reflect current pre-project conditions and make necessary revision as needed after approval from the STATE.
      iii. The ENGINEER shall verify external drainage areas from available LiDAR, previous studies, or topographic information.
      iv. The ENGINEER shall use the hydrologic models to verify that peak runoff rates and hydrographs for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events

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have been simulated.

v. The ENGINEER shall modify the hydrologic models using current HDM standards.

b. Offsite Proposed Drainage Analysis

i. The ENGINEER shall update the offsite drainage area map for existing/proposed development per TXDOT policy.

ii. The ENGINEER shall verify and perform minor modifications to the existing pre-project conditions hydrologic models to reflect necessary changes as needed based on the proposed project.

iii. The ENGINEER shall revise the external drainage areas to proposed conditions, if needed.

iv. The hydrologic models shall be used to update peak runoff rates and hydrographs for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events.

c. ROW to ROW Existing Drainage Analysis (Used for Impact Analysis)

i. Verify ROW to ROW existing drainage systems, including but not limited to Time of Concentration, drainage areas, and impervious areas developed by others.

ii. Verify hydrologic impacts at outfalls from internal existing drainage for existing outfalls.

d. ROW to ROW Proposed Drainage Analysis (Used for Impact Analysis)

i. Update ROW to ROW proposed drainage systems, including but not limited to Time of Concentration, drainage areas, and impervious areas for minor modifications.

ii. Verify and update ROW to ROW hydrologic models and determine proposed peak runoff rates and hydrographs.

2. Hydraulic Analysis and Preliminary Design Improvements

a. Culverts

i. The ENGINEER shall obtain existing hydraulic models and drainage studies. The models shall be verified that they reflect current pre-project conditions using Atlas 14 rainfall data. HEC-RAS or HY-8 shall be used as appropriate for culvert analysis and to determine overtopping.

ii. The ENGINEER shall update existing hydraulic models to proposed conditions.

iii. All bridges and bridge-class culverts shall use HEC-RAS for hydraulic analysis

b. Bridges and Bridge Class Culverts

i. The ENGINEER shall coordinate with the STATE to communicate changes in the Engineer's schematic design that could result in changes to the bridge

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analysis.

c. Major Channels and Storm Sewer Trunk Systems
   i. The ENGINEER shall obtain existing SWMM models of major channel and storm sewer trunk systems. The ENGINEER shall verify that these models reflect current pre-project conditions and shall update those models as necessary.
   ii. The ENGINEER shall verify the update to existing hydraulic models to proposed conditions and update the models for minor roadway modifications. The trunk lines of the storm sewer systems shall be analyzed. Preliminary investigations shall only include validating elevations of receiving storm sewer system for positive grade and preliminary analysis of each subsystem.
d. Conduct meetings with the STATE to discuss WSELs, Ditches, and Roadway Profiles

3. Impact Analysis, Water Quality and Floodplain Mitigation

Hydrologic Impact Analysis (mitigation): For each identified outfall, the ENGINEER shall quantify the change in peak flow rates between the existing and proposed conditions created by the project. The ENGINEER shall then determine if the overall increase in peak flow from the project compared to the peak flow in the receiving channel or storm drain system will create an adverse impact to the adjacent properties or existing storm drain systems. The ENGINEER shall evaluate peak flows for the 100-year discharge at each outfall for flow rate, velocity and water surface elevations relative to existing conditions and make any recommendations for flood mitigation and/or erosion protection required to prevent any adverse effects. If the ENGINEER determines that the project will create adverse impacts to adjacent properties, the ENGINEER shall identify potential on-site (preferred) and off-site detention locations and volumes and assess potential detention storage availability. Detention storage calculations shall be based on peak flow attenuation and not a volumetric control. The ENGINEER shall not design underground storage for either water quality management or flood detention unless there is no other feasible alternative method, or it is clearly justifiable (clearly cost effective for its entire useful life) and approved by the STATE. In addition, the ENGINEER shall also assess the hydrologic impact of the project in the 2-, 5-, 10-, 25-, 50-year storm events to the receiving system and make any recommendations for erosion protection if required. If the receiving system is to an existing storm sewer system outside of the State ROW, the ENGINEER shall address impacts to the receiving storm drain system, taking into consideration what the existing system was sized to accommodate, and make recommendations for onsite improvements as to not have an adverse impact on these systems.

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Hydraulic Impact Analysis: The ENGINEER shall perform hydraulic analysis; specifically, the ENGINEER shall determine existing water surface profiles, perform a trunk-line hydraulic grade line analysis, and compare the proposed water surface profile with the existing water surface profile both upstream and downstream of culvert, bridge or storm drain crossing I-35. The ENGINEER shall make recommendations for the proposed design which would limit any increase in water surface elevations upstream and downstream of the facility to be contained within State right-of-way. If there are conditions which cause an increase in water surface elevation outside of State right-of-way, the ENGINEER shall evaluate the potential risk to adjacent properties both upstream and downstream of the crossings. The drainage crossings shall be analyzed using the FEMA effective models or best available data. The ENGINEER shall determine the 100-year impact to the overall flood zone and, if applicable, an additional floodway analysis shall be created in order to determine if there are any floodway impacts. If a culvert, bridge or storm drain system bisects the project and no changes to the hydraulic structure are proposed, the ENGINEER shall perform a hydraulic analysis to determine if the structure meets current STATE design criteria as described in the most recent TxDOT Hydraulic Design Manual.

a. The ENGINEER shall verify and perform necessary design modifications to outfalls within the ROW.
    i. The ENGINEER shall verify and perform minor modifications to Preliminary Mitigation Plans for detention due to negative hydrologic impacts at outfalls.
    ii. The ENGINEER shall verify and perform minor modifications to preliminary structural calculations for underground detention if needed
    iii. The ENGINEER shall perform routing computation of detention based on selected sites using state approved software
b. The ENGINEER shall verify and assess fills placed within the floodplain and coordinate with the STATE for these locations.
    i. The ENGINEER shall develop cross-sections for existing and proposed.
    ii. The ENGINEER shall estimate floodplain volume gained or lost and coordinate with the STATE
c. The ENGINEER shall verify and perform minor modifications to proposed culvert, bridge, and drainage system improvement impacts.
d. The ENGINEER shall determine preliminary pump station locations, if necessary, and sizes for the following pump station locations, if needed. The ENGINEER to size pumps and wet wells, determine general intake and discharge piping routes, develop plan for maintenance access, provide preliminary plan and section views to demonstrate overall layout, and determine required setbacks and overall footprint requirements. It is not anticipated that any pumps are necessary, and the use of pumps is highly discouraged.

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e. The ENGINEER shall develop Hydraulic Data Sheets for all bridge-class culverts and bridges
f. The ENGINEER shall prepare Opinion of Probable Costs for Detention Alternatives as requested by the STATE
g. The ENGINEER shall conduct meetings with the STATE as directed on Detention Alternatives

4. Drainage Impact Analysis, Project Management and Coordination
   a. The ENGINEER shall verify and update the project impacts to upstream, downstream and abutting properties and the 100-year floodplain due to proposed highway improvements, identify the water surface elevations for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events, identify and locate outfalls, drainage outfall descriptions, provide overall drainage area map, sub-drainage area map, and storm water detention facilities needed for storm water mitigation based on increased runoff from additional impervious cover, change in drainage areas and Tc, etc.), and provide a drainage report in accordance with the STATE's *Hydraulic Design Manual*. The drainage report shall be signed and sealed by a professional engineer and include applicable hydrologic and hydraulic models such as HEC-RAS, HEC-HMS, OpenRoads Drainage, SWMM, HY-8 and other applicable models, as provided by others and updated with minor modifications as needed
   b. The ENGINEER shall lead drainage meetings

<u>Deliverables:</u>

102.2.B.a. Draft, Pre-Final and Final Submittals of Drainage Report, electronic PDF, and native file formats
102.2.B.b. Draft, Pre-Final and Final Submittals of fully-annotated hydrologic and hydraulic model(s)
102.2.B.c. Draft, Pre-Final and Final Submittals of drainage design files

102.2.C Water Quality

Portions of the project overlie the Edwards Aquifer Recharge Zone. The ENGINEER shall evaluate water quality impacts of the proposed schematic to the extent necessary to determine proposed ROW impacts. The ENGINEER shall develop and submit a preliminary Water Quality memo, signed and sealed by a professional engineer that includes requirements for storm water treatment in accordance with Texas Commission on Environmental Quality (TCEQ) requirements for total suspended solids (TSS) reduction. The ENGINEER shall:

1. Gather and review existing water pollution and abatement plans (WPAP) developed for other I-35 projects within the project limits. The STATE will provide known WPAP's in

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the project limits, the ENGINEER shall follow up with TCEQ for further WPAP data if needed.

2. The ENGINEER shall analyze the existing WPAP's in the project limits, treatment areas for the project Best Management Practices (BMP's) and validate the incorporation of the additional pavement needed for this project in the Total Suspended Solids (TSS) treatment. A geologic assessment is included in FC 120.
3. Develop exhibits which show existing BMP's and associated treated pavement areas.
4. Determine potential impacts to these existing BMP' that would result from this project. This effort shall include the identification of BMP's that must be modified, or removed and replaced and develop exhibits showing these impacts
5. Determine additional required TSS removal based on TCEQ Edwards Aquifer requirements for increased impervious cover.
6. Determine preliminary post construction water quality controls that would be required to remove a minimum of 80 percent of the incremental increase in the annual mass loading of TSS caused by the proposed project, not already accounted for in the existing WPAP's. Detailed water quality design is not included. However, the ENGINEER shall determine preliminary sizing and feasible locations for water quality controls that will be further developed during PS&E.
7. Develop exhibits which show proposed BMP's (including preliminary locations, sizes, and limits of grading), and associated treatment areas.
8. For project areas not within existing WPAP's, investigate existing site conditions from available LiDAR and survey that meet TCEQ BMP criteria and would be impacted or removed by the proposed project. These locations are generally in areas where the existing geometry meets TCEQ standards for water quality and were not permitted as TCEQ BMPs under the Edwards Aquifer Rules. The ENGINEER will determine the TSS load removed by each "de-facto" BMP. ENGINEER will provide additional TSS removal equal to or greater than the effected "de-facto" water quality treatment with the proposed improvements.
9. Develop exhibits which show these de facto BMP's and associated treatment areas. These shall not be included in the drainage report.
10. Develop a Draft Surface Water Quality Memo.
11. Develop Final Surface Water Quality Memo.
12. Hold up to three (3) coordination meetings with the STATE.

<u>Deliverables:</u>

102.1.C.a. Draft Surface Water Quality Plan
102.1.C.b. Final Surface Water Quality Plan
102.1.C.c. Draft Water Quality Memo
102.1.C.d. Final Water Quality Memo
102.1.C.e. Three (3) coordination meetings

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102.2.D Design Exceptions, Waivers, and Variances

The ENGINEER shall identify, document, and keep a list of Design Exceptions, Waivers, and Variances, to be provided to the STATE as part of the Geometric Memorandum, which includes a plan showing grouped areas of Design Exceptions and summary tables for FHWA review during coordination meetings. The STATE will provide documents from previous efforts related to the identification and analysis of Design Exceptions. The ENGINEER shall prepare a Request for Design Exception, Waiver, or Variance (Request) for each Design Exception, Waiver, and Variance identified. The Requests shall conform to the requirements of current versions of the TxDOT PS&E Preparation Manual, TxDOT Roadway Design Manual and standards developed for the on-going Mobility35 Program.

Deliverables:

102.2.D.a. Draft, Pre-Final and Final Submittal of the Geometric Memorandum (submitted as part of the Engineering Summary Report), with graphics showing grouped areas of Design Exceptions and summary tables in PDF format and native file formats

102.2.D.b. Draft, Pre-Final and Final Submittal of a list of identified Design Exceptions, Waivers, and Variances (submitted as part of the Geometric Memorandum), in PDF format and native file formats

102.2.D.c. Draft, Pre-Final and Final Submittal of Design Exception, Waiver, and Variance Request Documents, in Microsoft Word electronic format, PDF format and native file formats

102.2.D.d. Meeting agendas and minutes including action items with list of all attendees of all scheduled Design Exceptions related meetings in Microsoft Word electronic format and Mobility35 style format

102.2.E Intelligent Transportation Systems (ITS)

The ENGINEER shall incorporate the STATE's ITS Master Plan, which may include consideration for connected and autonomous vehicles (CAV), into the proposed schematic design and provide an ITS base map at a 1" = 200' scale showing key ITS elements.

1. Coordinate with the STATE on the incorporation of the ITS Master Plan for the project
2. Perform quality assurance and quality control on ITS base map

Deliverables:

102.2.E.a. Draft and Final Submittals of ITS Base Map

102.2.F Bicycle and Pedestrian Accommodations

The ENGINEER shall comply with the federal policy statement on Bicycle and Pedestrian Accommodations Regulations and Recommendations by United States Department of Transportation (USDOT) and AASHTO Bike Guide. This policy encourages the

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incorporation of safe and convenient walking and bicycling facilities into transportation projects. The inclusion of bicycle and pedestrian facilities shall be considered when the project is scoped. Public input when applicable, as well as local city and metropolitan planning organization for bicycle and pedestrian plans shall be considered. The ENGINEER shall also comply with Mobility35 Program guidance that applies to this section. The ENGINEER shall submit vertical and horizontal alignments according to ADA geometry requirements, ROW needs, and Shared-Use Path (SUP) width for those areas where the SUP has a profile that is not tied to the profile of the Frontage Roads. Some sections of the SUP may need to be on a bridge structure.

Deliverables:

102.2.F.a. Draft and Final Submittals of SUP layouts shown on geometric schematic roll plots for necessary locations in electronic PDF and native file formats

102.2.G Managed Lanes - High Occupancy Vehicle and Transit

The ENGINEER shall consider the Managed Lanes as Express Lanes, High Occupancy Vehicle lanes, Transit Vehicle lanes, other special use lanes, and public transportation elements within the context of the general purpose, ramp, frontage road, and interchange design.

102.2.H USFWS Consultation

The ENGINEER shall support the STATE by providing information to assist with United States Fish and Wildlife Service (USFWS) consultation. The ENGINEER shall provide up to 5 exhibits to show the project limits and areas of interest. The ENGINEER shall meet (up to 2) with the STATE and GEC as necessary. The ENGINEER shall assist in the characterization of excavation/disturbance for the entire project limits (differentiating between fill/bedrock, karst zones, karst fauna regions, vegetation removal, roadway excavation, utilities excavation, drainage/water quality/stormwater BMPs excavation, drilling for geotechnical boreholes, drilling bridge support shafts, subsurface milling/grading, trackhoe or backhoe excavation, open trench excavation, jack and bore excavation, etc.). The ENGINEER shall assist in characterizing anticipated construction methods, staging areas, etc. The ENGINEER shall assist as needed in responding to questions/requests from USFWS.

Deliverables:

102.2.H.a. Up to five (5) copies of required exhibits for USFWS consultation, PDF and native files

102.2.H.b. Calculations / estimates of required for USFWS consultation

102.2.I Value Engineering Study Support

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The STATE will conduct the VE Study. The ENGINEER shall provide project related materials for use by the VE team.

Deliverables:

102.2.I.a. Project related materials for use by the VE team including reports, sketches, plan views, profiles, cross-sections, schedules, roll plots, slide shows, calculations, and spreadsheets as required in Excel, PowerPoint, Word, PDF or other appropriate electronic format

102.2.J Traffic Analysis

1. Existing Traffic Counts and Data Review

The ENGINEER shall collect any relevant data from the STATE or other agencies (local or Federal). The ENGINEER shall review necessary project-related traffic data provided by the STATE. This data shall consist of traffic volume counts, corridor or study area historical count year data from permanent count stations, vehicle classification data and historical truck data.

The ENGINEER shall collect existing daily and peak-hour traffic data on the project corridor. The existing traffic data includes the following:

i. 72-hour volumes for the main lanes on the project corridor.
ii. 72-hour ramp volumes including direct connectors on the project corridor.
iii. 72-hour frontage road volumes on the project corridor.
iv. A.M. and P.M. peak-hour turning volumes at all intersections as shown on the stick diagram for the project corridor.
v. A.M. and P.M. peak-hour directional distribution
vi. K factor

The ENGINEER shall review the CAMPO 2045 Travel Demand Model Network structure and shall recommend any zone and network updates to the model to reflect the schematic provided by the STATE. Any changes to the network, and any new model runs shall be performed by the ENGINEER as well as any metrics required by MAP-21 legislation. The ENGINEER shall utilize the model results in the development of traffic projections. The traffic volume assignments will be plotted, and the resulting link volumes will be used to determine the growth factors for converting existing volumes to Base Year. The growth factors will be calculated based on historical growth factors and results from the travel demand model runs.

2. Traffic Projections and Methodology

The ENGINEER shall develop a proposed methodology for estimating traffic projections for each component of the project corridor based on historical traffic

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data and traffic analysis package, existing traffic counts, and the travel demand model results. The ENGINEER shall review the methodology with the STATE. Based on these discussions, the ENGINEER shall address comments and incorporate revisions, as necessary, to the methodology. The ENGINEER shall submit a memorandum outlining the final methodology for estimating traffic projections for the STATE's review and approval. The ENGINEER shall revise the methodology based on the STATE's comments and resubmit if necessary.

The ENGINEER shall develop the traffic projections for the significant roadway segments and cross streets within the study corridor, based on the approved methodology. The ENGINEER shall create traffic volume line diagrams for all scenarios using data previously provided by the STATE. This shall include distributing proposed volumes from existing configuration to the proposed configuration. Based on future traffic projections developed as part of Mobility35, develop daily traffic forecasts for air and noise analysis years. The projected traffic data includes:

i. Annualized Average Daily Traffic (AADT) and Design Hourly Volume (DHV) for all proposed facilities in the corridor, including main lanes, ramps, direct connectors, intersections, and frontage roads
ii. Percent of trucks for both the AADT and DHV
iii. Directional distribution
iv. K factor (DHV/AADT)
v. Vehicle classification-light duty, medium duty and heavy duty

The ENGINEER shall develop the following traffic volumes and the data necessary for pavement design based on the approved methodology:

i. Base year AADT (Opening)
ii. Future (Design) year AADT (Opening +20)
iii. Pavement Design year AADT (Opening + 30)
iv. Growth rate per year between base and forecast years
v. Percent trucks AADT

3. Traffic and Operational Analysis

The ENGINEER shall review and analyze traffic data (including percent trucks, design hourly volume, and directional distribution), existing roadway features (including ramp locations, weaving sections, number of lanes, offset to obstructions, lane widths, frontage road operations, and intersection operation and geometry), traffic flow patterns, accident patterns and frequencies, and transit and traffic operations. The ENGINEER shall develop and calibrate an existing traffic model. The calibration of the model shall be included in the traffic analysis report and Interstate Access Justification Report (IAJR) or both. A detailed level of service analysis with HCS, VISSIM, and SYNCRO, and/or other acceptable model will be performed for the current year using current traffic and

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geometric conditions and for the build year and 20-year design year using traffic projections and proposed geometric designs to compare different geometric alternatives and ramp patterns. Results of this analysis shall be incorporated into the schematic design. The ENGINEER shall develop a traffic analysis report summarizing all analysis performed.

4. Interstate Access Justification Report (IAJR)
The ENGINEER shall prepare and submit an IAJR utilizing FHWA's 8 step guidance and including the latest FHWA guidance and State SOP. Due to FHWA requirements, the study area analysis will include one interchange to the west and east of the affected ramps. The ENGINEER shall utilize the STATE's approved existing and design year traffic for the No-build and Build alternative to develop the IAJR. Traffic count data collection and the development of traffic projections will not be performed by the ENGINEER. The ENGINEER will perform crash analysis for the IAJR using crash data provided by the STATE. The ENGINEER shall prepare an access request including an explanation of how the request satisfies each of the eight points in the policy requirements. The ENGINEER shall provide supporting analysis to illustrate how those requirements are met. The ENGINEER shall submit the IAJR for review to obtain State and FHWA approval. The Engineer shall make up to four submittals and corresponding revisions of the IAJR.
The ENGINEER shall assist the STATE in processing, review, and coordination regarding project status updates.

5. Safety Analysis
The ENGINEER shall prepare a Safety Analysis of the corridor, documenting the location and types of crashes along the corridor.

102.3 Construction Sequence/Traffic Control Plan (TCP)

The ENGINEER shall prepare a Construction Sequence/TCP Report. The report shall include a summary of the TCP requirements, TCP layouts, TCP narrative, the requirements for construction staging and a preliminary construction schedule with durations including a breakout of the time duration needed for the construction of all structures. The ENGINEER shall use the TCP requirements for number of lanes to be maintained during construction, cross street closure limitations, etc. provided by the STATE to develop preliminary TCP layouts. The TCP layouts (1" = 100' scale) shall depict the phasing and traffic detours anticipated to construct the proposed design. The ENGINEER shall include typical sections at pinch points for each phase. The ENGINEER shall develop a narrative for traffic handling showing major phases of work to accompany the TCP layout. The ENGINEER shall develop the requirements for construction staging throughout the development of schematic design to ensure that the proposed design can be constructed. The ENGINEER shall provide

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construction phasing assumptions to the STATE as requested with the TCP layouts. The ENGINEER shall demonstrate consideration of construction sequence requirements as part of the design schematic deliverable and shall develop a total construction schedule with time frames required for each construction/traffic control phase. The use of smart work zones will be included in the development of the construction sequence.

Deliverables:

102.3.A.a. Draft, Pre-Final and Final Submittal of Construction Sequence/Traffic Control Plan Report including narrative, phased TCP layouts with typical sections, staging requirements, and construction schedule; electronic PDF, hard copy roll plots for the District (up to five (5) copies upon request by the STATE) and native file formats

102.4 Geometric Design Schematics

The ENGINEER shall develop geometric design schematics showing lane arrangement and ROW and easement requirements. The ENGINEER shall use Bentley OpenRoads Technology in performing this task.

102.4.A Design Elements

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, retaining walls, HOV lanes, managed 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/shared use paths for roadway improvements
4. Typical sections of existing and proposed roadways, see Section 102.2.B
5. Proposed bridge limits including abutment, bent and rail locations
6. Existing and proposed major utilities
7. The ENGINEER shall obtain information on existing ROW, easements, and property ownership information from as-built plans, ROW maps, and tax records and prepare a Property Base Map with parcel numbers
8. 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), utilities, pedestrian and bicycle facilities, draft traffic control plan, construction sequence and environmental mitigation requirements. The ENGINEER shall show the ROW needs on the schematic plans and submit an electronic pdf to the STATE. The ROW needs will include color coding business and residential displacements identified through coordination with the STATE. The

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ENGINEER shall prioritize the identification of ROW needs based on displacements, long lead utilities, constructability, and coordination with District ROW office.

9. Waters of the US (WOUS)
10. Control-of-access limits
11. Existing and projected traffic volumes, to be provided by others
12. Location and text of the existing and proposed managed lanes and general purpose lanes guide signs and the preliminary locations for changeable message signs and other ITS elements
13. Lane lines, shoulder lines, and direction of traffic flow arrows indicating the number of lanes on roadways
14. Location of High Mast poles provided by others
15. Location of existing and proposed ITS devices

The geometric schematic profile view shall contain the following design elements:

1. Calculated profile grade and vertical curve data including "K" values for all lane types included in the improvements
2. Existing ground line profiles along the mainlanes
3. Grade separations and overpasses including preliminary bent locations, girder type, and span lengths
4. Calculated vertical clearances at grade separations and overpasses
5. The calculated profile grade for frontage roads, connectors, ramps and cross streets will be shown on separate Supplemental Profile rolls

Deliverables:

102.4.A.a. Draft, Pre-Final and Final Submittals showing Plan & Profiles; electronic PDF formats, hardcopy roll plots for the District (up to five (5) copies upon request by the STATE), KMZ files and Bentley OpenRoads computer-generated files showing 3D models of congested design areas or other locations as requested by the STATE with a maximum of 6 models

102.4.B Cross-Sections

The ENGINEER shall use a Bentley OpenRoads model to generate preliminary cross-sections every 100 feet and at culvert locations in conjunction with the Geometric Schematic. The ENGINEER shall determine earthwork volumes for use in the cost estimate and shall prepare 11”x17” cross-sections**.**

Deliverables:

102.4.B.a. Draft, Pre-Final and Final Schematic Submittals of cross sections on 11”X17”, five (5) copies printed and one (1) electronic PDF and native file formats with 3D model as well

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102.4.B.b. Preliminary Earthwork calculations, electronic PDF and native file formats

102.4.C Bridge Structures

The ENGINEER shall perform the following tasks related to bridge structures:

1. Define all existing and proposed bridges and bridge class culverts. Definition of bridges includes bridge type, limits, bent locations, and vertical clearances.
2. Perform a bridge type study to evaluate potential superstructure and substructure configurations which may be suitable for the proposed bridges based on geometric constraints, span lengths, deck widths and known soil parameters. The study shall consider as-built plans, hydraulic and scour issues, environmental issues, wetland impacts, safety and maintenance of traffic, highway alignments, constructability, aesthetic requirements, future widening, construction schedule and costs.
3. Develop preliminary Exhibit “A” details for modifications or replacements of structures crossing railroads (Union Pacific).

Deliverables:

102.4.C.a. Draft, Pre-Final and Final Submittals showing bridges on plan and profile view drawings, cross-sections, and typical sections.

102.4.C.b. Pre-Final and Final Submittals of Bridge Type Study Report. Report shall include recommendation on bridge superstructure and substructure types.

102.4.C.c. Draft, Pre-Final and Final Submittals of preliminary Exhibit “A” details for any modifications or replacements of structures crossing railroads (Union Pacific).

102.4.D Retaining Walls

The ENGINEER shall determine preliminary retaining wall locations and include retaining walls on plan view schematics, typical sections, and cross sections as required.

The ENGINEER shall compute and tabulate retaining wall quantities for each plan submittal.

Deliverables:

102.4.D.a. Draft, Pre-Final and Final Submittals showing retaining walls on plan view drawings, cross-sections and typical sections as required

102.4.E Noise Walls

The ENGINEER shall prepare preliminary noise wall locations to be shown on schematic plans based upon analysis. The ENGINEER shall determine if proposed noise walls are constructible as shown on noise wall plans. The ENGINEER shall compute and tabulate

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noise wall quantities for each Design Schematic Submittal.

Deliverables:

102.4.E.a. Draft and Final Submittals showing noise walls on plan view drawings as required

102.4.E.b. Draft and Final Traffic noise wall constructability analysis memo

102.4.F Renderings

The ENGINEER shall develop five (5) renderings, one (1) three-dimensional (3D) model of the final schematics, illustrations, and one (1) linear video aerial-view video animation as a means of expression and understanding for what the owner of a project envisions and what the public perceives. These renderings shall consist of general concepts for bridge and retaining wall aesthetics, general area theme and potential gateway applications. In support of the Public Outreach effort, reasonable Build Alternatives will be chosen by the STATE to be carried forward into creating one rendering and one traffic animation for each of the final alternatives. A 3D model shall be created for the reasonable Build Alternative from supplied: horizontal and vertical alignments, existing and proposed digital terrain models (DTMs), proposed typical sections, traffic counts, and ground photography.
The animations and renderings shall give the public and stakeholders a clear awareness and appreciation for how traffic will flow into and out of the project area.

Deliverables:

102.4.F.a. Draft and Final Renderings (maximum of fifteen (15) renderings), and electronic native file formats

102.4.G Preliminary Cost Estimate

The ENGINEER shall prepare a preliminary cost estimate for the project for each of the Draft, Pre-Final and Final submittals, including the costs of construction, required ROW and associated improvements, and reimbursable utility adjustments. Current STATE unit bid prices will be used in preparation of the estimate.

Deliverables:

102.4.G.a. Draft, Pre-Final, and Final Submittal cost estimates including the items described in this section in electronic PDF and native file formats

102.4.H Engineering Summary Report

The ENGINEER shall prepare an Engineering Summary Report to summarize the design criteria, preliminary cost estimate and basis of estimate, construction sequence

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description, and utility conflict issues. This document shall be per current TxDOT guidance and shall be updated at submittals throughout the term of this contract.

Deliverables:

102.4.H.a. Draft and Final Engineering Summary Report including items described in this section in electronic PDF and native file formats

102.4.I Agency Coordination

The ENGINEER shall assist the STATE in conducting meetings with various agencies to discuss and review the schematic design. The ENGINEER shall document and respond to issues related to the schematic design.

Deliverables:

102.4.I.a. Attendance with preparation of meeting minutes and attendance list for meetings with various agencies

102.4.I.b. Comment and response log for issues related to the schematic design

102.4.J Railroad Coordination

The ENGINEER shall assist the STATE in coordination with the Union Pacific Railroad and crossings. The ENGINEER shall schedule, attend and produce meeting minutes of coordination meetings. The ENGINEER shall produce layouts including plan and profiles and typical sections for the crossings near McNeil Rd. The ENGINEER shall prepare the Exhibit “A” for the crossings and submit to the STATE for their submittal to the appropriate railroad agency.

Deliverables:

102.4.J.a. Draft and Final railroad layouts including plan and profiles and typical sections for the crossings in electronic PDF and native file formats

102.4.J.b. Draft and Final Exhibit “A” documents for the crossing in electronic PDF and native file formats

102.4.J.c. Scheduling, attendance and production of meeting minutes for all coordination meetings

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102.4 Preliminary Geotechnical Survey

The ENGINEER shall determine the location of proposed soil borings for bridge foundation, retaining walls, and pavement design in accordance with the latest edition of the STATE’s Geotechnical Manual. The ENGINEER shall prepare and submit a proposed soil boring plan, traffic control plans, and required permits to obtain soil borings. The STATE will review and provide comments for a boring layout, traffic control plans and required permits submitted by the ENGINEER showing the general locations and depths of the proposed borings. Once the ENGINEER receives the STATE’s 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 District's procedures and design guidelines. If applicable, the ENGINEER shall perform pavement coring to determine existing pavement thickness. Pavement design shall be developed by the STATE and will be based on STATE Standard Materials Specifications. a. The ENGINEER shall perform a geotechnical investigation by drilling borings throughout the project alignment. These borings shall be used for bridge foundation and pavement design. It is anticipated that straight drilled shaft shall be utilized for the support of the bridge structures. Based on this assumption, ENGINEER shall perform bridge borings to a depth achieving 4 consecutive blows less than 3"/100 blows by the Texas Cone Penetrometer Test (Test Method Tex-132-E) into intact rock or maximum depth up to 70 feet, whichever is shallower below the existing ground surface.

All geotechnical work should be performed in accordance with the latest version of the STATE's Geotechnical Manual. Laboratory testing shall include Moisture Content, Liquid and Plastic Limits of Soils, Unconfined Compression Tests for Soil and Rock, Soil-Lime Testing, Minus No. 200 Sieves, Triaxial Compression for Disturbed Soils and Base, and Sulfate Content tests. All testing shall be performed in accordance with the latest version of the STATE's Manual of Test Procedures. American Society for Testing Materials (ASTM) test procedures can be used only in the absence of the State's procedures. All soil classification should be done in accordance with the Unified Soil Classification System.

The ENGINEER shall perform soil borings, coring to determine existing pavement thickness, piezometric readings (if applicable), testing and analysis to include slope stability analysis, settlement analysis, and foundation design recommendations along bridges and embankments.

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Deliverables:

102.4.A.a Draft and Final Geotechnical Report in Word electronic file format, PDF and native file formats.

102.4.A Geotechnical Design Memorandum

The ENGINEER shall prepare a geotechnical design memorandum to describe the geotechnical design parameters for bridge, structural, roadway, retaining walls, and temporary structures.

Deliverables:

102.4.A.a. Draft and Final Geotechnical Design Memorandum in Word electronic file format, PDF and native file formats

102.5 Project Concept and Alternative Refinement and Screening Process

The ENGINEER shall develop a Project Alternatives Screening Report which can be utilized within the EA document. This project alternatives screening report will summarize project alternatives, describe and compare project factors (constructability, environmental impacts,

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property impacts, preliminary cost estimates, etc.) and identify one (1) constructible Build alternative and the No-Build alternative that will be carried forward into the Draft EA for further evaluation.

Deliverables:

102.5.A.a Draft and Final Project Alternatives Screening Report

102.5.B.a Draft summary of findings to be included in the EA

102.5.C.a Comment Response forms

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

120.0 Social, Economic, and Environmental Studies and Public Involvement

The ENGINEER shall conduct an environmental study and applicable analysis, prepare technical reports, develop an Environmental Assessment (EA) documentation, and formulate a decision document for the project. The ENGINEER shall follow guidance per current TxDOT toolkits and the STATE in effect as of the date of delivery of the documents for review; current state and federal laws, regulations, and policies; agreements between the STATE and other state or federal agencies; and FHWA and AASHTO guidelines. Prior to technical report development, the ENGINEER shall create an environmental constraints map and develop a summary document to determine areas of concern within the study area. Additionally, the ENGINEER shall develop a Project Alternatives Screening Report which can be utilized within the EA document. This project alternatives screening report will summarize project alternatives, describe and compare project factors (constructability, environmental impacts, property impacts, preliminary cost estimates, etc.) and identify one (1) constructible Build alternative and the No-Build alternative that will be carried forward into the Draft EA for further evaluation.

120.1 Project Coordination and Initiation

The ENGINEER shall prepare technical reports to support the environmental assessment. The ENGINEER shall address comments from the STATE and revise Draft documents as needed.

120.1.A Environmental Constraints

The ENGINEER shall prepare a GIS based Environmental Constraints Map showing potential environmental issues to be addressed by the environmental and schematic team during the Alternative Analysis Process.

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The map will also be submitted with an Environmental Constraints Report that details the information presented, including a list of all sources consulted for environmental information, in the map in narrative form.

Deliverables:

120.1.A.a. Draft and Final Environmental Constraints Map
120.1.A.b. Draft and Final Environmental Constraints Report
120.1.A.c. Comment Response Forms

120.1.B Project Alternatives Screening Report

The ENGINEER shall develop a Project Alternatives Screening Report which can be utilized within the EA document. This project alternatives screening report will summarize project alternatives, describe and compare project factors (constructability, environmental impacts, property impacts, preliminary cost estimates, etc.) and identify one (1) constructible Build alternative and the No-Build alternative that will be carried forward into the Draft EA for further evaluation.

Deliverables:

120.1.B.a. Draft and Final Project Alternatives Screening Report
120.1.B.b. Draft summary of findings to be included in the EA
120.1.B.c. Comment Response Forms

120.1.C Agency Coordination

The ENGINEER, with input from representatives from the STATE, shall conduct meetings with various agencies to discuss and review environmental issues related to the schematic design. The ENGINEER shall document and respond to issues. In addition, the ENGINEER shall prepare sign-in sheets, agendas, handouts, multi-media and meeting summaries. The ENGINEER shall also prepare up to two exhibit boards. The ENGINEER shall conduct up to 5 meetings. The ENGINEER shall document and respond to issues.

Deliverables:

120.1.C.a. Draft and Final Meeting materials for Agency Coordination Meetings

120.1.C.b. Schedule, set up, prepare, attend, break down, and document meetings (5)

120.1.C.c. Documentation recording meeting concerns, action items, and response

120.1.C.d. Draft summary of findings to be included in the EA

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120.1.D Right-of-entry Letters

The ENGINEER shall draft right-of-entry (ROE) letters to be sent to potentially affected property owners to request entry for environmental surveys. One set of letters to be sent out for response, followed by outreach via email or phone records.

Right-of-entry will be tracked via the production of a GIS based map showing the right-of-entry status and a spreadsheet with updated property owner information.

Deliverables:

120.1.D.a. Draft and Final right-of-entry Letters
120.1.D.b. Right-of-entry tracking spreadsheet and GIS map

120.2 Technical Reports

The ENGINEER shall prepare the required Technical Reports and analyses for the one (1) Build and No-Build Alternatives to be carried through the Environmental Assessment (EA).

120.2.A Project Description Technical Report

The ENGINEER shall provide a detailed description of the proposed action to include the project limits, existing facility, alternatives description and analysis, proposed design alternative being advanced, need and purpose, logical termini, bicycle and pedestrian accommodations, as applicable, and right-of-way requirements. The ENGINEER shall include the following:

1. Typical sections (including dimensions) for existing and proposed conditions
2. Schematics and project layouts
3. Topographic map
4. Photographs

If changes to the schematic are made after the Final Project Description Technical Report, the ENGINEER shall produce memorandums explaining what has changed.

Deliverables:

120.2.A.a. Draft and Final Project Description Technical Report
120.2.A.b. Project Description Update memos (up to 15)
120.2.A.c. Draft summary of findings to be included in the EA
120.2.A.d. Comment Response Forms

120.2.B Non-archeological Historic-Age Resources

The ENGINEER shall assess non-archeological historic-age properties as described in

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Deliverables:

120.2.B.a. Draft and Final Project Coordination Request
120.2.B.b. Draft and Final Historic Resources Research Designs
120.2.B.c. Draft and Final Historic Resources Survey Reports
120.2.B.d. Draft summary of findings to be included in the EA
120.2.B.e. Comment Response Forms

120.2.C Archeological Background Studies

The ENGINEER shall develop an Archeological Background Study for coordination through the TxDOT MOU with the Texas Historical Commission. The Background Study shall review previous archeological surveys and develop an inventory of areas deemed to have high probability to contain intact archeological materials for survey.

Deliverables:

120.2.C.a. Draft and Final Archeological Background Study
120.2.C.b. Draft summary of findings to be included in the EA
120.2.C.c. Comment Response Forms

120.2.D Archeological Surveys

The ENGINEER shall conduct an archeological survey in high potential areas as outlined in the Archeological Background Studies. The ENGINEER shall prepare an antiquities permit prior to any survey work. Upon issuance of the antiquities permit, the ENGINEER shall conduct the archeological survey in accordance with the NHPA, Antiquities Code of Texas, and Health and Safety Code. Up to 20 shovel tests are included in this scope of work. The ENGINEER shall prepare an archeological survey technical report in accordance with the STATE's guidelines.

Deliverables:

120.2.D.a. Draft and Final Antiquities Permit Applications
120.2.D.b. Draft and Final Archeological Survey Reports
120.2.D.c. Draft summary of findings to be included in the EA
120.2.D.d. Comment Response Forms

120.2.E Air Quality Technical Report

The ENGINEER shall prepare an Air Quality Technical Report including a Carbon Monoxide (CO) Traffic Air Quality Analysis (TAQA) and a quantitative Mobile Source Air Toxics (MSAT) analysis as described in 120.0.

Deliverables:

120.2.E.a. Draft and Final CO TAQA and MSAT Technical reports

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120.2.E.b. Input and output modeling files and supporting documentation (i.e., traffic files, modeling locations, etc.)
120.2.E.c. MSAT conference call meeting notes and determinations
120.2.E.d. Draft summary of findings to be included in the EA
120.2.E.e. Comment Response Forms

120.2.F Traffic Noise Studies

The ENGINEER shall prepare a Traffic Noise Analysis Technical Report as described in 120.0.

Deliverables:

120.2.F.a. Draft and Final Traffic Noise Analysis Technical Reports
120.2.F.b. Draft and Final Traffic noise model input and output data files
120.2.F.c. Draft and Final Traffic noise wall constructability analysis memo (if required)
120.2.F.d. Draft summary of findings to be included in the EA
120.2.F.e. Comment Response Forms

120.2.G Initial Assessment of Hazardous Materials Impacts

The ENGINEER shall perform a hazardous material Initial Site Assessment for to identify potential hazardous materials impacts as described in 120.0. The ENGINEER shall conduct up to 30 Texas Commission on Environmental Quality (TCEQ) file searches and up to 3 hazardous material radius reports.

Deliverables:

120.2.G.a. Draft and Final Hazardous Materials Initial Site Assessments
120.2.G.b. Additional TCEQ file searches and hazardous material radius reports (up to 3 updates)
120.2.G.c. Draft summary of findings to be included in the EA
120.2.G.d. Comment Response Forms

120.2.H Water Resources

The ENGINEER shall perform a surface water analysis, a waters of the U.S. delineation, and associated U.S. Army Corps of Engineers (USACE) permitting as described in 120.0.

Deliverables:

120.2.H.a. Draft and Final Surface Water Analysis Forms
120.2.H.b. Draft and Final Waters of the U.S. Delineation Reports
120.2.H.c. Draft and Final Section 404/10 Impacts Tables
120.2.H.d. Draft summary of findings to be included in the EA
120.2.H.e. Comment Response Forms

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120.2.I Edwards Aquifer Water Quality

A portion of the project is located over the Edwards Aquifer Recharge and Contributing Zones so the Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer rules shall be followed. 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 (January 2017), or latest addition. As part of this work, the ENGINEER shall perform the following:

BMP analysis: The ENGINEER shall locate all BMPs which have been previously permitted under the TCEQ Edwards Aquifer rules that will be impacted by the project. The ENGINEER shall determine the amount of Total Suspended Solids (TSS) being treated under these permitted BMPs.

TSS load calculations: The ENGINEER shall develop TSS load calculations required to be treated under the Edwards Aquifer rules. This calculation is for 80% of the increase in TSS load resulting from development and is based on increased impervious cover within the project area.

"De-facto" water quality: The ENGINEER shall determine the amount of "de-facto" water quality being treated via grassy swales (GS) and vegetative filter strips (VFS). These locations are generally in areas where the existing geometry meets TCEQ standards for water quality and were not permitted as TCEQ BMPs under the Edwards Aquifer rules.

TSS removal determination: The ENGINEER shall determine the total amount of TSS removal required for the project utilizing the TCEQ calculation spreadsheet. This will be the sum of a., b. and c. above.

Design coordination and Water Quality Report: After the 30% submittal, the ENGINEER shall meet with the STATE in order to discuss the TSS removal required for the project and delineate the design approach for the water quality BMPs. As geometry allows, the ENGINEER should first maximize treatment via the roadway section (vegetative filter strips and grassy swales). For all other permanent BMP treatment options, the ENGINEER shall coordinate with the STATE for preferred treatment options and determine any necessary drainage easements required for the water quality BMP. The ENGINEER shall identify and document BMP's in draft and final schematic Water Quality reports and provide cost estimates.

Deliverables:

120.2.I.a. Two (2) draft copies of the Edwards Aquifer Water Quality Report

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120.2.I.b. Draft and final meeting preparation materials including agenda, sign-in sheet, and meeting materials, up to 2 hard copies and electronic PDF and native file formats

120.2.I.c. Meeting minutes including documentation of attendees, decisions, and action items, electronic PDF and native file formats

120.2.I.d. Draft water quality calculations, report, and estimate submitted with the 60%, and 90% milestone deliverables

120.2.I.e. Final water quality calculations, report, and estimate submitted with 100% milestone deliverables

120.2.J Geologic Assessment

The ENGINEER shall prepare a Geologic Assessment (GA) as described in 120.0. The GA must be performed in accordance with the TCEQ's current "Instructions to Geologists". Draft and final versions of the GA shall be identified and released to the STATE POC in accordance with Title 22, Texas Administrative Code Chapter 851, relating to the Texas Board of Professional Geoscientists Licensing and Enforcement Rules. The ENGINEER will include known discharge features such as springs and wells in the GA.

Deliverables:

120.2.J.a. Draft and Final Geologic Assessment

120.2.J.b. KMZ and GIS files including all geologic features and discharge features

120.2.J.c. Draft summary to be included in the EA

120.2.J.d. Comment Response Forms

120.2.K Biological Resources

The ENGINEER shall assess impacts of the project on biological resources as described in 120.0.

Deliverables:

120.2.K.a. Draft and Final Species Analysis Form

120.2.K.b. Draft and Final Species Analysis Spreadsheet

120.2.K.c. Up to three updates to Species Analysis Spreadsheet (TxNDD, RTEST, IPAC, SGCN)

120.2.K.d. Draft and Final Tier 1 Site Assessment

120.2.K.e. Draft and Final Presence/Absence Survey Report for karst invertebrates and salamanders

120.2.K.f. Draft and Final Biological Assessment

120.2.K.g. Attendance at USFWS Coordination Meetings (including a Schematic Team representative)

120.2.K.h. Engineering/design support for USFWS consultation

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120.2.K.i. Draft and Final Memo defining recommendations for bat friendly design elements/plan to address bats in construction and targeted public involvement
120.2.K.j. Field/GPS Identification of Monarch Trees (as defined by City of Round Rock) within the Existing/Proposed ROW summarized in a report
120.2.K.k. Draft summary to be included in the EA
120.2.K.l. Comment Response Forms

120.2.L Community Impact Assessment

The ENGINEER shall assess the impacts of the project on the community and populations in the study area as described in 120.0.

Deliverables:

120.2.L.a. Draft and Final Community Impact Assessment Technical Reports
120.2.L.b. Draft and Final Origin and Destination analysis
120.2.L.c. Draft summary of findings to be included in the EA
120.2.L.d. Comment Response Forms

120.2.M Section 4(f) Analysis

The ENGINEER shall identify and assess Section 4(f) properties in the study area as described in 120.0

Deliverables:

120.2.M.a. Draft and Final Section 4(f) analysis summary document
120.2.M.b. Draft and Final Section 4(f) de minimis determination documentation (up to 3)
120.2.M.c. Draft summary of findings to be included in the EA
120.2.M.d. Comment Response Forms

120.2.N Section 6(f) Analysis

The ENGINEER shall assess the alternatives for development on Section 6(f) properties in the study area as described in 120.0

Deliverables:

120.2.N.a. Draft and Final Section 6(f) analysis summary document
120.2.N.b. Draft summary of findings to be included in the EA
120.2.N.c. Comment Response Forms

120.2.O Indirect Impacts Analysis Technical Report

The ENGINEER shall assess the indirect impacts for the project as described in 120.0.

Deliverables:

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120.2.O.a. Risk Assessment for Indirect Impacts
120.2.O.b. Draft and Final Methodology for Induced Growth
120.2.O.c. Draft and Final Area of Influence
120.2.O.d. Draft and Final Indirect Impacts Analysis Technical Reports
120.2.O.e. Draft summary of findings to be included in the EA
120.2.O.f. Comment Response Forms

120.2.P Cumulative Impacts Analysis Technical Report

The ENGINEER shall assess the cumulative impacts for the project as described in 120.0.

Deliverables:

120.2.P.a. Risk Assessment for Cumulative Impacts
120.2.P.b. Draft and Final Resource Study Areas
120.2.P.c. Draft and Final Cumulative Impacts Analysis Technical Reports
120.2.P.d. Draft summary of findings to be included in the EA
120.2.P.e. Comment Response Forms

120.3 Environmental Assessment

120.3.A Draft Environmental Assessment

The ENGINEER shall prepare the EA based on the completed environmental analyses of the one build alternative and one no build as described in 120.0.

Deliverables:

120.3.A.a. Draft and Approved Draft EA documents

120.3.A.b. Comment Response Forms

120.3.B Final Environmental Assessment

The ENGINEER shall prepare a Final EA document based on revisions to the design and Draft EA as a result of the Public Hearing and Public and Agency Comment Periods.

Deliverables:

120.3.B.a. Draft and Approved Final EA Document

120.3.B.b. Comment Response Forms

120.3.C Environmental Decision Document

The ENGINEER shall prepare the Environmental Decision document.

Deliverables:

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120.3.C.a. Draft and Final Environmental Decision documents

120.3.C.b. Comment Response Forms

120.3.D Notice of Availability

The ENGINEER shall prepare a Notice of Availability for the EA document.

Deliverables:

120.3.D.a. Draft and Final Notice of Availability for Draft EA

120.3.D.b. Draft and Final Notice of Availability for Final EA

120.3.D.c. Draft and Final Notice of Availability for NEPA Decision Document

120.3.D.d. Comment Response Form(s)

120.3.E Project File

The ENGINEER shall assemble and maintain the Project File (electronic and hard copy). The Project File and complete indices shall be delivered to the STATE at project close out or as directed by the STATE. The ENGINEER shall maintain documentation of references, correspondence, emails (in original format and PDF where necessary), meetings, draft and final documents, and comment/response forms.

Deliverables:

120.3.E.a. Project file available in SharePoint

120.3.E.b. Final project file in electronic format on external storage device

120.3.F Environmental Permits, Issues, and Commitments

The ENGINEER shall prepare the Environmental Permits, Issues, and Commitments (EPIC) sheet.

Deliverables:

120.3.F.a. Draft and final EPIC sheets

120.3.F.b. Comment Response Forms

120.4 Public Involvement

The ENGINEER shall plan, coordinate, participate in, and execute public involvement during the project development process as described in 120.0.

120.4.A Public Involvement Plan

The ENGINEER shall develop a project specific Public Involvement Plan (PIP).

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Deliverables:

120.4.A.a. Draft and Final Public Involvement Plan

120.4.A.b. Comment Response Forms

120.4.B Public Meetings and Public Hearing

The ENGINEER shall plan, coordinate, pay for meeting venue and associated costs, provide security, audio and video equipment, and participate (up to 15 staff) in one (1) public meetings and one (1) public hearing as described in 120.0. The ENGINEER shall participate in up to 2 planning meetings per event. The ENGINEER shall provide electronic materials, content, and website development for each event for Virtual Open Houses.

Deliverables:

120.4.B.a. Log of phone calls, emails, and written correspondence received and made to external stakeholders and the public
120.4.B.b. Displays for each event
120.4.B.c. Handouts (Two per event)
120.4.B.d. Draft ads and notices (one announcement in English and Spanish in up to two newspapers per event)
120.4.B.e. Final ads and notices (one announcement in English and Spanish in up to two newspapers per event)
120.4.B.f. Internal talking points and FAQs
120.4.B.g. Transcripts (1)
120.4.B.h. Way-finding signs
120.4.B.i. Sign-in sheets
120.4.B.j. Draft and final presentations
120.4.B.k. Draft and final Public Hearing Summary Report
120.4.B.l. Draft and Final Public Hearing Comment Response Form
120.4.B.m. Schedule, set up, prepare, attend, break down, and document (1) Public Meetings and (1) Public Hearing
120.4.B.n. Draft and Final Public Meeting and Open House Summary Reports
120.4.B.o. Draft and Final Public Meeting and Open House Comment Response Forms
120.4.B.p. Virtual Open House meeting materials
120.4.B.q. Comment Response Forms

120.4.C Stakeholder Meetings

The ENGINEER shall participate, provide technical assistance, and prepare as-needed exhibits for up to 100 meetings with stakeholders including, but not limited to, affected

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property owners, neighborhood associations, and general public as requested by the STATE. Assume one engineering staff member at each meeting.

Deliverables:

120.4.C.a. The ENGINEER shall prepare, participate in, provide technical assistance, develop exhibits, and document up to 100 stakeholder meetings

120.4.D Project Mailing List

The ENGINEER shall utilize the project mailing list database created by the STATE's GEC and shall update and maintain it as necessary for use in distributing meeting and hearing notices and other project information. The ENGINEER shall obtain email addresses of property owners for use in DocuSign right-of-entry.

Deliverables:

120.4.D.a. Updated project mailing list and database (three updates)

120.4.E Elected Officials List and Letters

The ENGINEER shall utilize the Elected Officials list created by the STATE's GEC and shall update and maintain it as necessary for use in distributing meeting and hearing notices and other project information. In addition, the ENGINEER shall prepare up to three separate draft letters to the elected officials.

Deliverables:

120.4.E.a. Public Meeting - draft and final elected officials letter (up to three separate letters)

120.4.E.b. Public Hearing - draft and final elected officials letter (up to three separate letters)

120.4.E.c. Updated elected officials list (three updates)

120.4.F Digital Content and Surveys

The ENGINEER shall prepare draft and final content for the project website, including up to 40 project updates and other information as needed. The ENGINEER shall prepare up to 2 digital surveys to gather input, analyze feedback, and prepare a report of input for internal and external use.

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Deliverables:

120.4.F.a. Draft and final content for the project website, including up to 40 project updates

120.4.F.b. Up to 2 digital surveys to gather input

120.4.F.c. Analyze survey feedback and prepare report for internal and external use

120.4.F.d. Update project website and correspond with third-party web developer

120.4.F.e. Comment Response Forms

120.4.G Stakeholder Correspondence Management

The ENGINEER shall prepare responses to stakeholder inquiries and maintain a log of stakeholder correspondence.

Deliverables:

120.4.G.a. Responses to stakeholder inquiries

120.4.G.b. Maintain log of stakeholder questions and STATE responses

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

130.1 General Requirements

A. Traffic Control

The ENGINEER's Surveyor shall control traffic in and near surveying operations adequately to comply with provisions of the latest edition of the Texas Manual on Uniform Traffic Control Devices – Part VI which can be found on the State's internet site.

In the event field crew personnel must divert traffic or close traveled lanes, a Traffic Control Plan based upon principles outlined in the latest edition of the Texas Manual on Uniform Traffic Control Devices – Part VI shall be prepared by the ENGINEER's Surveyor and approved by the STATE prior to commencement of field work. A copy of the approved plan shall be in the possession of field crew personnel on the job site at all times and shall be made available to the STATE's personnel for inspection upon request.

B. Underground Excavation

The ENGINEER's Surveyor shall contact the "Texas Excavation Safety System, Inc." (DIGTESS), or call telephone number 811, to mark underground utilities prior to digging the holes for monuments, as necessary. The ENGINEER's Surveyor shall maintain documentation of all notification calls. The ENGINEER's Surveyor shall comply with the States excavation laws as they appear in the Texas Administrative Code (TAC).

C. Preventative Measures to Prevent the Spread of Oak Wilt Contamination

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The ENGINEER's Surveyor shall take the following preventive measures while cutting, pruning, or removing oak trees in counties which have confirmed cases of Oak Wilt or at the direction of the STATE:

1. When possible, employ alternative methods instead of pruning or cutting oak trees.
2. When possible, perform necessary pruning and cutting of healthy trees during the winter months of January and February when Sap Beetles are least active. Also, if possible, avoid pruning or cutting during Spring months when Sap Beetles are most active.
3. Treat wounds with pruning paint in Oak Wilt infected counties to discourage insects, especially during warm weather.
4. Sterilize all pruning tools between each tree with either LysolTM spray or a 70 percent rubbing alcohol solution. The use of chlorine bleach solutions to sterilize pruning tools is discouraged due to premature oxidation or rusting of steel parts.
5. Destroy the tree cuttings by burning or burying the wood or dispose of the wood in another approved method.

D. <u>Additional Requirements</u>

1. Adherence to schedule
   If at any time during the Contract Period the ENGINEER's Surveyor determines that it is unable to meet a scheduled submission date, the ENGINEER's Surveyor shall notify the STATE in writing immediately. This notification shall consist of an explanation as to the reason(s) for the delay and a revised submission schedule, which shall to the extent possible, incorporate a plan to recover days lost as a result of subject delay.

   If at any time during the Contract Period the ENGINEER's Surveyor encounters unforeseen circumstances which may materially affect the scope, complexity or character of the work authorized by the STATE, the ENGINEER's Surveyor shall notify the STATE in writing immediately with a complete description of the circumstances encountered.
2. Transmittal
   All documents submitted to the STATE shall be accompanied by a letter of transmittal which shall include, but need not be limited to, the highway number, project limits, county, Control Section Job (CSJ), contract number, and an inventory of attachments.
3. Right-of-entry
   It shall be the responsibility of the ENGINEER's Surveyor to secure permission to enter private property for purposes of survey. It is the stated policy of the STATE to make every effort to maintain positive relations with the general public. In pursuance of that policy, the ENGINEER's Surveyor shall not commit acts which will result in damages to private property and the ENGINEER's Surveyor shall make every effort to comply with the wishes and address the concerns of private property owners.

E. <u>Compensation</u>

1. Payment requests shall include the ENGINEER's Surveyor's invoice.
2. Progress Report
   The ENGINEER's Surveyor shall submit a monthly progress report electronically by the 5th of each month following the month through which status is being reported. Progress and percent complete shall be according to the task as included in the scope.

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With each payment request, the ENGINEER's Surveyor shall submit the corresponding project progress report which shall, as a minimum, include the percentage of total work complete as of the date of the payment request and a description of current work activity. The percentage of total work complete shall not be based simply on the percentage of funds expended, but shall be based on the best judgment of the ENGINEER's Surveyor as to the percentage of actual work complete.

130.2 General Standards for Surveying

All surveys must meet or exceed the standards set in the Professional Land Surveying Practices Act, the General Rules of Procedures and Practices promulgated by the Texas Board of Professional Engineers and Land Surveyors (TBPELS), and the Texas Department of Transportation (TxDOT) TxDOT Survey Manual, latest edition, and shall be accomplished in an organized and professional manner, subject to the approval of the STATE.

The ENGINEER's Surveyor shall use the State's *ROW Vol. 1 - Procedures Preliminary to Release*, (online at: http://onlinemanuals.txdot.gov/txdotmanuals/ppr/index.htm) and the TxDOT Survey Manual, latest edition, as the basis for the format and preparation of all right-of-way documents produced, including Right-of-Way (ROW) maps, property descriptions (including parcel plats), and other Right-of-Way work products, unless otherwise specified by the STATE.

The ENGINEER's Surveyor shall use 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, unless otherwise directed by the STATE. The ENGINEER's Surveyor shall use the datum adjustment currently in use by the STATE unless otherwise specified by the STATE.

Project or surface coordinates must be calculated by applying a Combined Adjustment Factor (CAF) to State Plane Coordinate values. The STATE may direct the ENGINEER's Surveyor to use a specific CAF for a project to: a) match existing or ongoing projects, b) conform to a county-wide surface adjustment factor, or c) be calculated specifically for the project area.

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

All GPS work, whether primary control surveys or other, must meet or exceed the current TxDOT Survey Manual, latest edition, to the order of accuracy specified in the categories listed below. If the order of accuracy is not specified in this Contract, the work must meet or exceed the order of accuracy specified in the publications listed in this paragraph.

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

In order to ensure accuracy and accountability of the services provided under this Contract, the STATE may require the ENGINEER's Surveyor to certify work performed under this Contract as

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true and correct according to FGCS standards, the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

The ENGINEER's Surveyor shall provide temporary signing and traffic control in and around survey operations; the signing and traffic control shall comply with provisions of the Texas Manual of Uniform Traffic Control Devices. All signs, flags and safety equipment shall be provided by the ENGINEER's Surveyor. The ENGINEER's Surveyor shall notify the Public Information Office of the District where the work is to be performed at least five working days in advance of any lane closures.

The ENGINEER's Surveyor shall provide all personnel, equipment, and materials necessary for the performance of the activities required by this agreement.

The ENGINEER's Surveyor shall provide Survey Data (original and processed) to the STATE on a compact disk or other approved medium. The Survey Data must be fully compatible with the STATE's computer system and with programs in use by the STATE at the time of the submission, without further modification or conversion. The current program formats used by the STATE are: *Microsoft Office Word 2016* for word processing, *MicroStation* Bentley OpenRoads *Survey* for graphics applications and ArcGIS for its Geo-Database platform. 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 STATE.

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

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

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

130.3 Specific Work To Be Performed

The ENGINEER's Surveyor shall perform surveying services for projects and locations as directed by the STATE per the function codes and description of work provided below.

A. ROW Mapping

ROW Mapping includes the performance of on the ground surveys and preparation of parcel maps, legal descriptions (metes and bounds descriptions), and right-of-way maps.

1. PURPOSE

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The purpose of right-of-way mapping is to prepare documents suitable for the acquisition of real property interests and the probable issuance of a title policy.

2. DEFINITIONS

For purposes of this Contract, the following definitions shall apply:

a. Abstract Map (Working Sketch) – A drawing to scale prepared from record documents depicting proposed right-of-way lines, existing right-of-way lines, easement lines, and private property lines with relevant grantee names, recording data, and recording dates.
b. Closure/Area Calculation Sheet – 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.
c. Denial of Access Line – A line which indicates specific location where access to the roadway is denied.
d. Property Description – A document prepared as an exhibit for the conveyance of a property interest, reflecting a boundary survey, signed and sealed by a Registered Professional Land Surveyor (RPLS), attached to an acquisition deed as Exhibit A, and consists of the following two (2) parts:
   (1) 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.
   (2) A parcel plat – An 8 ½ inch by 11-inch formatted drawing to scale depicting all the information shown on the right-of-way map regarding an individual parcel of land to be acquired.
e. Owner – The most current title holder of record as determined by a study of the Real Property Records.
f. Parent Tract – A unit or contiguous units of land under one 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 right-of-way, easement, or separate ownership which destroys unity of use.
g. Parent Tract Inset – A small line drawing, to an appropriate scale, of the parent tract perimeter placed upon the right-of-way 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 right-of-way map. Since parent tract insets are used to identify the limits and location of parent tracts, they must include public right-of-ways, utility easements and fee strips, and identifiable water courses which bound the parent tract.
h. Point of Beginning (P.O.B.) – A corner of the parcel of land to be acquired, located on the proposed right-of-way line and being the beginning terminus of the first course of the property description.
i. Point of Commencing (P.O.C.) – A monumented property corner which can be identified in the Real Property Records and is located outside the proposed right-of-way corridor. For title purposes, the point of commencing 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 right-of-way corridor may be used.

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j. Preliminary Right-of-Way Layout – A drawing to scale depicting proposed right-of-way lines; existing right-of-way 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 right-of-way lines and to each PC, PT, and angle point in the existing right-of-way lines in areas of no proposed acquisition.
k. Right-of-Way Maps – A series of 22 inch by 34 inch drawings to scale depicting the results of relevant elements of records research, field work, analysis, computation, and map making 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 right-of-way project.

3. PROCEDURE

All standards, procedures and equipment used by the ENGINEER's Surveyor shall be such that, at a minimum, the results of the survey shall be in compliance with the "Precision and Accuracy Requirements" set forth by the latest Board Rule as promulgated by the Texas Board of Professional Engineers and Land Surveyors (TBPELS).

a. Existing Right-of-Way Map

The ENGINEER's Surveyor shall field locate items such as: property corners and existing right-of-way markers. The ENGINEER's Surveyor shall verify and update the planimetric file as directed by the STATE.

The ENGINEER's Surveyor shall prepare an existing right-of-way map for proposed right-of-way project.

File must include, but need not be limited to, the following items of information:

(1) Existing right-of-way lines.
(2) Existing Denial of Access lines must be shown sufficiently to indicate areas access is denied.
(3) Record Private property lines must be delineated.
(4) League lines and survey lines must be shown and identified by name and abstract number.
(5) County lines and city limit lines must be located and identified by name.
(6) A north arrow must be shown.
(7) Monumentation found must be shown and described as to material and size.
(8) Intersecting and adjoining public right-of-ways must be shown and identified by name, right-of-way width, and recording data.
(9) Railroads must be shown and identified by name, right-of-way width, and recording data.
(10) Major Utility corridors must be identified as to easement or fee.
(11) Existing TxDOT Easements must be shown and identified by width, and recording data.
(12) Appropriate notes must be included stating the following:
    i. Month(s) and year field surveys were conducted upon which the map is based.

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ii. Bearing Basis and SAF datum
iii.

(13) The right-of-way Control-Section-Job (CSJ) number, if available, shall be shown

4. ADHERENCE TO STANDARDS
For purposes of clarity, consistency, and ease of understanding, the STATE, as an acquiring agency of private property for public use, has adopted standards and formats for right-of-way mapping which have proven to facilitate the processes of negotiation, appraisal, relocation assistance, and condemnation. The ENGINEER's Surveyor shall adhere to these standards and formats to every extent possible to ensure that the needs of the STATE are met.

5. GENERAL SPECIFICATIONS
For purposes of this Contract, the following general specifications for right-of-way mapping apply:
   a. Right-of-way maps must be drawn to a scale of 1 inch = 50 feet. An appropriate scale other than 1 inch = 50 feet may be used on some proposed right-of-way projects with prior approval by the STATE.
   b. The smallest size lettering acceptable on a right-of-way map shall be 1/10 of one inch (Leroy #100) because right-of-way maps are reduced in size by one-half for archiving purposes, t. A right-of-way map which contains any lettering smaller than 1/10 of one inch will not be accepted by the STATE.
   c. The ENGINEER's Surveyor shall obtain STATE approval prior to using a paper product not previously approved by the STATE.

6. GENERAL REQUIREMENTS
For purposes of this Contract, the following general requirements shall apply:
   a. Coordinates appearing on right-of-way maps, on parcel plats, and in property descriptions must be surface coordinates based on the Texas 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 the STATE, must be noted.

      In order to obtain surface coordinates, the ENGINEER's Surveyor shall multiply grid coordinates by the appropriate combined adjustment factor for each zone, as provided by the STATE (The Grid coordinates multiplied by the combined adjustment factor = surface coordinates).
   b. Line and curve tables may be used when necessary.

7. ELECTRONIC RIGHT-OF-WAY MAPPING STANDARDS
The primary purpose of this section is to provide instructions for the graphics standards, file management structure, and naming conventions, for right-of-way mapping electronic deliverables submitted to the STATE's Right-of-Way Division by the Districts, other Divisions, and Consultants, as an integral part of the right-of-way mapping package.

The software, file types and file formats must be compatible with those used by the District/Division Design for Schematics and PS&E (e.g., native *MicroStation V8i* files for graphics, *Microsoft Office Word 2016* for metes and bounds descriptions).

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a. MicroStation V8i
All graphic files for Map Sheets and Parcel Plats must be native Design (DGN) files created using *MicroStation V8i* with the STATE's current seed files and the STATE's workspace environment, settings, and resource files.

b. Level Library Files
The ENGINEER's Surveyor shall use the STATE's current MicroStation V8i Level Library Files for right-of-way mapping. The files contain all the predefined levels that will normally be needed for right-of-way mapping and to show existing utilities.

c. Format of the MDF/MRF (Master Design File or Master Right-of-Way Files) DGN Reference Files and Map Sheet Naming Conventions

The recommended naming prefix for design files is MDF (Master Design File). Therefore, the prefix must be different for the right-of-way files because the location of the existing and proposed right-of-way in the design files from the schematic will change to some degree after an on the ground survey is made for right-of-way mapping. Therefore, the prefix could be MRF for Master Right-of-Way File.

The corrected Master Right-of-Way Files shall be given to the design engineer to be used in the final PS&E so that all features of construction and the relocation of utilities shall be correctly placed in relation to the highway right-of-way and the right-of-way of cross streets or roadways.

The Master Right-of-Way File naming convention is: "MRF ROW CSJ_Logical Name.dgn", with examples as follows:
MRF212104065_Schematic90.dgn (Schematic layout 90% submittal);
MRF212104065_Schematic100.dgn (Schematic layout 100% submittal);
MRF212104065_SchemApprov.dgn (Final Approved [State & FHWA] Schematic);
MRF212104065_PSEDesign.dgn (Final P.S.&E. Design);
MRF212104065_ExROW.dgn (Existing right-of-way determined by RPLS);
MRF212104065_PropROW.dgn (Proposed right-of-way of final design);
MRF212104065_DeedPlot.dgn (Deed Record);
MRF212104065_Planimetric.dgn (Aerial mapping topography);
MRF212104065_ROWTopo.dgn (Improvements data collection);
MRF212104065_DesignTopo.dgn (Design level data collection topography);
MRF212104065_ExUtil.dgn (Existing utilities), etc.

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.

d. File Structure of Master and Reference DGN Files
If possible, the file structure will not have any subfolders, to allow better transfer of data to different PC or server drive names or CD/DVD's without path problems to reference files when the sheet files are opened.

e. 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. Not only must the sheets be legible at full scale sheet size (22 inches x 34 inches), they must be completely legible at half scale sheet size (11 inches x 17 inches). Even if the originals or first generation plots are legible, the reproductions (copies) must also be legible.

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The normal scales for the full scale sheet size must be 1 inch = 50 feet (urban) and 1 inch = 100 feet (rural), which shall be 1 inch = 100 feet and 1 inch = 200 feet, respectively, when plotted or reduced to the half scale sheet size.

Minimum line weights, text size and text font are dictated by legibility at half scale sheet size (11 inches x 17 inches). Even if the originals or first generation plots are legible, the reproductions (copies) must also be legible.

Standard cell library: TxdotSurv_04.cel or current State cell files; Standard Font: 1 Leroy; and standard State color tables: V256COLR.ctb or Txgpk.ctb.

The ENGINEER's Surveyor shall use the STATE'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 STATE's current level library files.

The ENGINEER's Surveyor shall use *MicroStation Packager* for the submission of electronic deliverables, which would capture any non-State standard rsc, cel, text, etc. files that were used in the mapping that look and plot differently in the State's *MicroStation® V8i* workspace.

f. Text and Line Colors When Using Color Digital Orthoimagery in the Background
The predominate colors of the digital orthoimagery (greens, browns, etc) dictate which line and text colors stand out and are legible. Some degree of trial and error is sometimes needed.

g. Required Data in the GEOPAK Right-of-Way GPK File
Alignments, chains of proposed and existing right-of-way 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 right-of-way use, input files can be created for the information sought from the design GPK file to load into the right-of-way GPK file.

h. Surface Coordinate and the ROW GIS Geo-Database
Surface adjustment factors and basis of datum must be well documented in the electronic deliverables "file structure/deliverables read me" file.

i. Requirements for Electronic Deliverables
   (1) Native *MicroStation V8i* DGN files (reference files, sheets files, and parcel plats files);
   (2) *GEOPAK Survey* GPK files;
   (3) Separate comma delimited point files (ASCII file) and.csv file in the following types of coordinates: Surface or Projected Coordinates, Grid Coordinates (Texas Coordinate System of 1983 in U.S. Survey feet) and Geographic Coordinates (WGS-84 in decimal degrees) in the following format: point number, northing or latitude, easting or longitude, elevation, feature code, description. Text/.csv point file naming convention is: ROWCSJ_Type of Coordinates.csv (Example: 212101065_Surface.csv, 212101065_Grid.csv, and 212101065_WGS84.csv);

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(4) Raw and processed GPS files including adjustment reports.

8. DELIVERABLES
   In preparing right-of-way maps, the following are required:
   a. A Preliminary Map showing the proposed schematic and existing right-of-way.
   b. The ENGINEER's Surveyor's report, outlining the approach, reasons or basis for the existing right-of-way determination, and conclusions made.

FUNCTION CODE 145 - MANAGING CONTRACTED/DONATED PE

CONTRACT MANAGEMENT AND ADMINISTRATION

145.1 Project Management and Coordination

The ENGINEER shall direct and coordinate the various elements and activities associated with developing the design schematic and associated reports as well as preparing the environmental document. The ENGINEER shall manage project activities and work to assure they are in accordance with federal and state statutes, regulations, guidelines and the STATE's latest codes, practices, criteria, specifications, policies, procedures, and Standards of Uniformity (SOU) as identified under each task as well as on schedule within project scope and budget. The ENGINEER shall manage project activities and work. The ENGINEER shall provide continuous project coordination and administration; meetings and coordination activities; preparation of meeting minutes; and other project management activities for the project. The ENGINEER shall meet deliverables expectations and the ENGINEER's Project Manager shall be accountable for applying and ensuring appropriate quality control processes, procedures, and conformance is occurring across the team to ensure the highest quality products are delivered to the STATE at every stage of draft, pre-final, and final product. The ENGINEER shall:

1. Schedule project meetings, assist the STATE in preparing correspondence with internal and external parties, and organize and maintain the project file and technical support data file.
2. Manage, oversee and coordinate subconsultant efforts. This includes but is not limited to: monitoring subconsultant activities (staff and schedule), and review and recommendation of approval of subconsultant invoices. Subconsultant progress reports and invoices shall be incorporated into the ENGINEER's invoice.
3. Conduct monthly coordination meetings with the STATE to review project status, including but not limited to: development of meeting agenda with input from the STATE, documentation of meetings attendees, and preparation and distribution of meeting minutes.
4. Prepare for and hold weekly team progress meetings to discuss project progress and action items. The ENGINEER shall invite the STATE to participate in this meeting. The ENGINEER shall include subconsultants as needed.
5. Conduct a kickoff meeting immediately after Contract execution. The ENGINEER shall conduct the kickoff meeting including development of the meeting agenda with input from the STATE, documentation of meeting attendees, and preparation and distribution of meeting minutes.
6. Project File – Assemble and maintain the project file organized to allow for easy file search.

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The project files and complete indexes shall be delivered to the STATE at project closeout or as directed by the STATE.

Deliverables:

145.1.A.a. Attendance with preparation of project meeting documentation and correspondence, filed by date, electronic PDF and native file formats.

145.1.A.b. Project files with index to be delivered at the termination of this Contract, electronic native file formats.

145.1.A.c. Draft and final kickoff meeting materials including agenda (five (5) copies), sign-in sheets (five (5) copies), and meeting materials (up to five (5) copies), and electronic PDF and native file formats.

145.1.A.d. Meeting minutes including documentation of attendees, decisions and action items, electronic PDF and native files for Kick-off and other coordination meetings, electronic PDF and native file formats.

145.1.A.e. Project file (electronic and one (1) hard copy) and complete indexes.

145.2 Project Schedule

The ENGINEER shall develop and maintain a detailed graphic project schedule utilizing Primavera P6 software indicating activities, critical dates, deliverables, and STATE requirements, and to track project conformance to Exhibit C, Work Schedule.

Baseline - Baseline schedule development is expected to be a 2 step process e.g. initial and final submittal. Step 1 - Within 30 days of NTP, the ENGINEER shall develop and submit for review an initial Baseline schedule in accordance with the *Mobility35 QMS procedure SCH-01 Schedule Management*. Step 2 – The ENGINEER shall collaborate with TxDOT in a workshop environment to address outstanding comments for final submittal to TxDOT. When dates change from the approved baseline in the initial project schedule or latest schedule baseline, the ENGINEER shall submit a revised baseline schedule or a recovery schedule for TxDOT approval.

Monthly Updates – The ENGINEER shall submit monthly schedule updates in accordance with the requirements outlined in the *Mobility35 QMS procedure SCH-01*. Monthly schedule updates are due on the third Thursday of each month to include forecast progress to month-end.

Each schedule submittal package should include, at a minimum:

1. Transmittal Cover Sheet via SharePoint
2. Oracle Primavera P6 Schedule File (.xer)
3. Basis of Schedule/ Narrative
4. Schedule Reports (Adobe Acrobat PDF) –
    a. Longest Critical Path Report
    b. Level 3 Summary Report

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c. Detailed Bar chart Report (no collapsed summary bars)

Deliverables:

145.2.A.a. Draft and Final Baseline Project Schedule, electronic PDF and native file (P6) formats.

145.2.A.b. Monthly Project Schedule updates, filed by date, electronic PDF and native file formats

145.3 Progress Reports

All progress reporting guidelines are as follows:

The ENGINEER shall prepare and submit a monthly written progress report in electronic format to the STATE regardless of whether the ENGINEER submits an invoice for that month. The ENGINEER's monthly written progress report shall describe: the progress accomplished for the reporting period; progress summary (including completed activities or deliverables during the current invoice period, progress of ongoing activities or deliverables with percent complete, and progress completed after the reporting period, but not yet invoiced); future progress expected (activities and deliverables anticipated within at least one month of the reporting period); problems encountered or anticipated and actions taken to remedy them; list of meetings attended; and schedule status (to indicate whether the work is on schedule for timely delivery or not).

Deliverables:

145.3.A.a. Monthly Progress Reports, filed by end-of-period date

145.3.A.b. Progress Reports, covering invoicing period, filed by end-of-period date

145.4 Project Management Plan and Quality Plan

145.4.A **Project Management Plan (PMP) –** The ENGINEER shall prepare and submit a PMP commensurate with the anticipated level of complexity of the project which may be subject to review and comment by TxDOT. The PMP should at a minimum address (but not be limited to) the following project specific elements:

1. The ENGINEER's organization and sub-consultants showing lines of authority, communication and key contacts.
2. Resource management for achieving deliverables as planned
3. Identification of risks which may impact planned deliverables and proposed mitigations.
4. Key decisions which require input from TxDOT to ensure design development progresses in a timely manner.

Deliverables:

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145.4.A.a. Up to two (2) copies of the Draft Project Management Plan, electronic PDF and native file formats

145.4.A.b. Up to two (2) copies of the Final Project Management Plan, electronic PDF and native file formats

145.4.B **Quality Assurance / Quality Control Plan (QA/QC Plan) -** The ENGINEER shall submit their QA/QC Plan which describes the policies, procedures and quality controls which are in place to ensure the quality of design throughout the duration of the project. The QA/QC Plan shall address at a minimum (but not limited to) the following:

1. QA/QC Objectives
2. Definitions
3. Team Member Definitions, Qualifications and Responsibilities
4. QC Schedule
5. QC Check Procedure, covering the processes to review different types of deliverables, such as:
   a. Plans (Schematics, PS&E, exhibits, etc.)
   b. Calculations
   c. Reports/ other technical documents (design exceptions, DSR, Stage Gate, etc.)
   d. Electronic Files (CADD, kmz, 3D models, etc.)
   e. Correspondence
   f. Constructability Review
6. Supplemental Reviews
7. Sub-consultant Quality
8. QA/QC Records
9. Check Lists

<u>Deliverables:</u>

145.4.B.a. Up to two (2) copies of the Quality Management Plan, electronic PDF and native file formats

145.5 Invoices

The ENGINEER shall invoice according to Function Code breakdowns shown in Attachment ‘E’ - Fee Schedule. The ENGINEER shall submit each invoice no later than 30 days after the end of the reporting period in a format acceptable to the STATE. With each invoice, the ENGINEER shall include a completed Projected vs. Actual Contract Invoices form; and update the progress report and Deliverables Table (if updates are necessary, for example to update the financial percent complete) and submit the progress report and Deliverables Table with the invoice. Invoices should be broken out by fiscal year when the invoice spans a time period of two different fiscal years.

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FUNCTION CODE 160 ROADWAY DESIGN

160.1 Design Surveys

Design Surveys include performance of surveys associated with the gathering of survey data for topography, cross-sections, and other related work in order to design a project.

A. PURPOSE

The purpose of a design survey is to provide field data in support of transportation systems design.

B. DEFINITIONS

A design survey is defined as the combined performance of research, field work, analysis, computation, and documentation necessary to provide detailed topographic (3-dimensional) mapping of a project site. A design survey may include, but need not be limited to locating existing right-of-way, cross-sections or data to create cross-sections and Digital Terrain Models (DTM), horizontal and vertical location of utilities and improvements, detailing of bridges and other structures, review of right-of-way maps, establishing control points, etc.

C. TASKS TO BE COMPLETED

Design Surveys

The STATE will request design surveys on an as needed basis. The ENGINEER's Surveyor shall perform tasks including, but not limited to the following:

a. Obtain or collect data to create cross-sections and digital terrain models.
b. Locate existing utilities.
c. Locate topographical features and existing improvements with labels.
d. Provide details of existing bridge structures.
e. Provide details of existing drainage features including flowlines, (e.g., Water Quality Ponds, culverts, manholes with inverts, etc.).
f. Locate wetlands.
g. Establish additional and verify existing control points. Horizontal and Vertical control ties must be made and tabulated, to other control points in the vicinity, which were established by other sources such as, the National Geodetic Survey (NGS), and the Federal Emergency Management Agency (FEMA), and any other local entities as directed by the STATE.
h. Locate existing right-of-ways.
i. Review right-of-way maps.
j. Locate boreholes.
k. Perform hydrographic surveys.
l. Update existing control data and prepare survey control data sheets, as directed by the STATE for inclusion into a construction plan set.

The Engineer's Surveyors shall also prepare a *Survey Control Index Sheet* and a *Horizontal and Vertical Control Sheet(s)*, signed, sealed and dated by the professional

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engineer in direct responsible charge of the surveying and the responsible RPLS for insertion into the plan set. The *Survey Control Index Sheet* shows an overall view of the project control and the relationship or primary monumentation and control used in the preparation of the project; whereas, the *Horizontal and Vertical Control sheet(s)* identifies the primary survey control and the survey control monumentation used in the preparation of the project. Both the *Survey Control Index Sheet* and the *Horizontal and Vertical Control Sheet(s)* must be used in conjunction with each other as a set. The STATE's forms for these sheets can be downloaded from the STATE's website.

The following information shall be shown on the *Survey Control Index Sheet:*

a. Overall view of the project and primary control monuments set for control of the project
b. Identification of the control points
c. Baseline or centerline
d. Graphic (Bar) Scale
e. North Arrow
f. Placement of note "The survey control information has been accepted and incorporated into this PS&E" which shall be signed, sealed and dated by a Texas Professional Engineer
g. RPLS signature, seal, and date
h. The STATE's title block containing District Name, County, Highway, and CSJ

The following information shall be shown on all *Horizontal and Vertical Control Sheets*:

a. Location for each control point, showing baseline or centerline alignment and North arrow.
b. Station and offset (with respect to the baseline or centerline alignments) of each identified control point.
c. Basis of Datum for horizontal control (base control monument/benchmark name, number, datum).
d. Basis of Datum for the vertical control (base control monument, benchmark name, number, datum).
e. Date of current adjustment of the datum.
f. Monumentation set for Control (Description, District name/number and Location ties).
g. Surface Adjustment Factor and unit of measurement.
h. Coordinates (State Plan Coordinates [SPC] Zone and surface or grid).
i. Relevant metadata.
j. Graphic (Bar) Scale.
k. Placement of note "*The survey control information has been accepted and incorporated into this PS&E"* which shall be signed, sealed and dated by a Texas Professional Engineer.
l. RPLS signature, seal and date.
m. The STATE's title block containing District Name, County, Highway, and CSJ.

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D. TECHNICAL REQUIREMENTS

1. Design surveys must be performed under the supervision of a RPLS currently registered with the TBPELS.
2. Horizontal ground control used for design surveys, furnished to the Engineer's Surveyor by the STATE or based on acceptable methods conducted by the Engineer's Surveyor, must meet the standards of accuracy required by the STATE.

   Reference may be made to standards of accuracy for horizontal control traverses, as described in the TxDOT Survey Manual, latest edition, 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, furnished to the Engineer's Surveyor by the STATE or based on acceptable methods conducted by the Engineer's Surveyor, must meet the standards of accuracy required by the STATE.

   Reference may be made to standards of accuracy for vertical control traverses, as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.
4. Side shots or short traverse procedures used to determine horizontal and vertical locations must meet the following criteria:
   a. Side shots or short traverses must begin and end on horizontal and vertical ground control as described above.
   b. Standards, procedures, and equipment (may be GPS Equipment, LiDAR, Total Stations, etc.) used must be such that horizontal locations relative to the control may be reported within the following limits:
      (1) Bridges and other roadway structures: less than 0.1 of one foot.
      (2) Utilities and improvements: less than 0.2 of one foot.
      (3) Cross-sections and profiles: less than 1 foot.
      (4) Bore holes: less than 3 feet.
   c. Standards, procedures, and equipment (may be GPS Equipment, LiDAR, Total Stations, etc.) used must be such that vertical locations relative to the control may be reported within the following limits:
      (1) Bridges and other roadway structures: less than 0.02 of one foot.
      (2) Utilities and improvements: less than 0.1 of one foot.
      (3) Cross-sections and profiles: less than 0.2 of one foot.
      (4) Bore holes: less than 0.5 of one foot.

E. AUTOMATION REQUIREMENTS

1. Planimetric design files (DGN) must be fully compatible with the STATE's *MicroStation V8i* graphics program without further modification or conversion.
2. Electronically collected and processed field survey data files must be fully compatible with the STATE's computer systems without further modification or conversion. All files must incorporate only those feature codes currently being used by the STATE.

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3. DTM must be fully compatible with Bentley's *OpenRoads* system without further modification or conversion. All DTM must be fully edited and rectified to provide a complete digital terrain model with all necessary break lines.

F. DELIVERABLES

The deliverables to be specified for design surveys shall be any combination of the following:

1. Digital Terrain Models (DTM) and the Triangular Irregular Network (TIN) files in a format acceptable by the STATE.
2. Maps, plans, or sketches prepared by the Engineer's Surveyor showing the results of field surveys.
3. Computer printouts or other tabulations summarizing the results of field surveys.
4. Digital files or media acceptable by the STATE containing field survey data (ASCII Data files).
5. 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.
6. Field survey notes, as electronic and hard copies.
7. An 8 ½ inch by 11 inch survey control data sheet for each control point which must include, but need not be limited to, a location sketch, a physical description of the point including a minimum of two reference ties, surface coordinates, a surface adjustment factor, elevation, and the horizontal and vertical datums used. A pre-formatted survey control data sheet form in Microsoft Office Word 2016 format will be provided by the STATE.
8. A digital and hard copy of all computer printouts of horizontal and vertical conventional traverses, GPS analysis and results, and survey control data sheets.
9. All GEOPAK GPK files.
10. Survey reports in a format requested by the STATE.

160.2 Aerial Mapping

Aerial Mapping involves the collection and reduction of aerial survey data, and preparation of site maps and topographic maps.

A. PURPOSE

The purpose of aerial mapping is to provide planimetric digital mapping (DGN) and DTM in support of roadway design.

B. DEFINITIONS

For purposes of this Contract, the following definitions shall apply:

1. Aerial Photograph – A vertical photograph taken from an aircraft at an altitude above mean terrain elevation to produce a photo scale of 1:3,000.

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2. Analytical triangulation – The process of expanding a skeletal network of ground control points to provide the dense control network to reference each individual photogrammetric stereo model to the actual ground.
3. Ground control – Ground control targets sufficient in number and geospatial distribution to allow analytical triangulation and mapping to meet American Society for Photogrammetry and Remote Sensing (ASPRS) Class standard for 1" = 40' scale map accuracy with a one foot contour interval.
4. Airborne GPS/IMU – An airborne GPS receiver on-board the aircraft recording GPS data to be included in the analytical triangulation with the purpose of reducing the number of ground control points required for an aerial mapping task. Inertial Measurement Unit (IMU) data to supplement the analytical triangulation is optional and its use is at the discretion of the Certified Photogrammetrist.
5. DGN – A two or three dimensional graphics file produced by *MicroStation V8i using Bentley's OpenRoads tools*. These files may contain features and improvements plotted in a horizontal plane along the N and E axes which correspond to Texas State Plane Coordinates. These files may contain 2D or 3D elements representing topographic, existing, proposed, schematic, and general layout features.
6. Digital terrain Model (DTM) – A three dimensional digital model of the ground containing those features necessary to define surface relief. A three dimensional model does not normally contain those planimetric features not necessary to define relief.
7. Flight Map – A map depicting the flight line layout over the project area.
8. Horizontal and Vertical Ground Control – Survey control points for which the N and E coordinate and elevation have been determined by on-the-ground surveys.
9. Low Altitude Photography – Aerial photography with a film photo scale of 1:3000 or a digital image with a ground pixel size of 5 cm or less.
10. Medium Altitude Photography – Aerial photography with a film photo scale of 1:12,000 or a digital image with ground pixel size of 20 cm.
11. Planimetric Map – A two dimensional map containing natural ground features and improvements plotted in a horizontal plane along the N and E axes. A planimetric map does not include relief elements such as spot elevations, cross-sections, or contours.
12. Project Photo Length – The distance over which photographs are required to be taken.

C. <u>TASKS TO BE COMPLETED</u>

1. Aerial Photography

   The Engineer's Surveyor shall provide aerial photography for low altitude aerial mapping appropriate for detailed design.

   a. Ground Control Accuracy Standards

      (1) The Engineer's Surveyor shall provide horizontal ground control that meets standards of accuracy required by the STATE and as described in the <u>TxDOT Survey Manual</u>, latest edition, or the TSPS <u>Manual of Practice for Land Surveying in the State of Texas</u>, as may be applicable.

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(2) The Engineer's Surveyor shall provide vertical ground control that meets standards of accuracy required by the STATE and as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

b. Paneling Placement Specifications
For purposes of this Contract, all standards and specifications shall be in accordance with established guidelines and recommended or approved by the STATE.

c. Aerial Photography Standards and Specifications
For purposes of this Contract, all standards and specifications shall be in accordance with established guidelines and recommended or approved by the STATE.

d. LiDAR Technology
The use of LiDAR Technology (mobile, terrestrial or aerial) will be acceptable when approved by the STATE and the accuracies of the specified tasks it will be used for are met or exceeded.

e. Deliverables
The Engineer's Surveyor shall provide:
(1) Digital Orthophotos on USB or Hard-Drive.
(2) A photo index of the scanned aerial film frames or digital image frames for each frame of photography in the project.

2. DGN, DTM and TIN Files
The Engineer's Surveyor shall prepare DGN, DTM and TIN files covering the specific work location, meeting standards and specifications as required.

a. Horizontal Ground Control Accuracy Standards
The Engineer's Surveyor shall provide horizontal ground control that meets standards of accuracy required by the STATE and as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

b. Vertical Ground Control Accuracy Standards
The Engineer's Surveyor shall provide vertical ground control that meets standards of accuracy required by the STATE and as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

c. Map Accuracy Standard
Aerial mapping must meet or exceed the requirements for ASPRS Class 1 standard for 1" = 40' scale mapping with a one foot contour interval.

Field verification of adherence to the required accuracy specification is at the discretion of the STATE.

d. Statement of Map Accuracy
For maps that are not field checked but have been compiled to meet the STATE's accuracy standard, the Engineer's Surveyor shall include the following statement

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along with the Photogrammetrist's seal on the delivered hard copy and digital versions of the map:
"This map was compiled to meet the ASPRS Standard for Class 1 map accuracy."

If the map was checked and found to conform to this spatial accuracy standard, the statement above and the following statement must also be included on the delivered hard copy and digital versions of the map, and in the field check summary:
"This map was checked and found to conform to the ASPRS Standard for Class 1 map accuracy."

e. DGN File Specifications
   (1) Files must be fully compatible with the STATE's *MicroStation* graphics system without further modification or conversion.
   (2) File features and level structure must be in compliance with the State's current *Photogrammetry Mapping Legend*.
   (3) Files must be capable of plotting maps to a 1 inch = 40 feet scale with the smallest text size being one tenth of one inch (1/10").
f. DTM and TIN Files Specifications
   (1) Files must be fully compatible with Bentley's OpenRoads graphics system without further modification or conversion.
   (2) The STATE's current Level Library Files for Photogrammetry mapping will be provided by the STATE.
   (3) File features and level structure must be in compliance with the STATE's current *Photogrammetry Mapping Legend*.
   (4) Files must be capable of plotting maps to a 1 inch = 50 feet scale with the smallest text size being one tenth of one inch (1/10").
g. Deliverables
   The Engineer's Surveyor shall provide:
   (1) DGN, DTM and TIN files on a medium and in a format acceptable to the STATE, delivered on USB, or hard-drive.
   (2) Orthophotography (created using the DTM) delivered on CD, DVD, flash-drive, or hard-drive in tiff format (3 banded) with world files. If digital, depending on intended use, deliverable formats must include:
      i. Raw tiff image – rectified – 4 Band Tiff (for archive only).
      ii. Color photography – rectified – 3 Band Tiff and Mr. Sid.
      iii. Infrared Photography – rectified – 3 Band Tiff and Mr. Sid.
   (3) The STATE's *Photogrammetry Mapping Legend* and supplements

160.3 Horizontal and Vertical Control for Aerial Mapping

Horizontal and Vertical Control for Aerial Mapping involves the establishment of the horizontal and vertical control for aerial mapping.

A. <u>PURPOSE</u>

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The purpose of an aerial photography control survey is to provide ground control in support of aerial Photogrammetry.

B. DEFINITIONS

An aerial photography control survey is defined as the combined performance of reconnaissance, field work, analysis, computation, and documentation necessary to provide the horizontal and vertical position of specific ground points to be used in setting the scale of aerial photographs and determining the relative position of elements visible in said photographs.

C. TASKS TO BE COMPLETED

The following is an outline of the tasks to be performed. The Engineer's Surveyor shall:

1. Prepare and submit an Aerial Ground Control Layout showing the proposed control and offsite control points, and aerial ground control points, for approval by the STATE.
2. Establish and determine the coordinates of the offsite and control points, and aerial ground control points.
3. Establish and determine the elevations of the offsite and control points, and aerial control points.
4. Place aerial ground control target material at the established points and maintain until the photographs from the flight are approved.
5. Prepare, to scale, a Survey Control Index Sheet, a Horizontal and Vertical Control Sheet, and an individual control data sheet for each offsite and control point, and aerial control point.

D. TECHNICAL REQUIREMENTS

1. Aerial photography control surveys must be performed under the direct supervision of a RPLS currently registered with the TBPLS.
2. The coordinate location of the aerial control points shall be based on acceptable methods, conducted by the Engineer's Surveyor, and must meet the standards of accuracy as set forth below:
3. Reference may be made to standards of accuracy for horizontal control traverses, as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.
4. The elevation of the aerial control points must be based on acceptable methods, conducted by the Engineer's Surveyor, and shall meet the standards of accuracy as set forth below:
5. Reference may be made to standards of accuracy for horizontal control traverses, as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.
6. The elevation of aerial control points based on side shots or short traverses must meet the following criteria:

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a. Side shots or short traverses must begin and end on vertical ground control as described above.
b. Standards, procedures, and equipment used must be such that the vertical location relative to the control may be reported to within 0.02 of one (1) foot.

E. AUTOMATION REQUIREMENTS

Post processing of field data will be reviewed by the STATE. Data processed by standard calculators, computers, and other business hardware and software normally maintained and used by the Engineer's Surveyor shall be considered acceptable.

F. DELIVERABLES

The Engineer's Surveyor shall:

1. Submit a final aerial control point layout showing the location of the points and labeled with their respective alpha-numeric designations.
2. Submit a PDF and computer graphics of an 11 inch by 17 inch 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 STATE.
3. Submit a PDF and computer graphics of an 11 inch by 17 inch 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 STATE.
4. Submit an 8 ½ inch by 11 inch data sheet for each aerial ground control point which must include, but need not be limited to, a location sketch, a physical description of the point, surface coordinates, the elevation, and datums used.
5. Submit a USB or Electronic Delivery containing the graphics files and scanned images of the control data sheets.
6. Submit a written statement describing the datum used along with copies of all relevant NGS and data sheets.
7. Submit a written tabulation of all aerial control points with their respective alpha-numeric designations, surface coordinates (for center panel points only), and elevations.

160.4 Utility Investigation and Coordination

Utility Investigation

Utility Base Map

A. The ENGINEER shall obtain information on existing utilities from utility owners and shall conduct investigations to identify and evaluate all known existing and proposed public and private utilities. The ENGINEER shall identify potential conflicts and attempt to minimize the potential adverse utility impacts in the preparation of the schematic design. The ENGINEER shall prepare a base map depicting the utility locations. The engineer shall create and maintain a utility conflict matrix along with a utility conflict exhibit through the

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duration of the contract identifying potential known conflicts. The format of the matrix and exhibit shall be consistent with the latest version of the Dallas District Utility Conflict Matrix and Utility Conflict Exhibit.

B. Utility Engineering Investigation (currently Subsurface Utility Engineering) shall include utility investigations subsurface and above ground prepared in accordance with AASHTO standards [ASCE C-1 38-02 (http://www.fhwa.dot.gov/programadmin/asce.cfm)] and Utility Quality Levels defined in cumulative order as follows:

1. **Quality Level D – Existing Records**: Utilities are plotted from review of available existing records.
2. **Quality Level C (QL-C)– Surface Visible Feature Survey:** Complete 120, 000 LF of QL-C. Quality Level D information from existing records is correlated with surveyed surface-visible features. Includes Quality Level D information. If there are variances in the designated work area of Level D then a new schematic or plan layout, if needed, is required showing the limits of the proposed project and limits of the work area required; including highway stations, limits within existing or proposed right of way, additional areas outside the proposed right of way, and distances or areas to be included down existing intersecting roadways.
3. **Quality Level (QL-B) – Designate:** Complete 300, 000 LF of QL-B. Two-dimensional horizontal mapping. This information is obtained through the application and interpretation of appropriate non-destructive surface geophysical methods. Utility indications are referenced to established survey control. Incorporates Quality Levels C and D information to produce Quality Level B. If there are variances in the designated work area of Level D then a new schematic or plan layout, if needed, is required showing the limits of the proposed project and limits of the work area required including highway stations, limits within existing or proposed right of way, additional areas outside the proposed right of way, and distances or areas to be included down existing intersecting roadways.

C. The ENGINEER shall comply with all applicable State policy and procedural manuals and shall be responsible for any damage to the utility during the locating process. In the event of damage, the ENGINEER shall stop work, notify the appropriate utility facility owner, the State and appropriate regulatory agencies. The regulatory agencies include, but are not limited to the Railroad Commission of Texas and the Texas Commission on Environmental Quality (TCEQ). The ENGINEER shall not resume work until the utility facility owner has determined the corrective action to be taken. The ENGINEER shall be liable for the costs involved in the repair or replacement of the utility facility.

D. The ENGINEER shall assist the State in conducting utility coordination meetings with utility companies, as required, to facilitate utility conflict identification and resolution.

1. The ENGINEER shall establish contact with all existing utilities within and adjacent to the project limits and set up utility coordination meetings to discuss concepts and options for design and construction. This process should also be extended to utilities,

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whom approach the State, that plan to install facilities within the project limits after the project has been initiated.

2. The ENGINEER shall establish and conduct workshop meetings, both individually with each utility and with all utilities that incorporate the State's project team to review and resolve conflicts.
3. The ENGINEER shall create agenda and exhibits for all coordination meetings as directed by the State.
4. The ENGINEER shall establish and promote the desired agenda and methodologies for utility construction within the project limits. This shall consist primarily of promoting the construction of utilities as a part of the Highway Contract.
5. The ENGINEER shall schedule and conduct a utility kick-off meeting to obtain more information on existing facilities within the project limits. Major utility facilities shall be discussed and analyzed to avoid relocation, if possible.
6. The ENGINEER shall schedule and conduct milestone meetings (or as needed) with the State to coordinate the work effort and resolve problems and prepare a written report of such meetings. The meetings shall review:
   a. Existing facilities including major facilities to be avoided with the project, if possible
   b. Utility Conflict Matrix
   c. Utility Conflict Exhibit
   d. Long lead items that could potentially impact the schedule during PS&E

E. DELIVERABLES:

1. Utility Conflict Matrix along with Utility Conflict Exhibit. The Utility Conflict Exhibit will be on 11x17 sheets and include callouts to indicate the conflict ID#, utility owner, type of line (water, sewer, high pressure gas, etc.), material (if it is an AC pipe line), and size (if known).
2. Utility Contacts list in excel and pdf format
3. Utility Summary to indicate major utility facilities or time sensitive items pertaining to utilities that need to be addressed in PS&E.

Utility Conflict Plan

160.4.1 The ENGINEER shall analyze information on existing utilities provided by the STATE and shall conduct investigations to identify and evaluate known proposed public and private utilities. The ENGINEER shall identify potential conflicts and attempt to minimize the potential adverse utility impacts in the preparation of the schematic design. The ENGINEER shall create and maintain a utility conflict matrix along with a utility conflict plan through the duration of the contract identifying potential known conflicts. The format of the matrix and exhibit shall be consistent with the latest version of the template provided by the STATE.

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160.4.2 The ENGINEER shall lead the STATE in conducting utility coordination meetings with utility companies, as required until major utility conflicts have been discussed and agreed upon by these parties, to facilitate utility conflict identification and resolution.

A. The ENGINEER shall establish contact with existing utilities within and adjacent to the project limits and set up utility coordination meetings to discuss concepts and options for design and construction. This process should also be extended to utilities, whom approach the STATE, that plan to install facilities within the project limits after the project has been initiated

B. The ENGINEER shall schedule and conduct workshop meetings with involved utilities that incorporate the STATE's project team in order to resolve conflicts

C. The ENGINEER shall create agenda and exhibits for coordination meetings as directed by the STATE

D. The ENGINEER shall establish and promote the desired agenda and methodologies for utility relocation within the project limits. This shall include promoting the construction of utilities as a part of a potential design-build Contract

E. The ENGINEER shall schedule and conduct a utility kick-off meeting to obtain more information on existing facilities within the project limits. Major utility facilities shall be discussed and analyzed to avoid relocation, if possible. Major utilities include: water and waste water 24" and larger, any gas lines 10" and larger, pipelines, any electrical transmission, telecom lines of regional importance critical to their infrastructure such as fiber and large duct banks

F. The ENGINEER shall schedule and conduct meetings (as needed) with the STATE to coordinate the work effort and resolve problems and prepare a written report of such meetings. The meetings shall review:

   i. Existing facilities including major facilities to be avoided with the project, if possible
   ii. Utility Conflict Matrix
   iii. Utility Conflict Exhibit
   iv. Long lead items that could potentially impact the schedule during the potential design-build project

<u>Deliverables:</u>

160.4.A.a. Utility Conflict Matrix along with Utility Conflict Exhibit. The Utility Conflict Exhibit will be on 11"x17" sheets and include callouts to indicate the conflict ID#. Line styles/legend will identify utility owner, type of line (water,

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sewer, high pressure gas, etc.), material (if it is an AC pipe line), and size (if known).

160.4.A.b. Utility Contacts list in excel and pdf format

160.4.A.c. Utility Summary to indicate major utility facilities or time sensitive items pertaining to utilities that need to be addressed during the design-build project.

160.4.A.d. Meeting minutes and Meeting Report for all above mentioned workshop, coordination, kick-off and meetings including action items with list of all attendees of each utility meeting for a maximum of 40 meetings.

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