Texas Department of Transportation

DESIGN-BUILD SPECIFICATIONS

Items 10-28, 32, 10,001, 10,004

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Item 10
General

10.1 Offices, Equipment, and Vehicles

Except where noted elsewhere in the Contract Documents, DB Contractor and TxDOT shall co-locate until Final Acceptance to facilitate Project coordination and daily communication. The definition of "co-locate" for the Term is office space meeting the conditions of these Design-Build Specifications that are within one mile of the Project ROW and east of the western Project limits, or as approved by TxDOT. In addition to colocation requirements for specified personnel and Key Personnel elsewhere in these Design-Build Specifications, the following DB Contractor's personnel shall be co-located with TxDOT:

- Senior design engineer, and at least one CADD technician for the design duration; and
- ROW AM during ROW acquisition phase.

The office space requirements for the Project office are provided below.

10.1.1 Core Office

DB Contractor shall provide all space, facilities, and support Elements necessary to design, construct, and maintain the TxDOT Project office in accordance with the DBA. DB Contractor shall provide office space for TxDOT's design and Project management staff. If it is necessary to locate any of these Elements of the Work off-site or outside of this office, DB Contractor shall obtain TxDOT's prior written consent.

DB Contractor shall provide TxDOT office space. (i.e., available for occupancy) within 90 days following issuance of NTP1, and prior to NTP2. The location, condition, and amenities of the office space for TxDOT are subject to TxDOT's prior written approval. DB Contractor shall provide a preliminary TxDOT facility area layout plan to TxDOT no later than 30 days after NTP1. TxDOT will promptly review and comment on required modifications to the layout within 10 days. DB Contractor shall submit a final facility layout plan within 10 days of receipt of TxDOT comments.

DB Contractor shall provide separate office space for the exclusive use of TxDOT's design and Project management staff in the TxDOT facility area as specified herein and subject to TxDOT's prior written approval. This office space shall be located within the same building or complex as DB Contractor's office staff. TxDOT will be reasonable regarding re-use of existing space within DB Contractor's current office facility, provided that the space is contiguous and workable in TxDOT's discretion.

10.1.1.1 Core Office Condition

The offices shall be in good and serviceable condition, at least of the same quality as those of DB Contractor's counterpart office space, and available for occupancy as specified herein. Both Parties shall participate in a facility condition survey prior to and at the completion of occupancy. TxDOT shall return possession of DB Contractor-provided TxDOT facility area to DB Contractor in essentially the same condition as when TxDOT occupied the facilities, except for reasonable wear and tear and except for alterations, or loss or damage, caused by any member of a DB Contractor-Related Entity.

10.1.1.2 Core Office Loss or Damage

If office spaces, related facilities, or fixtures are destroyed, damaged, or stolen during the Term in the TxDOT facility area, except as a direct result of willful misconduct of TxDOT or its personnel, DB Contractor shall, at its cost and within 10 Business Days after the occurrence of such destruction or damage, repair those items to their original condition or replace them. However, in the case of lost, damaged, or stolen office equipment (e.g., computers, fax machines, copy machines, and printers) necessary for normal office operations, replacement shall occur within two Business Days. If loss or damage is caused as a direct result of willful misconduct of TxDOT or its personnel, DB Contractor shall replace the facilities noted herein within the timeframes specified herein, and TxDOT shall reimburse DB Contractor for actual, reasonable, and documented costs incurred.

10.1.1.3 Core Office Facilities and Equipment

For the TxDOT facility area it provides, DB Contractor shall:

- General. Secure facility space, obtain all permits, install and pay for all utility services, and maintain the facilities as part of the Work;
- Access and Security. Provide separate TxDOT entrance/exit(s) from building, which shall be secured with electronic door lock(s) plus a deadbolt lock. DB Contractor shall provide security badge card access with locking doors running on time zone/holiday schedules for entry doors, as well as other designated areas (e.g., network/telecommunications, document storage, offices). DB Contractor shall provide software for maintaining access to these areas, which will be owned and/or maintained by TxDOT's design and Project management staff;
- Lighting and Electricity. Include with all interior spaces overhead lighting meeting OSHA, building, electrical, and energy code requirements for similar office space (provide 30 foot candles of light at 30 inches above finished floor). Each office space shall have at least four duplex receptacles, with minimum circuit capacity of 20 amperes. In addition, each personal office area and conference room shall have a 1,500 Volt-ampere (VA) uninterruptible power supply (UPS). All LAN, telephone system equipment, and appurtenances shall have a UPS sized properly to be capable of providing up to one hour of battery run time;
- Janitorial and Trash Services. Provide daily janitorial service (except Saturdays, Sundays, and holidays) and maintain trash containers and trash pickup service for the building and Site areas beyond the TxDOT facility area. This shall include, but not be limited to, sweeping and mopping floors, cleaning restrooms and break room, emptying wastebaskets, and periodic dusting. This service shall be paid for by DB Contractor. DB Contractor shall pay for and procure janitorial services for the TxDOT facility area;
- Exterior Maintenance. Maintain the exterior areas of office spaces, including access to parking areas;
- Accessibility and Licensing. Meet all access requirements of the Texas Accessibility Standards, ADA Accessibility Guidelines, as amended (42 USC § 12101, et seq.), and the applicable building code. Facility design plans shall be submitted to the TDLR for review and approval as required by 16 TAC § 68;
- Restrooms, Break Room, and Entry Space. Provide access to women's and men's restrooms, break room space, and building entry space. These spaces may be shared with DB Contractor's office space/staff. These spaces and all TxDOT spaces shall have access 24 hours per day, seven days per week, and 365 days per year. In lieu of access to a common break room, DB Contractor may provide a 200 SF break room/kitchen within the TxDOT space, with refrigerator with freezer compartment, sink, and microwave. Break room/kitchen will have storage closet (25 SF) and cabinets with drawers and counter tops. In the event that access to restrooms cannot be accessed from a common building entry/lobby, DB Contractor may provide separate restrooms for the TxDOT facility area. In the event it is necessary to locate a separate break room and/or restrooms within the TxDOT facility area, the 3,000 SF TxDOT space allocation may be required to be increased to accommodate these spaces;
- HVAC. Provide electrical, HVAC systems capable of maintaining temperatures between 65- and 75-degrees Fahrenheit in all spaces, 24/7/365, through the year. Server room shall have dedicated air conditioning/cooling system capable of maintaining temperatures between 65- and 70-degrees Fahrenheit, and 15% relative humidity;
- Code Requirements. Meet all applicable building and fire code requirements; and
- Disposal and Removal. Be responsible for disposal or removal of all DB Contractor-provided facilities and any facility and/or site restoration Work as required.

10.1.1.4 Core Office Space Requirements

DB Contractor shall include the following Elements in the TxDOT facility area:

- Offices. Enclosed offices for TxDOT's management staff (150 SF each), up to seven total with keyed door hardware, desk, desk chair, bookcase, file cabinet, credenza, and guest desk chair;
- Cubicles. Cubicle area spaces for administration staff (64 SF each), up to seven total; (power supply and data and communication lines to cubicles may be provided through power pole drops);

- Conference Rooms. Two conference rooms (enclosed) at 12 feet by 25 feet (300 SF); Each shall have dimmable lighting; conference rooms shall have two 60-inch minimum flat panel monitor with VGA/HDMI accessibility; each conference room shall have one chair for every 24 SF of conference room space and a conference table of sufficient size for each chair;
- Reception Area. Receptionist space with waiting area with seating for six visitors (200 SF); other furniture to be determined jointly by DB Contractor and TxDOT;
- Work Room. Work room (150 SF) with 30-inch high plastic laminate wall-mounted counters (15 linear feet of counter). Work room shall be located near the center of the facility, and in close proximity to the receptionist space.
- Storage and Filing. One lockable space for storage and filing, at 15 feet by 20 feet (300 SF);
- Server Room. One computer server room (150 SF or larger to meet ADA, OSHA, and NEC requirements as applicable) that has limited access and is locked via security card access. Server room shall be accessible via hallway entry not sharing any walls with the exterior of the building, and have no windows, a non-static floor covering, a standard 7-foot by 19-inch rack and at least three dedicated 20-amp power circuits and one 30-amp circuit. All patch panels (phone and data) shall be located within the designated server room. Temperature shall be maintained with a dedicated air conditioning/cooling system as defined above.
- Parking Area. Parking area for a minimum of 16 vehicles (10 staff/6 visitors) that is reasonably level (all-weather surface and all-weather access); a minimum of one-half of the available parking area must accommodate an 8-foot vehicle height. If covered parking is available, no less than two covered parking spaces shall be made available to TxDOT.
- Exterior Lighting. Sufficient exterior security lighting that is automatically activated at low light levels to maintain 2 foot candles of lighting within the building and parking areas of the site; and
- Corridors. Corridors within the TxDOT facility shall have a width of 54 inches.

10.1.1.5 **Core Office Miscellaneous Requirements and Features**

DB Contractor shall provide the following as noted:

- Flooring. Carpeted flooring (carpet not required in server room);
- Entry Access. Entry to TxDOT areas by electronic door hardware card access (not keyed), with UPS on locks (fail closed);
- Electrical Outlets. All data/voice outlets shall be installed next to power outlets;
- HVAC. 24/7/365 HVAC as previously described;
- Window Coverings. Horizontal mini-blinds (no drapes) for each exterior window;
- Power Circuits. Provide dedicated electrical power circuits for copiers, and minimum of six duplex receptacles with three dedicated 20-amp circuits and one 30-amp circuit for the server room;
- Fire Extinguishers. DB Contractor shall provide fire extinguishers, per fire code and fire marshal with jurisdiction;
- Insurance. Insurance (obtained and provided by DB Contractor) covering the use of the Project office by DB Contractor and TxDOT, in accordance with the terms of the underlying property use agreement with the property owner, to the extent such insurance is not otherwise required by the DBC;
- Vending Area. DB Contractor shall provide access to general building vending area;
- Utilities. Initial installation and monthly expense of all utilities paid by DB Contractor except long-distance telephone service;
- Monthly Services. DB Contractor shall provide janitorial, trash, recycling, and secure document shredding services;
- Emergency Contacts. 24-hour emergency contact to DB Contractor;
- Furniture. DB Contractor-provided allowance of $15,000 in the Price for additional furniture not listed in the requirements of this Section 10.1.1, which shall be obtained by DB Contractor at the direction of TxDOT, and billed through DB Contractor. At the end of the Project, DB

Contractor shall have ownership of the furniture and shall be entitled to the full salvage value of the furniture, with the right to retain or otherwise dispose of the furniture at its sole discretion, without any further accounting to TxDOT; and

- Cable Television. Provide cable television connections and service to each flat screen television.

10.1.2 **Field Office**

DB Contractor shall provide all space, facilities, and support Elements necessary to conduct field operations to complete the Work in accordance with the Contract Documents. DB Contractor shall provide office space for TxDOT's Project management acquisition staff including, the Program Manager and other contract employees. The field office shall be located within one mile of the Project ROW.

DB Contractor shall provide field office space for the exclusive use of TxDOT's field construction staff for the Project as specified herein. The field offices may be located at the same site as the core office described in Section 10.1.1 as long as the offices meet the cumulative space and other requirements of Sections 10.1.1 and 10.1.2, e.g. facilities required for the core office shall not be shared with facilities required for the field office(s).

Subject to TxDOT's prior written approval, DB Contractor shall provide separate facilities for TxDOT's resident engineer staff located within the same complex as DB Contractor's field office. Should DB Contractor elect to construct the Work using field offices other than the one specified, corresponding facilities shall be provided for TxDOT's exclusive use and shall be at least of the same quality as DB Contractor's counterpart management and field staff.

Prior to commencing construction of TxDOT's field office space, DB Contractor shall submit for TxDOT's approval final wiring and circuitry plans, office furniture and equipment layout, a field office floor plan, a lighting plan, and a parking plan for TxDOT's Project management and contract staff vehicles.

Concurrent with NTP1, DB Contractor is authorized to begin work on the field office space. Final completion of TxDOT's field office space, including all punch list items, shall occur before TxDOT shall issue NTP2.

10.1.2.1 **Field Office Condition**

The field office shall be in good and serviceable condition meeting all ADA and local government regulatory criteria for safe a workspace environment, at least of the same quality as those of DB Contractor's counterpart management and field staff, respectively, and available for occupancy as specified herein. Both Parties shall participate in a facility condition survey prior to and at the completion of occupancy. TxDOT shall return possession of DB Contractor-provided facilities to DB Contractor in essentially the same condition as when TxDOT occupied the facilities, except for reasonable wear and tear and except for alterations, loss, or damage caused by any member of DB Contractor-Related Entity.

10.1.2.2 **Field Office Loss or Damage**

If office space(s) or related facilities, furniture, or fixtures that are provided by DB Contractor are destroyed, damaged, or stolen during the Term, except as a direct result of willful misconduct of TxDOT or its personnel, DB Contractor shall, at its cost and within 10 Business Days after the occurrence of such destruction or damage, replace those items that it had provided or repair them to their original condition; however, in the case of lost, damaged, or stolen office equipment (e.g., computers, fax machines, copy machines, printers) necessary for normal office operations, replacement shall occur within two Business Days. If loss or damage is caused as a direct result of willful misconduct of TxDOT or its personnel, DB Contractor shall replace the facilities noted herein within the timeframes specified herein, and TxDOT shall reimburse DB Contractor for actual, reasonable, and documented costs incurred.

10.1.2.3 **Field Office Facilities and Equipment**

For the facilities it provides, DB Contractor shall:

- General. Secure sites, obtain all site permits, install and pay for all utility services, and maintain the facilities clean and in good working order as part of the Work;
- Access and Security. Provide separate buildings or trailers for TxDOT staff that include at least two entrances/exits, providing an 8 foot by 10 foot (minimum) covered entrance area,

from each building or trailer. Each entrance/exit shall be secured with a door lock plus a deadbolt lock;

- Lighting and Electricity. Include with all interior spaces overhead lighting meeting the requirements of OSHA and of building and electrical codes for office space. Each office space shall have at least two duplex receptacles. The minimum circuit capacity shall be 20 amperes;
- Janitorial and Trash Service. Provide daily janitorial service (except Saturdays, Sundays, and holidays) and maintain trash containers and trash pickup service. This will include, but not be limited to, sweeping and mopping floors, cleaning the toilet and lavatory, and emptying wastebaskets;
- Exterior Maintenance. Maintain the exterior areas of office spaces, including access to parking areas;
- Accessibility and Licensing. Meet all access requirements of the Texas Accessibility Standards, ADA Accessibility Guidelines, as amended (42 USC § 12101, et seq.), and the applicable building code. Facility design plans shall be submitted to the TDLR for review and approval as required by 16 TAC § 68;
- Utility Service. Provide potable water, sewer service, and electricity to the field office facility;
- HVAC. Provide electrical and HVAC systems capable of maintaining temperatures between 65 and 75 degrees Fahrenheit in all spaces, 24/7/365, through the year. Server room or network/telecommunications room, as applicable, shall have dedicated air conditioning/cooling system capable of maintaining temperatures between 65 and 70 degrees Fahrenheit, and 15% relative humidity. Temperature controls for TxDOT's field office space shall be placed in an appropriate location within TxDOT's secured area;
- Code Requirements. Meet all local building and fire code requirements; and
- Disposal and Removal. Be responsible for disposal or removal of all DB Contractor-provided facilities and any site restoration Work as required.

10.1.2.4 Field Office Space Requirements

Although actual space requirements will depend upon the Project Schedule and geographic locations of the field offices, DB Contractor shall include the following Elements in a typical field office:

- Offices. Enclosed offices with lockable doors for TxDOT's construction representative, TxDOT-designated construction manager and one other TxDOT or contract employees (three offices at 150 SF each, unless otherwise approved by TxDOT), with keyed door hardware, desk, desk chair, book case, file cabinet, credenza and guest chair;
- Offices/Cubicles. Offices or cubicles for up to six field engineer/inspection/ administration staff (60-80 SF each);
- Conference Rooms. One owner-dedicated enclosed conference room of not less than (350 SF) and access to another common conference room (350 SF);
- Server room. One server room, matching the requirements of the core office server room;
- Storage and Filing. Two lockable spaces for storage and filing at each field office (a combined space of 200 SF);
- Surveying Equipment Storage. Clean inside storage space for surveying equipment (80 SF);
- Tool Shed. Outside shed for small tools and equipment (outside) (200 SF);
- Site Amenities. A well-graded site for the office with access road, parking area, and security fence with lockable drive-in gates sufficient to enclose the office and parking area;
- Staff Parking Area. A parking area for at least 15 vehicles that is reasonably level (all-weather surface and all-weather access) within the boundaries of a security fence;
- Visitor Parking Area. An all-weather level surface outside the security fence to accommodate visitor parking (all-weather surface and all-weather access, minimum of 2,000 SF);
- Security. A 24-hour security service or silent watchmen-type security system;
- Exterior Lighting. Sufficient exterior security lighting that is automatically activated at low light levels to maintain 2 foot candles of lighting within the fenced field office site;
- Window Security. Security bars on all exterior windows;

- Laboratory Facility. A completed facility suitable to accommodate a functioning portable lab (approximately 2,500 SF) located immediately adjacent to the Independent Quality Firm (IQF) laboratory required in Section 4.4 of the TxDOT QAP for Design-Build Projects;
- Kitchen/Break Room. Each field office shall contain a 300 SF kitchen with storage closet (25 SF), cabinets with drawers and counter tops. Kitchen shall be equipped as described above for the core office;
- Restrooms. Two permanent restrooms including toilets and sinks with HVAC; and
- First Aid Supplies. Provide emergency first aid supplies in accordance with DB Contractor's Safety Plan.

10.1.2.5 **Field Office Miscellaneous Requirements and Features**

DB Contractor shall provide the following:

- Flooring. Carpeted flooring for offices (nonstatic in server room). All other rooms shall be tiled;
- Entry Access. Entry to TxDOT areas by electronic door hardware card access (not keyed), with UPS on locks (fail closed);
- Electrical Outlets. Each office and conference room shall have two (2 data, 1 com Cat 5E) outlets per room, and one (2 data, 1 com Cat 5E) outlet per cubicle, as well as outlets at designated printer, fax, and copier locations and any and all shared areas (i.e., workroom, storage room, etc.). All data/voice outlets shall be installed next to power outlets;
- HVAC. 24/7/365 HVAC as previously described;
- Window Coverings. Horizontal mini-blinds (no drapes) for each exterior window;
- Power Circuits. Provide dedicated electrical power circuits for copiers, and minimum of six duplex receptacles with three dedicated 20-amp circuits and one 30-amp circuit for the server room;
- Fire Extinguishers. DB Contractor shall provide fire extinguishers, per fire code and fire marshal with jurisdiction;
- Insurance. Insurance (obtained and provided by DB Contractor) covering the use of the Project office by DB Contractor and TxDOT, in accordance with the terms of the underlying property use agreement with the property owner, but in no event, shall the insurance be less than that required by the Agreement;
- Utilities. Initial installation and monthly expense of all utilities paid by DB Contractor except long distance telephone service;
- Emergency Contacts. 24-hour emergency contact to DB Contractor; and
- Furniture. DB Contractor-provided allowance of $15,000 in the Price for additional furniture not listed in the requirements of this Section 10.1.2, which shall be obtained by DB Contractor at the direction of TxDOT, and billed through DB Contractor. At the end of the Project, DB Contractor shall have ownership of the furniture and shall be entitled to the full salvage value of the furniture, with the right to retain or otherwise dispose of the furniture at its sole discretion, without any further accounting to TxDOT.

10.1.3 **Office Network and Systems**

DB Contractor shall, for each TxDOT representative, provide, furnish, install, operate, and maintain the following for the TxDOT office spaces described in Item 10, Section 10.1, "Offices, Equipment, and Vehicles:"

- A local area network (LAN) with a minimum two 300 megabits per second (Mbps) network drops for each personal office area and a minimum of four 300 Mbps drops for each conference room. All drops shall have the ability to connect to the internet. The network shall allow for multiple virtual private network (VPN) connections/sessions. The network shall also provide full wireless (wi-fi) coverage within the office. The wireless network shall be capable of 802.11 a/b/g/n and must match the speed requirements of the LAN in the office;
- A touch-tone telephone system (with voicemail) with at least one telephone, with speakers, for each personal office area. Also provide at least one telephone, with speakers, and a minimum of one satellite microphone for each conference room. The telephone system shall have the

ability to host two lines per telephone, access all outside lines, receive any incoming call, caller identification, conference-call capability (three-way calling), call forwarding, call transfer, hold, hold music, and send to voice mail functionality;

- Access to DB Contractor's electronic document management system (EDMS) systems for file sharing, collaboration, reviews, and responses at each personal office area and within each conference room;
- High speed, highly reliable internet service(s) capable of providing a minimum download speed of 100 Mbps and a minimum upload speed of 20 Mbps per network drop, with a minimum of three concurrent download connections and a minimum of two concurrent upload connections;
- The ability to print to any printer listed in this Section 10.1.3 from any network drop or wireless connection regardless of user domain (e.g. TxDOT and others' computers shall be able to print to any printer listed in this Section 10.1.3 from any network drop);
- Include all network equipment, racks, structured cabling, wall plates, jacks, patch panels, patch cords (including patch cables for each LAN and telephone drop in each personal office area and conference room, power assemblies, and other appurtenances needed to meet the requirements contained within these Design-Build Specifications;

All hardware and software shall meet applicable industry standards and protocols:

- Provide on-site technical support eight hours per day, five days per week until the completion and close out of the Project;
- One high-speed laser computer printer capable of handling 11 inches by 17 inches prints for core office and one for field office;
- One high-speed color printer capable of handling 11 inches by 17 inches prints for core office and one for field office;
- One high-speed color photocopy machine capable of handling 11 inches by 17 inches prints for core office; and
- One high-speed color scanner capable of handling 11 inches by 17 inches prints for core office and one for field office;

A multipurpose piece of equipment capable of meeting multiple parts of the requirements above will meet the requirements:

- One paper shredder or secure paper shredding service for core office;
- One commercial grade three-hole punch for core office and one for field office;
- One commercial grade GBC binder (or equal) for core office;
- All office supplies, including copier paper, toners, pens, pencils, notepads, and other miscellaneous office supplies; and
- One hard copy of all TxDOT and AASHTO design manuals and standards as specified in the Agreement for core office.

DB Contractor shall certify and state supplied components as functional before installation and will bear all responsibility for replacement of parts at work commencement. DB Contractor shall prepare test plan for all parts and components and submit, before installation, test installed systems and supply test results, in conformance with industry standard testing procedures.

10.2 Three Dimensional (3-D) Design

DB Contractor shall design the Project utilizing 3-D methodologies and techniques, and submit its 3-D design files to TxDOT for use during the design and construction process.

Utilization of 3-D design is an integral part of the performance of the Project prior to and during construction and throughout the Project's service life. Additionally, the implementation of 3-D design techniques is intended to improve quality, reduce risk, improve collaboration with project stakeholders, provide an early focus toward technical review, and increase opportunity for innovation.

DB Contractor shall utilize design software and versions currently in use by TxDOT to develop the 3-D design, unless DB Contractor receives advanced written approval from TxDOT in accordance with Section 5.2.7 of the General Conditions.

10.2.1 3-D Design Requirements

DB Contractor shall submit proposed 3-D design file naming conventions to TxDOT for review and approval.

DB Contractor shall incorporate the Schematic Design into DB Contractor's Project design files utilizing 3-D methodologies and techniques.

DB Contractor shall create an integrated 3-D model of the existing condition including existing ground surface and subsurface elements and infrastructure (including, but not limited to, drainage structures, utilities, bridges and wall foundations), utilizing data from light detection and ranging (LiDAR), SUE, field surveys, and existing plans (as-built) data collection; including currently available LiDAR or other existing ground surface data (digital terrain model (DTM) or triangulated irregular network (TIN) formats) provided in the RID.

DB Contractor shall utilize 3-D methodologies and techniques to develop the geometric design, as well as the 3-D design model for each proposed roadway and incorporate it into the Project's integrated design models. All geometric design shall be prepared in accordance with the Design-Build Specifications:

- Refine and finalize 3-D horizontal and vertical alignments for all high-occupancy vehicle lanes, exclusive lanes, general purpose lanes, ramps, direct connectors, collector-distributors, crossing and parallel roadways, pavement transitions, and tie-ins to existing lanes;
- Determine horizontal and vertical clearances at grade separations, underpasses and overpasses; and
- Develop superelevation and superelevation transition designs for each roadway. Verify rollover constraints are adequately addressed, including ramp, collector-distributor, and direct connector gore locations.

DB Contractor shall include existing and proposed 3-D design features for the following Elements of Work in accordance with the Design-Build Specifications:

- Roadway: pavement structures, metal beam guard fence (MBGF), pedestrian facilities, existing and proposed ROW;
- Drainage: storm sewers (inlets, manholes), culverts, and channel grading;
- Structures: sufficient detail to show top of deck surface, structure type, bottom of beam surface, bent cap, piers, foundations (size and length), abutment, and retaining wall locations including straps, nails and footings;
- Utilities: relocated and existing Utilities to remain in place (existing Utilities to be abandoned in place are not required to be included);
- Signing: overhead span or cantilever sign structure locations and structure type, foundations (size and length); and
- Temporary structures: including, but not limited to, temporary shoring, soil nails, and temporary retaining walls.

10.2.2 Immersive 3-D Review Meetings

DB Contractor shall present the Project 3-D design model to TxDOT and stakeholders at 3-D review meetings. DB Contractor shall utilize software that allows for interactive visualization of the 3-D design model key features. The 3-D design model shall be completed to a sufficient level of detail that existing terrain, proposed design features, and existing infrastructure to remain in place can be viewed, analyzed, and discussed among participants. DB Contractor shall conduct a 3-D review meeting with TxDOT prior to submitting each Submittal package listed in Section 10.2.3.

DB Contractor's 3-D design model shall be capable of providing the following minimum functionality during the 3-D review meetings:

- View the model and manipulate view settings to interactively change data display on the screen (e.g. pan, rotate, walk, fly, zoom, etc.);
- Measure distances and areas throughout all areas of the model;

- Reference baseline geometry, stationing, and existing and proposed ROW; and
- Dynamically visualize key existing and proposed design features and detect conflicts/clashes amongst the following disciplines:
  - Roadway;
  - Drainage;
  - Structures (bridges, retaining walls);
  - Utilities (existing and proposed);
  - Signing (overhead span or cantilever sign structure locations and structure type);
  - Lighting (pole and foundation locations);
  - Signals (controller, pole, and foundation locations); and
  - Temporary structures.

DB Contractor shall submit the following five business days in advance of every 3-D review meeting:

- Adobe PDF file of Project 3-D model which shall include proposed striping;
- All CADD and other electronic files used to develop the 3-D model along with all associated files required to duplicate the model;
- Updated Utility Adjustment Concept Plan; and
- A .kmz of the current design compatible with Google Earth.

10.2.3 3-D Design Deliverables

DB Contractor shall prepare and submit to TxDOT for review and comment an integrated 3-D design model with the following Submittal packages:

- Preliminary Design;
- Final Design; and
- Released for Construction.

The integrated 3-D design model shall consist of 3-D MicroStation file(s) containing 3-D graphical elements (components, contours, superelevation transitions limits, and existing and proposed finish grade triangles) representative of the stage of design development of the Submittal package.

DB Contractor shall submit a final 3-D model consisting of a compilation of 3-D design models submitted with previous design submittal packages.

Additional electronic design files to be submitted to TxDOT by DB Contractor include:

- OpenRoads: 3-D MicroStation design files containing civil data of alignments, profiles, pertinent geometry, terrain surfaces, civil cells, corridor models and final surface. In addition to other MicroStation elements used in the creation of the corridor model such as point controls, corridor references, GPK files, etc.;
- InRoads template library (ITL): OpenRoads Template Libraries;
- XML: Output files of alignments, profiles, pertinent geometry, DTM for terrain surface and final surfaces;
- Drawing exchange format (DXF): Output files of DTM for terrain surfaces and final surfaces;
- Image color matching (ICM): Output files (infrastructure consensus model) in a rich data exchange format using Bentley i-model standards. The ICMs will be used to transfer the 3-D model information to construction equipment;
- CivilStorm: DB Contractor shall have a license for CivilStorm and a software license to export the drainage design to CivilStorm. Catchments (aka drainage areas) must be represented geospatially in grid coordinates in CivilStorm. DB Contractor shall confirm that data exported to CivilStorm is correct and make any necessary modifications to the drainage design data such that it is correct in CivilStorm and that the CivilStorm model runs without any errors; and
- DTM data:
  - GEOPAK original ground TIN file;

  - Preliminary design surface: A comprehensive model of existing terrain. Progression through detailed design will advance the preliminary design surface to a final design surface; and
  - Final design surface: Proposed project in final condition.
- Electronic construction i-models compatible with DB Contractor's construction equipment to be utilized by TxDOT and IQFM to verify grading operations of subgrade and the final pavement surface, as well as construction of storm sewer systems and culverts.

10.3 Required Software during Construction Activities

DB Contractor shall utilize a mobile based, web hosted, collaborative design-construction productivity software solution (such as PlanGrid or an equivalent) allowing real-time access to and management of construction documents. DB Contractor must purchase and provide licenses to DB Contractor staff (including subconsultants, as appropriate), and 20 copies for TxDOT staff and TxDOT's consultants from the commencement of Construction Work through Final Acceptance. Utilization will cover the course of the Construction Work. This software application will be used to view drawings, specs and documents, as well as automate RFI submittals and punchlists for Construction Work in the field and facilitate collaboration between project stakeholders. The software solution must meet the following technical requirements:

- All features and Project documents uploaded in the system must be available offline in the event that there is no wireless connection;
- The software must be compatible with iOS, Windows and Androids operating systems and devices;
- The software must be able to export an as-built set. This as-built must be complete with documents, photos and hyperlinks embedded in the set;
- The software must be capable of being used during post construction operations and maintenance phases;
- After Final Acceptance, the software should be handed to the operations and maintenance team for post construction coordination;
- The software must be able to provide a detailed audit trail of all parties collaborating in the application. This includes date/time stamp of any mark-ups, photos, issues, RFIs and punch list items;
- The software must auto-tag sheet disciplines to distinguish different trade drawings;
- Vendor must be able to support each project and customer with a dedicated sales representative for rollout; and
- Vendor must offer training/consulting on the software solution as needed during the project.

10.4 Design Visualization

DB Contractor shall provide accurate 3-D models that depict the Project. Completed models shall represent realism and aesthetic attributes of the existing conditions and the proposed Project. DB Contractor shall add roadway design details to the model that are not normally provided at the stage of TxDOT Schematic Design and verify that the TxDOT Schematic Design complies with design guidelines presented in the TxDOT *Roadway Design Manual*, Texas MUTCD, the AASHTO *Green Book*, the AASHTO *Roadside Design Guide*, and the AASHTO *Guide for the Development of Bicycle Facilities* or applicable standards listed in these Design-Build Specifications.

The design visualization models shall show existing and proposed design conditions either separately or combined in the same display. Based on specific Project requirements the final design visualization deliverables may include photo-matched renderings, rendered plan view layouts, and animated sequences.

DB Contractor shall provide, along with the Final Design Submittal package, a 3-D CADD model of the completed Project and any work product generated during the modeling process, such as site photographs, textures, material assignments, and additional terrain information. All CADD data shall be in electronic format and native to TxDOT's CADD architecture using Bentley Systems, Inc. MicroStation (MicroStation) to provide complete compatibility between DB Contractor and TxDOT.

DB Contractor shall collect, review, and evaluate all of the available existing data pertaining to the Project and prepare the design visualization models to reflect current design requirements. The data shall include

MicroStation design files, GEOPAK geometry files, existing terrain models, and digital ortho photography. DB Contractor shall field verify the existing and proposed condition of design visualization models for dimensional accuracy and realism.

Resulting animations for design visualization purposes do not have to be native MicroStation, but do need to be capable of viewing on any device with minimal support to, or effort by TxDOT.

All CADD data and associated files, in native form, shall be submitted by DB Contractor to TxDOT as part of their final deliverable.

10.4.1 Photo Renderings

DB Contractor shall provide photo renderings of no more than twelve locations to be determined by TxDOT at the Preliminary Design Submittal and Final Design Submittal design stages, or as directed by TxDOT, but not to exceed 24 renderings total. DB Contractor shall submit the completed renderings to TxDOT within 30 days of TxDOT's request. The quality of the renderings shall be equal to or better than that of the renderings shown on http://www.oakhillparkway.com.

DB Contractor shall coordinate with TxDOT the location of the photographs. DB Contractor shall take a minimum of two existing condition photographs at each of the 12 locations. These photographs will serve as the basis for the photo-renderings.

DB Contractor shall provide two mounted "before" images and two mounted "after" static 3-D photo matched images of proposed design Elements at each of the 12 locations.

10.5 Submittals

All Submittals described in this Item 10 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth on Table 10-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 10-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Preliminary TxDOT facility area layout plan	After NTP1	Review and Comment	10.1.1
Final wiring and circuitry plans, office furniture and equipment layout, a field office floor plan, a lighting plan, and a parking plan	Prior to commencing construction of TxDOT's field office	Approval	10.1.2
3-D design files	Upon Request and with the Submittal packages identified in Section 10.2.3	Review and Comment	10.2
Proposed 3-D design file naming conventions	Prior to Implementation	Review and Approval	10.2.1
Project 3-D Model with proposed striping, all CADD files associated with the Model, and updated Utility Adjustment Concept Plans	Prior to every 3-D milestone review meeting and with the Submittal packages identified in Section 10.2.3	Review and Comment	10.2.2 and 10.2.3
Additional OpenRoads, ITL, XML, DXF, ICM and DTM design files	As Necessary	For Information	10.2.3
3-D CADD Model	As Necessary	For Information	10.4
Project photo renderings	Preliminary and Final design stages, or as directed by TxDOT, within 30 days of request	For Information	10.4.1

Item 11
Public Information and Communications

11.1 **General Requirements**

DB Contractor will coordinate and collaborate with TxDOT and will be responsible for communicating with and providing information as described in this Item 11 to TxDOT within 48 hours unless otherwise described. DB Contractor shall develop the PICP in collaboration with TxDOT and submit to TxDOT for approval. The PICP shall include processes for keeping TxDOT informed about construction activities. DB Contractor shall provide information related to the Project and DB Contractor to TxDOT as requested in order to assist TxDOT. DB Contractor shall provide to TxDOT complete copies of all materials to be presented to the public or the media at least three Business Days prior to dissemination. TxDOT will serve as the main interface with the public.

11.2 **Administrative Requirements**

DB Contractor shall meet regularly with TxDOT's public information officer to coordinate efforts. Such meetings shall occur weekly or more frequently as necessary, as determined by TxDOT.

DB Contractor shall use, but not be limited to, the implementation strategies described in this Item 11.

11.3 **PICP**

DB Contractor shall implement the approved PICP that is developed in accordance with Section 4.2.2 of the General Conditions. The PICP will include strategies and tactics, specific timelines and deliverables. The PICP shall specifically include:

- A detailed work plan;
- Air, lighting, and noise quality measures methodology;
- Traffic management and construction staging methodology;
- Strategies for interaction with community, federal, state and local agencies;
- Summaries of key issues anticipated to be addressed through the life of the Project;
- Construction or design related adjustments in response to community concerns;
- Emergency response plan; and
- Processes for acknowledgements or receipt of public complaints or inquiries.

The PICP shall include the following with regard to Third Party Claims:

- Procedures to respond immediately to public complaints related to damages and to act promptly to resolve claims for damage to vehicles, persons and property caused by the Work (e.g. construction activities) or as a result of the condition of the Project (e.g., broken windshields, damaged tires or damaged vehicle paint);
- Procedures for prompt response to complaints from the public related to dust, noise and other nuisance caused by the Work, and policies and procedures to mitigate public complaints, including carwash service vouchers, air filters, etc.; and
- Procedures to log all complaints, dates and times of claims and occurrences, contact information (including the name, address, telephone number, and e-mail address of complainant), name of the respondent, any requirements from the complainant, whether the complaint is satisfied, and whether the claim has been or will be forwarded to DB Contractor's insurance carrier.

The PICP shall assist TxDOT in minimizing impacts to businesses during construction and may include concepts such as, but not be limited to, enhanced directional signage, special events, and advertising. DB Contractor shall collaborate with TxDOT by providing TxDOT information about the Project as a means to assist TxDOT in:

- Informing the public on the status of design and construction;

- Providing the public with an opportunity for input; and
- Notifying the public in advance of construction, traffic detours, and potential impacts.

11.4 **Staffing Requirements**

DB Contractor shall provide information and support staff as requested to implement the PICP, including preparation of all the materials and attendance at meetings and presentations.

DB Contractor shall assist in public involvement activities related to the Project as directed by TxDOT, including (but not limited to) the following:

- Assistance in the emergency response program;
- Providing updates for TxDOT's Project internet website;
- Cooperation with local and regional Governmental Entities as directed by TxDOT;
- Staffing of public meetings with individuals who can provide technical subject matter expertise to TxDOT staff and public meeting attendees who may have questions or comments;
- Preparation and distribution of regularly updated materials to those Persons identified by TxDOT; and
- Supporting meetings and events involving community groups.

Any and all contact between the news media and DB Contractor's team shall be coordinated through TxDOT.

11.5 **Project Website and Social Media**

DB Contractor shall be required to provide information to TxDOT for posting to the Project website and such information shall be updated as necessary or requested by TxDOT.

In addition to information for the website, DB Contractor shall also provide information for possible social media updates and e-mail blasts used to keep the public informed and such information shall be updated as necessary or requested by TxDOT.

Within 30 Business Days following issuance of NTP 1, DB Contractor shall provide available pertinent Project information to TxDOT for posting onto the Project's website that will be maintained by TxDOT, which shall include but is not limited to:

- Schematic maps;
- DB Contractor contact information;
- Project fact sheet;
- Project Schedule;
- Contact information for employment;
- Contact information for DBE opportunities;
- Major project milestones;
- Major traffic configuration changes; and
- Traffic impact and road closure notifications for the website and/or local media 72 hours prior to closure. DB Contractor shall provide these notices to TXDOT in a format that includes a map clearly identifying the roads impacted, closures and detour routes. TXDOT will distribute this information to the media at least 24 hours in advance of such events in accordance with Item 26, "Traffic Control."

During the Term, DB Contractor will continue to provide information and content for the website to TxDOT in order to ensure information remains current and relevant to users.

11.6 **Community and Business Outreach**

DB Contractor shall be required to participate in all community/business outreach as described in this Section 11.6.

DB Contractor will be required to support TxDOT in the implementation of outreach activities that will strengthen understanding of the Project. DB Contractor will participate in community events and activities that take place within or adjacent to the Project corridor as directed by TxDOT.

DB Contractor and TxDOT will work together to arrange for and make presentations to various groups about the Project. DB Contractor shall provide information to TxDOT to the extent necessary to inform the community about the Project. The community meetings and presentations will be attended by appropriate DB Contractor team representatives who are capable of addressing technical questions related to the Project. DB Contractor shall provide for appropriate staffing as required by TxDOT. At such meetings and presentations Contractor shall provide key design and construction personnel, and oral, written, and graphic information, including but not limited to:

- The design and location of local streets and Utilities impacts;
- The design and implementation of street and roadway detours;
- Scheduling and hours of construction activities;
- Truck haul routes;
- Methods to minimize noise and dust;
- Turf establishment and environmental mitigation measures; and
- Any other relevant topics requested by TxDOT, local municipalities within the Project's corridor, landowners, or community groups.

TxDOT will arrange and provide Project site tours with interested groups and individuals such as community groups, conference groups, elected officials, business representatives and others throughout the life of the Project. DB Contractor will be required to accommodate and provide DB Contractor team representatives as directed by TxDOT for Project site tours.

TxDOT will identify business groups and large employers and arrange presentations on the Project. These meetings will be attended by appropriate DB Contractor team representatives who are capable of addressing technical questions related to the Project. DB Contractor will be required to prepare presentation and meeting materials for presentations to business groups as directed by TxDOT and approved by TxDOT before the meeting.

DB Contractor shall be responsible for the rental and placement of portable messaging signs (dynamic and static) as required by the approved MOT plan to alert the public to traffic impacts/road closures. Messaging on the signs will be current and accurate at all times.

DB Contractor will support TxDOT communications staff in the development of project-related media releases to announce newsworthy Project milestones or events. DB Contractor will provide background and technical information, photos and interview sources to TxDOT. DB Contractor shall not disseminate any media releases unless directed to do so by TxDOT.

11.6.1 Groundbreaking Ceremony

DB Contractor shall be required to participate in a groundbreaking ceremony to mark the beginning of the construction of the Project. DB Contractor will provide the following elements for the groundbreaking: tents, chairs, stage, podium, sound system, mementos, refreshments, invitations, and program, as approved by TxDOT. DB Contractor will work with TxDOT to identify the location of the ceremony, assist with parking, logistics, and traffic control for the groundbreaking ceremony as directed by TxDOT.

DB Contractor shall provide an allowance of $20,000 in the Price for items listed above in the requirements of this Section 11.6.1 and Section 11.6.2, which shall be obtained by DB Contractor at the direction of TxDOT, and billed through DB Contractor.

11.6.2 Grand Opening Ceremony

DB Contractor will be required to participate in a grand opening ceremony to mark the opening of the Project to traffic. DB Contractor will provide the following elements for the grand opening: tents, chairs, stage, podium, sound system, mementos, refreshments, invitations, and program, as approved by TxDOT. DB Contractor will work with TxDOT to identify the location of the ceremony, assist with parking, logistics, and traffic control for the grand opening ceremony as directed by TxDOT.

DB Contractor shall provide an allowance of $20,000 in the Price for items listed above in the requirements of this Section 11.6.2 and Section 11.6.1, which shall be obtained by DB Contractor at the direction of TxDOT, and billed through DB Contractor.

11.6.3 Additional Ceremonies

DB Contractor will be required to participate in up to 4 additional ceremonies throughout the Term as directed by TxDOT. DB Contractor will provide the following elements for the additional ceremonies: one piece of heavy construction equipment, tents, chairs, stage, podium, sound system, mementos, refreshments, invitations, and program, as approved by TxDOT. DB Contractor will work with TxDOT to identify the location of the additional ceremonies, assist with parking, logistics, and traffic control for the grand opening ceremony as directed by TxDOT.

DB Contractor shall provide an allowance of $20,000 (exclusive of heavy construction equipment) in the Price for items listed above in the requirements of this Section 11.6.3, which shall be obtained by DB Contractor at the direction of TxDOT, and billed through DB Contractor.

11.7 Comments, Inquiries, and Complaints

DB Contractor shall be responsible for providing the information necessary for TxDOT to respond to comments and inquiries in a timely manner. Information for routine web site comments or inquiries shall be provided within one Business Day. When a comment or inquiry is received regarding an immediate or ongoing concern, DB Contractor shall have one hour after receiving the comment or inquiry to provide TxDOT with necessary information and a draft response for TxDOT to respond in a timely manner. In addition, DB Contractor shall timely provide any follow up information or materials requested by TxDOT. A public comment / inquiry log shall be submitted by DB Contractor monthly for approval.

11.8 Briefings, Meetings, and Coordination

For all briefings and meetings at which DB Contractor is in attendance, DB Contractor shall, within five Business Days of the meeting, submit a draft of the meeting minutes to TxDOT for review. Within five Business Days of receipt of TxDOT approval or comments, DB Contractor shall incorporate any comments and resubmit to TxDOT the final minutes. This process shall continue until TxDOT has approved the minutes. Draft minutes may be submitted electronically; however, the final TxDOT approved minutes shall be submitted as a final electronic file copy.

At a minimum, all briefing or meeting minutes shall contain:

- A complete list of attendees (including their affiliations, e-mail addresses, and telephone numbers);
- Descriptions of issues discussed;
- Decisions made and direction given; and
- Remaining open issues and action items (including identification of the party responsible for follow-up and the target date for resolution)

11.9 Emergency Communications

DB Contractor shall timely notify and inform TxDOT of all pertinent details of any Emergency events, including major vehicle collisions, severe weather conditions, and Hazardous Materials spills. DB Contractor shall continue to notify and inform TxDOT of all pertinent details until the Emergency no longer exists.

In the event of an Emergency, “timely notify” shall mean as soon as practicable, but in no event longer than within one hour of the occurrence. DB Contractor shall follow TxDOT’s general guidelines requiring notification when an Emergency results in delays for motorists in traffic extending beyond 20 minutes. If advanced warning is available for an Emergency event such as ice/snow, “timely notify” shall mean as soon as practicable, but in no event longer than within one hour of the time the information is available. In both situations, DB Contractor shall continue to provide updated information to TxDOT as soon as practicable until the Emergency no longer exists.

11.10 Submittals

All Submittals described in this Item 11 shall be in accordance with the Project Schedule and for the purpose (approval, review and comment, for information) set forth on Table 11-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 11-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Copies of all materials to be presented to the public or the media	Three Business Days prior to dissemination	Approval	11.1
PICP	Prior to NTP2	Approval	11.3
Updates to the PICP as listed in Section 11.3	As required, at least annually	Approval	11.3
Available pertinent Project Information for posting to Project website	Within 30 Business Days following issuance of NTP 1	Approval	11.5
Information and content for Project website throughout the Term	As necessary or requested by TxDOT	Post on Project website	11.5
Information for social media updates and e-mail blasts	As necessary or requested by TxDOT	Disseminate information	11.5
Presentation materials for meetings with business groups and large employers	As requested by TxDOT	Approval	11.6
Information for Project related media releases	As requested by TxDOT	Disseminate information	11.6
Comments or inquiries from Project website and draft responses to comments or inquiries	Within one Business Day of receiving comments or inquiries	Respond to public	11.7
Comments or inquiries from Project website and draft responses to comments or inquiries regarding immediate/ongoing concerns	Within one hour of receiving comments or inquiries	Respond to public	11.7
Public comment/inquiry log	Monthly	Approval	11.7
Draft meeting minutes	Within five Business Days of meeting	Review and comment	11.8
Final meeting minutes	Within five Business Days of receiving TxDOT comments to draft meeting minutes	Distribute to appropriate parties	11.8
Notification of Emergency events such as major vehicle collisions, severe weather conditions, and Hazardous Material spills	As soon as practicable	Disseminate information	11.9

Item 12
Environmental

12.1 **General Requirements**

DB Contractor shall deliver the Environmental Commitments required by the Contract Documents, Governmental Entities, Environmental Approvals (including all TxDOT-Provided Approvals), all other Governmental Approvals, the CEPP and all applicable Laws and regulations, including, Environmental Laws.

The Work shall comply with Environmental Approvals and compliance requirements for any additional actions throughout the Term. DB Contractor shall monitor and document Work activities so that documents providing evidence for compliance are available to TxDOT for inspection at any time.

12.1.1 **CEPP**

DB Contractor shall develop, implement and, as necessary, update a CEPP for the Work to ensure compliance with all applicable Environmental Laws, Environmental Approvals and Environmental Commitments. The CEPP shall obligate DB Contractor to protect the environment and document the measures to be taken during the performance of the Work to avoid and minimize impacts on the environment from the design, construction, maintenance, operation, and rehabilitation activities of the Project. The requirements for the CEPP are contained in Section 4.2.4 of the General Conditions.

The CEPP shall effectively demonstrate in detail DB Contractor's knowledge of all applicable Environmental Approvals, environmental issues on the Project, Environmental Commitments, and applicable Environmental Laws, including those set forth in these Design-Build Specifications, and shall describe the processes that will be followed during the course of the Work to comply with those Environmental Approvals, environmental issues, Environmental Commitments, and Environmental Laws, as well as the documentation required to validate compliance. All monitoring and reporting activities shall be:

- concise and consistent throughout the Term;
- applicable to the activities being performed; and
- in accordance with the requirements set forth in the DBA, the Environmental Approvals and applicable Environmental Laws.

The CEPP shall also effectively describe the quality control and assurance measures that DB Contractor will implement to verify the compliance of the plan with all applicable Environmental Laws.

The CEPP shall define procedures for obtaining Environmental Approvals and implementing procedures and Environmental Commitments consistent with the Environmental Approvals, including New Environmental Approvals, and TxDOT environmental policies. The CEPP shall establish a goal of zero environmental violations during the performance of all Work activities. However, should violations occur, the CEPP shall set forth detailed processes for rectifying such violations in an appropriate and timely manner.

12.1.1.1 **ECMP**

In addition to the requirements of the ECMP set forth in Section 4.2.4.2 of the General Conditions, DB Contractor shall include the following components in the ECMP:

- Environmental personnel;
- Regulatory partners;
- Inspections, reporting, and accountability;
- Pest management program
- Protection of sensitive features, including buffers, inspection and reporting;
- Oak wilt prevention; and
- Environmental contact tree

12.2 Environmental Approvals

12.2.1 New Environmental Approvals Including Amended TxDOT-Provided Approvals

TxDOT-Provided Approvals are based on the design features illustrated therein. Such approvals may require re-evaluation, amendment, supplement or additional studies and reports as the Work progresses in order to accommodate actions not identified in the TxDOT-Provided Approvals or covered specifically by existing resource agency coordination. Changes to the Schematic Design or incorporation of Additional Properties into the Project shall require the validity of existing Environmental Approvals to be reassessed and may require New Environmental Approvals.

DB Contractor is responsible for any coordination with Governmental Entities necessary to obtain New Environmental Approvals except where TxDOT has agreements with Governmental Entities to perform such coordination. DB Contractor shall extend an invitation to TxDOT five Business Days in advance for any meetings it has with Governmental Entities to discuss changes to the NEPA Approvals and any other TxDOT-Provided Approvals.

12.2.2 Responsibilities Regarding Environmental Studies

DB Contractor is responsible for conducting continuing environmental studies based on the NEPA Approvals and the Schematic Design.

DB Contractor is responsible for conducting environmental studies and re-evaluations caused by actions not identified in the Environmental Approvals, actions not covered specifically by existing resource agency coordination, or incorporation of Additional Properties into the Project. DB Contractor is responsible for all coordination of environmental studies with appropriate Governmental Entities, except where TxDOT has agreements with Governmental Entities to perform such coordination.

TxDOT has performed environmental field surveys and environmental study reports to the greatest extent possible prior to the Effective Date. Prior to the start of construction, DB Contractor shall be responsible for completing all remaining environmental field surveys, environmental study reports, and environmental agency coordination as identified in the TxDOT-Provided Approvals.

12.2.2.1 Clean Water Act - Sections 404 and 401: Waters and Wetlands of the United States

TxDOT-Provided Approvals may identify Section 404 impacts associated with Project improvements. Based on the NEPA Approvals, the temporary and permanent Section 404 impacts are anticipated to be authorized by Nationwide Permit 14 – Linear Transportation Projects with a Preconstruction Notification.

DB Contractor shall, based on final design, assess impacts to each potentially jurisdictional feature. Based on results of the assessment, and if required, DB Contractor shall update the related Section 404 impacts associated with the Project and perform all Work required to procure the necessary Section 404 permits and Section 401 certifications from the U.S. Army Corps of Engineers (USACE) and Texas Commission on Environmental Quality (TCEQ). DB Contractor shall determine Project mitigation requirements, prepare a mitigation plan per 33 CFR Part 332, and deliver all required mitigation.

DB Contractor is responsible for the maintenance and monitoring of any permittee-responsible mitigation sites for the term stipulated within the USACE approved mitigation plan. Project mitigation options shall be provided in accordance with TxDOT's *Standard Operating Procedure: Acquiring and/or Purchasing Section 404 Compensatory Mitigation Credits* dated August 2019. All coordination with the USACE regarding Section 404 permitting and mitigation shall be disclosed to TxDOT and all documentation shall be submitted to TxDOT for review and comment before submission to USACE.

DB Contractor shall document how it will identify Section 404 impacts, obtain required Section 404 permits, and comply with the terms and conditions of the Section 404 permits and Section 401 certifications issued to DB Contractor during the life of the Project. At a minimum, the documentation shall include:

- Process for training personnel to recognize Waters of the U.S. that fall under the jurisdiction of the USACE;
- Process for identifying Section 404 impacts associated with the Project;
- Process for obtaining required Section 404 permits;
- Process for communicating the terms and conditions of all Section 404 permits and TCEQ 401 certifications and other permits as necessary;

- Procedures for carrying out any required Environmental Commitments and mitigation; and
- Procedures for incorporating additional properties outside the original NEPA approved Schematic Design and any off-right-of-way Project Specific Locations (PSL) as required by all Section 404 permit(s) issued to either TxDOT or DB Contractor by the USACE.

DB Contractor shall comply with all general and regional conditions set forth by authorized Section 404 nationwide permits as described in TxDOT-Provided Approvals.

12.2.2.2 **Archeological Resources**

Prior to the start of construction, DB Contractor shall be responsible for completing the necessary archeological field surveys and the archeological survey report as identified in the TxDOT-Provided Approvals. DB Contractor shall not perform any construction, staging, storage, or ground disturbing activities of any kind within unsurveyed parcels without the prior approval of TxDOT.

TxDOT has provided a list of parcels requiring DB Contractor archeological surveys in the RID. TxDOT shall be responsible for completing coordination with the State Historic Preservation Office and completing Section 106 coordination.

12.2.2.3 **Historic Resources**

DB Contractor shall be responsible for relocating the 1969 historical marker for Oak Hill to a new location as stated in the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). *[Additional information will be provided in the RID.]*

12.2.2.4 **Threatened and Endangered Species**

Prior to the start of construction, DB Contractor shall be responsible for completing the necessary T&E species and SGCN field surveys and the T&E species and SGCN survey report as identified in the TxDOT-Provided Approvals. DB Contractor shall not perform any construction, staging, storage, or ground disturbing activities of any kind within unsurveyed parcels without the prior approval of TxDOT.

TxDOT has provided a list of parcels requiring DB Contractor T&E species and SGCN surveys in the RID. TxDOT shall be responsible for completing coordination with Texas Parks and Wildlife and/or the U.S. Fish and Wildlife Service, as necessary.

12.2.2.5 **Tree Protection and Removal**

DB Contractor shall comply with the requirements of Item 10,001, “Tree Protection”.

DB Contractor must perform all Tree clearing Work in phases in accordance with this Section 12.2.2.5. A Tree clearing phase is the Tree clearing Work within a distinct area of the Project that is designated by DB Contractor in the Tree Preservation Plan or an update thereof. Each Tree clearing phase must be reflected in either the Tree Preservation Plan or an approved update to the Tree Preservation Plan by designation of the Project area covered by the Tree clearing phase and identification of the date upon which the Tree clearing Work for the applicable phase will commence. DB Contractor shall not perform any Tree clearing Work, unless such Work is pursuant to a Tree clearing phase. Within 21 days of the commencement date of a Tree clearing phase, DB Contractor shall remove to ground level all Trees within the Tree clearing phase area that are not required to be protected or preserved.

12.2.2.6 **Water Quality**

DB Contractor shall develop, implement, and maintain a stormwater pollution prevention plan (SW3P) in accordance with Section 402 of the Clean Water Act throughout the course of the Work. The SW3P shall be designed to successfully manage a 2-year storm measuring 2.64 inches of rainfall in 3 hours. DB Contractor shall perform all dewatering operations in a manner that discharges stormwater into a sedimentation basin prior to be being discharged off Site. When discharge of stormwater into a sedimentation basin is not practicable, DB Contractor shall treat stormwater discharge using a dewatering bag prior to being discharged off Site.

DB Contractor shall perform weekly inspections of the erosion and sediment control systems in accordance with TxDOT Form 2118. DB Contractor shall also monitor turbidity levels of the stormwater runoff entering waterbodies (i.e. Williamson Creek) and correct all system deficiencies and perform required modifications as soon as practicable to maintain required water quality standards.

All existing and proposed clay liners used for water quality treatment shall be supplemented with an impermeable geomembrane liner in accordance with TxDOT Special Specification 5056.

12.2.2.7 **Williamson Creek United States Geological Survey (USGS) Water Quality Monitoring Station**

DB Contractor shall relocate the Williamson Creek USGS water quality monitoring station during construction as stated in the FEIS and ROD. DB Contractor shall coordinate with the USGS and City of Austin to identify a suitable new location for the monitoring station.

12.2.2.8 **Karst Features**

DB Contractor shall use the Karst Feature Discovery and Mitigation RID as the minimum requirements for developing their Karst Feature Mitigation Plans for Known Karst Features and Unknown Karst Features. DB Contractor shall be responsible for obtaining approval of their Karst Feature Mitigation Plan from TCEQ prior to mitigating all Karst Features.

DB Contractor shall utilize an impermeable geomembrane liner fifty feet around the Karst Feature in accordance with TxDOT Special Specification 5056 when developing their Karst Feature Mitigation Plans.

12.2.2.9 **Edwards Aquifer**

DB Contractor shall comply with all laws and regulations relating to the protection of the Edwards Aquifer. DB Contractor shall be responsible for preparing and implementing a WPAP, or multiple WPAPs, in accordance with TAC Title 30 Part 1 Chapter 213. DB Contractor shall be responsible for coordinating the WPAP(s) with TCEQ prior to start of construction.

DB Contractor shall design water quality protection measures and best management practices to ensure a net reduction in total suspended solids leaving the Site.

PSLs located within the Edwards Aquifer Recharge and Contributing Zones require approval from TCEQ prior to construction/use of the PSL site. DB Contractor shall be responsible for developing and coordinating the signed PSL SW3P site plan with TCEQ prior to the construction/use of the PSL site.

12.2.2.10 **Hazardous Materials**

DB Contractor shall perform a Phase I ESA for all Project ROW parcels prior to any property acquisition.

DB Contractor shall test, identify, inspect, notify, amend notifications as necessary, pay notification fees, and abate any Hazardous Materials encountered in connection with the work, in accordance with appropriate or relevant regulations or guidance.

DB Contractor shall take appropriate measures to prevent the spillage of Hazardous Materials in the construction areas. All construction materials used for the Project shall be removed as soon as the Project Schedule permits. DB Contractor shall initiate early regulatory agency coordination during Project development.

DB Contractor shall avoid the use of pesticides and herbicides.

12.2.2.11 **Asbestos Containing Material and Lead Based Paint**

Bridge and building demolition will be required for the Project. DB Contractor shall test for asbestos containing material (ACM) and lead based paint (LBP) on the existing bridge structures and building structures to be removed.

DB Contractor shall identify, inspect, notify TxDOT, amend notifications as necessary, pay notification fees, and abate asbestos and LBP found on any structure, including but not limited to bridges and buildings, and any asbestos and LBP identified in the “Lead and Asbestos Report” included in the RID in accordance with appropriate or relevant regulations or guidance.

DB Contractor shall provide TxDOT any inspection reports, proposed abatement plan, and/or report documenting abatement (as necessary).

Prior to scheduled demolitions, DB Contractor shall notify the Texas Department of State Health Services of bridge demolitions or building structures demolitions.

12.2.2.12 **Dust Control**

DB Contractor shall institute dust control measures to minimize air quality impacts. The measures shall be adjusted as necessary based on construction traffic, forecasted wind speeds, and persistent dry weather conditions.

Dust control measures shall include a combination of watering, chemical stabilization, and construction vehicle speed reduction (not to exceed 20 mph).

DB Contractor shall keep concrete traffic barriers and any other elements that can cause accumulation of dust, sand and debris (such as retaining walls, bridge columns, and drainage walls) within the Project limits clean of dust, sand and debris during construction.

DB Contractor shall prevent, control, and mitigate fugitive noxious or toxic vapors or particulate matter (dust) during disturbance of noxious or hazardous materials and media.

12.2.3 **TxDOT Review and Approval of DB Contractor Submissions**

TxDOT reserves the right to review, comment on, require revisions to and reject for resubmission documentation that is submitted for environmental compliance or Environmental Approvals. Documentation shall conform to current TxDOT submission standards and the requirements of all applicable Governmental Entities, applicable Laws and Environmental Approval approvals, including the erosion and sediment control plans. TxDOT shall return approved documentation to DB Contractor for submittal to the appropriate Governmental Entity in cases where DB Contractor performs coordination. Those submissions for which TxDOT's signature or other approval is required shall be subject to TxDOT approval, provided TxDOT approvals of such submissions are not subject to the review time limitations in the Contract Documents. Documentation not meeting current submission standards or requirements of Governmental Entities will be returned to DB Contractor, and shall be revised by DB Contractor to meet such submission standards or requirements.

12.2.4 **TxDOT-Provided Approvals**

For TxDOT-Provided Approvals, see Section 3.1 of the DBA.

12.3 **Environmental Team (ET)**

DB Contractor, acting through the ECM, shall designate an ET, as detailed in this Section 12.3, to prevent, minimize, and/or correct any violation of or noncompliance with Environmental Approvals. The ET shall include staff meeting the qualification requirements as indicated in this Section 12.3 below. All of the ET shall be deemed other principal personnel.

In the CEPP, DB Contractor shall establish a detailed approach, procedures and methods for:

- Staffing and availability of ECM and all ET personnel; and
- ET staff response times during the Work.

12.3.1 **ECM**

DB Contractor shall designate an ECM for the Work in accordance with Section 4.2.4.1.1 of the General Conditions.

12.3.2 **Environmental Training Staff**

Under the direction of the ECM, the environmental training staff shall develop, schedule and conduct environmental awareness and environmental compliance training for all of DB Contractor's personnel, including subcontractors. Each worker must receive at least one hour of karst discovery and mitigation training from DB Contractor before performing any work at the Site. All training shall be in accordance with the requirements set forth in Section 4.2.4.3 of the General Conditions. Environmental training staff members shall have at least one year of experience providing environmental compliance inspection for highway construction.

12.3.3 **Environmental Compliance Inspectors (ECIs)**

The ECM shall designate as needed ECIs, who shall conduct on-site environmental monitoring, prepare documentation, and report to the ECM daily all violations, compliance, and non-compliance with Environmental Approvals.

The ECIs shall report immediately to the ECM any violation or non-compliance and shall include with any such reports, the appropriate recommendations for corrective action, including, but not limited to stoppage of Work.

The ECIs shall have at least one-year operational control experience with SW3P activities.

12.3.4 Hazardous Materials Manager

The ECM shall designate a Hazardous Materials Manager to provide expertise, as needed, in the safe handling of Hazardous Materials required to perform the Work and those that may be discovered/impacted during the Term. The Hazardous Materials Manager shall conduct appropriate activities such as the following:

- Schedule and/or conduct training for DB Contractor's employees;
- Verify all employees have required certifications prior to the handling of Hazardous Materials; and
- Maintain records of all incidents involving Hazardous Materials and notify the ECM, TxDOT and appropriate authorities in writing of any such incidents in accordance with the Contract Documents.

The Hazardous Materials Manager shall be a qualified professional with 40-hour HAZWOPER certification and at least five years of experience in similar projects in the following areas:

- Developing IWPs, SIRs, and remedial action plans or equivalent reports necessary and acceptable to the TCEQ in material discovery and remediation efforts of Hazardous Materials; and
- Complying with TCEQ guidance for the investigation and remediation of Hazardous Materials under the TCEQ Voluntary Cleanup Program, Texas Risk Reduction Program, and the TCEQ Petroleum Storage Tank Rule.

The Hazardous Materials Manager shall meet the certification requirements of TxDOT Work Category 2.13.1, “Hazardous Materials Initial Site Assessment.”

12.3.5 Cultural Resource Management Personnel

The ECM shall designate an archeologist to provide expertise in completing the required archeological field surveys and the archeological survey report. Cultural resource management personnel shall only be required to complete the necessary archeological Work prior to the start of construction, and shall not be required for the duration of the Work.

The Cultural Resource Management Personnel shall meet the certification requirements of TxDOT Work Category 2.10.1, “Archeological Surveys, Documentation, Excavations, Testing Reports and Data Recovery Plans,” as applicable.

12.3.6 Natural Resource Biologist

The ECM shall designate a natural resource biologist to provide expertise in completing the required T&E species and SGCN field surveys and the T&E species and SGCN survey report, and to monitor impacts on wildlife and the natural environment during the course of the Work.

The Natural Resource Biologist shall meet the certification requirement of TxDOT Work Category 2.6.2, “Impact Evaluation Assessments” and 2.6.4, “Biological Evaluations/Assessments”.

12.3.7 Certified Arborist

The Certified Arborist shall provide expertise in the inspection and preservation of Trees throughout the course of the Work.

The Certified Arborist shall have three years of experience as a certified arborist and shall be certified by the International Society of Arboriculture.

12.3.8 **USFWS Permitted Karst Species Specialist**

The ECM shall designate a USFWS permitted karst species specialist (must possess the appropriate 10(a)(1)(A) permit) to determine if a potential karst feature meets the criteria for a sensitive feature.

The Karst Species Specialist determines if a potential karst feature has the potential to contain suitable habitat for endangered karst invertebrates or if the karst feature could open up into another karst feature with such suitable habitat.

The Karst Species Specialist conducts determinations of karst features for the presence or absence of endangered karst invertebrates throughout the course of the Work.

12.3.9 **Licensed Professional Geoscientist**

The ECM shall designate a licensed professional geoscientist for the course of the Work to assist the karst species specialist in determining if a potential karst feature meets the criteria for a sensitive feature.

The Licensed Professional Geoscientist assists the Permitted Karst Species Specialist in assessing the potential for a karst feature to contain suitable habitat for endangered karst invertebrates or if the karst feature could open up into another karst feature with such suitable habitat.

The Licensed Professional Geoscientist prepares Karst Feature Mitigation Plans and signs/seals the mitigation plan.

The Licensed Professional Geoscientist shall provide expertise in the development and implementation of the WPAP.

The Licensed Professional Geoscientist shall meet the certification requirements of TxDOT Work Category 2.5.1, “Geological Assessment for Edwards Aquifer Recharge Zone”.

12.3.10 **USACE Section 404 Specialist**

The ECM shall designate a USACE Section 404 specialist to provide expertise in performing delineations of waters of the U.S., including wetlands, Section 404 permitting, stormwater pollution prevention, and the protection of jurisdictional waters and the Edwards Aquifer during the course of the Work.

The USACE Section 404 Specialist shall have verifiable experience developing and implementing Section 404 permits, SW3Ps, and WPAPs, and be able to demonstrate a working knowledge of the Texas Pollutant Discharge Elimination System and MS4 permit requirements applicable to the Project.

The USACE Section 404 Specialist shall meet the certification requirements of TxDOT Work Category 2.3.1 “Wetland Delineation,” TxDOT Work Category 2.4.1, “Nationwide Permit,” and TxDOT Work Category 2.4.2 Clean Water Act §404 (Title 33, United States Code §1344) Permits (including mitigation and monitoring).

12.4 **Property Access**

To fulfill the obligation of the TxDOT-Provided Approvals to maintain current access during and after construction, DB Contractor shall make reasonable efforts to minimize the inconvenience to vehicles, bicycles, and pedestrians during the Term. DB Contractor shall maintain access to adjacent properties during construction and ensure that visibility of businesses is maintained.

12.5 **Riparian and Floodplain Vegetation Restoration**

DB Contractor shall be responsible for restoring disturbed, graded or cleared riparian and floodplain areas due to construction activities as stated in the FEIS and ROD. The areas anticipated to be impacted are those shown in the Schematic Design and the proposed overbank mitigation shown in the Atlas 14 technical memorandum RID. DB Contractor must maintain existing riparian areas that are contained within the Tree Preservation Areas, as shown in the RIDs.

DB Contractor shall follow the vegetation restoration guidelines and requirements of the Aesthetic and Landscaping Plan. When seeded, newly installed permanent vegetation must be protected by hydromulch or soil retention blanket.

12.6 Submittals

All Submittals described in this Item 12 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth on Table 12-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 12-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
PMP –CEPP	Prior to NTP2	Approval prior to commencement of Design Work	12.1.1
Environmental monitoring reports	Upon request	For information	12.1.1
Archeological survey report	Prior to commencement of Construction Work	Approval prior to commencement of Construction Work	12.2.2.2
Threatened and endangered species survey report	Prior to commencement of Construction Work	Approval prior to commencement of Construction Work	12.2.2.4
Section 404 Permit/Mitigation Plan	Prior to commencement of Construction Work	Approval prior to commencement of Construction Work	12.2.2.1, DBA 2.1.2.2
Karst Feature Mitigation Plan	As applicable, when sensitive karst features are discovered	For information	12.2.2.8, DBA 2.9.2, 6.9
PSL SW3P Site Plan	10 Business Days prior to construction/use of PSL site	For information	12.2.2.9
Water Pollution Abatement Plan	Prior to commencement of Construction Work	Approval prior to commencement of Construction Work	12.2.2.9
Phase I ESA	Prior to property acquisition	Approval prior to property acquisition	12.2.2.10
ACM / LBP Inspection Reports	Prior to demolition of applicable structures	Approval prior to demolition of applicable structures	12.2.2.11
ACM / LBP Abatement Plan	Prior to demolition of applicable structures	Approval prior to demolition of applicable structures	12.2.2.11
ACM / LBP Mitigation Report	Prior to demolition of applicable structures	Approval prior to demolition of applicable structures	12.2.2.11
SW3P	Prior to commencement of Construction Work	Approval prior to commencement of Construction Work	12.2.2.6

Item 13
Third-Party Agreements

13.1 **General Requirements**

TxDOT has existing agreements with certain local, state and federal Governmental Entities with respect to the Project. These agreements define additional requirements for the design, construction, operations, and maintenance of the Project. These agreements do and will specify the local Governmental Entities' responsibilities and TxDOT's responsibilities with respect to the requirements.

DB Contractor shall assume and execute TxDOT's responsibilities and duties stated in Third Party Agreements to the extent set forth in the DBC, including payments for work performed or services provided by the Governmental Entity. DB Contractor is responsible for providing TxDOT and Governmental Entities with all information necessary to fulfill TxDOT's responsibilities stated in such agreements. In the case that the local Governmental Entity, under such agreements, will need to be reimbursed by TxDOT for work performed, DB Contractor shall make payment of stated costs to TxDOT within 30 days from receipt of TxDOT's request for payment. TxDOT will reimburse the local Governmental Entity such costs.

13.2 **Traffic Signals**

New construction or modifications to the existing traffic signals are defined in Item 24, "Signing, Delineation, Pavement Marking, Signalization, and Lighting."

13.3 **Roadway Illumination**

Some local Governmental Entities may request continuous illumination along sections of the Project. Should this occur, additional agreements between TxDOT and the Governmental Entity will be required. DB Contractor shall coordinate with and provide reasonable accommodations to the third-party designated to carry out the installation, operations, and maintenance obligations as specified in such agreements. Design and construction of additional illumination by DB Contractor will be handled in accordance with terms of the DBC.

For sections of continuous lighting specified by these additional agreements, safety lighting included in those sections is considered a component of the overall system, and responsibilities for safety lighting shall be set forth in in the terms of the additional agreement.

New construction or modifications to the existing illumination are defined in Item 24, "Signing, Delineation, Pavement Marking, Signalization, and Lighting."

13.4 **Landscaping Enhancements**

Some local Governmental Entities may request landscaping enhancements along sections of the Project. Should this occur, additional agreements between TxDOT and the Government Entity will be required. DB Contractor shall coordinate with and provide reasonable accommodations to the third-party designated to carry out the design, installation, and maintenance obligations as specified in such agreements. Design and construction of landscaping enhancements by DB Contractor will be handled in accordance with the terms of the DBC.

Landscaping enhancements are defined in Item 23, "Aesthetics and Landscaping."

13.5 **Other Affected Third Parties**

DB Contractor is responsible for coordination and cooperation with all third parties affected by the Work, except as specifically provided otherwise.

Item 14
Utility Adjustments

14.1 General Requirements

A number of existing Utilities are located within or in the vicinity of the Project ROW, some pursuant to statutory rights and some pursuant to property rights. Certain of those existing Utilities will need to be relocated or otherwise adjusted in order to accommodate the Project. This Item 14 establishes procedures and requirements for Utility Adjustments including such processes as coordination with Utility Owners, administration of the engineering, construction, and other activities necessary for Utility Adjustments and required documentation. This Item 14 references certain TxDOT forms for DB Contractor's use in Utility Adjustments. Copies of those forms are included in Attachment 14-1 (Utility Adjustment Forms). Except as otherwise provided in this Item 14 or directed by TxDOT, whenever a TxDOT form is provided, DB Contractor shall prepare all forms of the same type using the TxDOT form and obtain TxDOT approval of all changes to the forms agreed to by DB Contractor and the Utility Owner prior to execution by the Utility Owner.

DB Contractor shall cause all Utility Adjustments necessary to accommodate construction, operation, maintenance, and/or use of the Project. Some Utility Adjustments may be performed by the Utility Owner with its own employees and/or contractors and representatives (i.e., Owner-Managed); all others shall be performed by DB Contractor with its own employees and/or Subcontractors and representatives (subject to any approval rights required by the Utility Owner for those working on its facilities) (i.e., DB Contractor-Managed). The Utility Agreement shall specify the allocation of responsibility for the Utility Adjustment Work between DB Contractor and the Utility Owners as described in Section 14.1.3.

The Project will be subject to 23 CFR Part 645 Subpart A, 23 CFR § 635.410 (Buy America) and FHWA's associated policies. DB Contractor shall comply (and shall require the Utility Owners to comply) with 23 CFR Part 645, Subpart A and 23 CFR § 635.410. TxDOT form 1818 Buy America (Material Statement) is required for all work performed for Utility Owners prior to the Utility Owners receiving final payment from DB Contractor or TxDOT to document compliance with Buy America requirements, as identified in Attachment 14-1 (Utility Adjustment Forms), if applicable. If costs of the Utility Adjustment Work are not eligible for reimbursement from DB Contractor or TxDOT, such as costs attributable to Betterments and any other costs for which the Utility Owner is responsible under applicable Law, then the Utility Owner is not required to comply with 23 CFR Part 645 Subpart A, 23 CFR § 635.410 (Buy America) and FHWA's associated policies for such costs. DB Contractor's obligations regarding reimbursement to Utility Owners for eligible costs of Utility Adjustment Work, and DB Contractor's obligations regarding the accommodation of Utilities from and after the Effective Date, are set forth in this Item 14 and Section 4.5 of the General Conditions.

This Item 14 does not address utility services to the Project. Utility services to the Project shall be the subject of separate agreements between DB Contractor and the Utility Owners.

14.1.1 When Utility Adjustment is Required

A Utility Adjustment may be necessary for the following reasons: (a) a physical conflict between the Project and the Utility, or (b) an incompatibility between the Project and the Utility based on the requirements in Section 14.2.1, even though there may be no physical conflict. In addition, certain Utility Adjustments are required under the Austin Water Utility Agreement for Austin Water Critical Infrastructure. The physical limits of all Utility Adjustments shall extend as necessary to functionally replace the existing Utility, whether inside or outside of the Project ROW. Section 14.2.4.2 contains provisions that address the acquisition of Replacement Utility Property Interests for Utilities to be installed outside of the Project ROW.

Utilities may remain in their existing locations within the Project ROW if (a) the requirements of Section 14.2.1 are met, (b) the existing location will not adversely affect the construction, operation, safety, maintenance, or intended use of the Project and Utility, and (c) the Utility Owner agrees to the Utility remaining in its existing location.

Existing Utilities that are not in physical conflict with the project that cross a roadway centerline at approximately 90 degrees may remain in the existing alignment. The existing Utilities may remain, be

relocated in place, or be protected in place at these crossings only if all other conditions of the UAR are met and the affected Utility Owners approve all proposed Utility Adjustment plans.

14.1.2 Certain Components of the Utility Adjustment Work

14.1.2.1 Coordination

DB Contractor shall communicate, cooperate and coordinate with TxDOT, the Utility Owners and potentially affected third parties, as necessary, for performance of the Utility Adjustment Work. DB Contractor shall be responsible for preparing and securing execution (by DB Contractor and the Utility Owner) of all necessary Utility Agreements except for the Austin Water Utility Agreement.

All Utility Agreements must be approved by TxDOT prior to taking effect and prior to the commencement of any Utility Adjustment construction related activity.

14.1.2.2 Betterments

Replacements for existing Utilities shall be designed and constructed to provide service at least equal to that offered by the existing Utilities, unless the Utility Owner specifies a lesser replacement. Utility Enhancements are not included in the Work; however, any Betterment work furnished or performed by DB Contractor as part of a Utility Adjustment shall be deemed added to the Work, on the date the Utility Agreement becomes effective, as set forth in Section 4.5.2 of the General Conditions. DB Contractor shall perform all coordination necessary for Betterments.

14.1.2.3 Protection in Place

DB Contractor shall be responsible for Protection in Place of all Utilities impacted by the Project as necessary for the continued safe operation and structural integrity of each Utility, and to satisfy the requirements described in Section 14.2.1. For each impacted Utility, DB Contractor shall obtain Utility Owner's approval of DB Contractor's proposed Protection in Place prior to beginning Construction Work.

14.1.2.4 Abandonment and Removal

DB Contractor shall make all arrangements and perform all work necessary to complete each abandonment or removal (and disposal) of a Utility in accordance with the requirements listed in Section 14.2.1, including obtaining Governmental Approvals and consent from the affected Utility Owner and any affected landowner(s), or shall confirm that the Utility Owner has completed these tasks. Utility facilities that will be abandoned in place must be clearly identified in the Utility Assembly plans and shall require approval by TxDOT. The Utility Assembly plans must detail the method of abandonment to be utilized for TxDOT to determine if UAR requirements are met. The plans must also detail the age, condition, material type, active status and size of each Utility. If a Utility other than an Austin Water Utility is to be abandoned, the plans shall (i) state that the Utility Owner continues to own and maintain the abandoned Utility facility and keep records of its location, and (ii) include a certification from the Utility Owner stating that the facility doesn't contain nor is composed of hazardous/contaminated materials. The requirements for abandonment of Austin Water Utilities are set forth in the Austin Water Utility Agreement. Voids and abandoned pipe beneath the ROW are prohibited and only allowed at TxDOT's discretion. In accordance with jurisdictional requirements or as directed by TxDOT, all voids must be filled with cement slurry or backfilled, and any pipe to be abandoned in place must be grout filled and capped.

14.1.2.5 Service Lines and Utility Appurtenances

Whenever required to accommodate construction, operation, maintenance, or use of the Project, DB Contractor shall cause Service Line Adjustments and Utility Appurtenance Adjustments. Each Service Line shall have a definitive point of termination such as a meter or point of sale. On completion of these, DB Contractor shall cause full reinstatement of the roadway, including reconstruction of curb, gutter, sidewalks, driveways, and landscaping, whether the Utility Adjustment Work is performed by the Utility Owner or by DB Contractor.

14.1.2.6 Discovery of Karst Features during Utility Adjustments

DB Contractor shall be responsible for all requirements outlined in Item 12, "Environmental" and in the DBA related to the discovery of Karst Features within the Project ROW by either DB Contractor or a Utility Owner during the course of Utility Adjustments.

14.1.2.7 **WPAP Requirements for Utility Adjustments**

DB Contractor shall be responsible for ensuring regulated Utility Adjustments are included in the WPAP application as necessary.

DB Contractor shall be responsible for determining if any wastewater utility adjustments require approval of a "TCEQ Edwards Aquifer Protection Program Organized Sewage Collection System (SCS) Plan" application. DB Contractor will be responsible for preparing, submitting, and obtaining approval of an "SCS Plan" from TCEQ prior to commencing construction of the regulated activity.

14.1.2.8 **Early Adjustments**

At TxDOT's discretion, there will be early Utility Adjustment Work accomplished by TxDOT through a direct contract with the utility company to coordinate Utility Adjustment Work that would progress the Project. TxDOT will coordinate with and notify the Proposers of all early Utility Adjustment Work during the procurement and negotiation phases.

14.1.2.8.1 **Austin Energy**

TxDOT will enter into an agreement with Austin Energy for the adjustment of the Austin Energy Transmission Lines. DB Contractor shall not be responsible for the cost or performance of any work required to relocate the Austin Energy Transmission Lines, except as set forth in Section 2.1.3.3 of the DBA.

14.1.3 **Agreements Between DB Contractor and Utility Owners**

Except as otherwise stated in this Item 14 or in the DBC, DB Contractor shall address each Utility Adjustment in a PUAA or in a UAAA, as described elsewhere in this Item 14. DB Contractor is responsible for preparing, negotiating (to the extent allowed by this Item 14) and obtaining execution by the Utility Owners of all PUAAs and UAAAs, (including preparing all necessary exhibits and information about the Project, such as reports, Plans and surveys).

A Utility Agreement is not required for any Utility work consisting solely of Protection in Place in the Utility's original location within the Project ROW, unless the Utility Owner is being reimbursed for costs incurred by it on account of such Protection in Place. If no reimbursement is required to the Utility Owner, a UJUA or Utility Installation Request, Form 1082, as described in Section 14.2.4.5 and plans detailing UAR compliance are required pertaining to the Adjustment or Protection in Place work. If a Utility Owner requests that DB Contractor relocate a Utility and the cost of that Utility Adjustment is the Utility Owner's sole responsibility in accordance with Transportation Code 203.092, then DB Contractor shall enter into a DB Contractor-Managed PUAA with the Utility Owner providing for the Utility Owner to be responsible for all costs of that Utility Adjustment Work.

14.1.3.1 **PUAA**

Except with respect to Austin Energy, for the Austin Energy Transmission Lines, and Austin Water, DB Contractor shall enter into one or more PUAAs with each affected Utility Owner to define the design, material, construction, inspection, and acceptance standards and procedures necessary to complete Utility Adjustments, and to define DB Contractor's and the Utility Owner's respective responsibilities for Utility Adjustment costs and activities, including material procurement, construction, inspection and acceptance. A PUAA may address more than one Utility Adjustment for the same Utility Owner. Additional Utility Adjustments may be added to an existing PUAA by a UAAA.

DB Contractor shall prepare each PUAA using the TxDOT form DB-ROW-U-PUAA-OM (Owner-Managed) or DB-ROW-U-PUAA-DM (DB Contractor-Managed), included in Attachment 14-1 (Utility Adjustment Forms). DB Contractor shall not modify the forms except by approval of TxDOT.

Promptly following issuance of NTP1, DB Contractor shall begin negotiations with each affected Utility Owner to reach agreement on one or more PUAAs and UAAAs. DB Contractor shall finalize the necessary PUAAs with each affected Utility Owner within a reasonable time period after issuance of NTP1. DB Contractor shall include any proposed changes to the form (other than filling in the blanks specific to a particular Utility Owner) in a track-change format that clearly identifies the changes and the party requesting the change. Each PUAA (including the Utility Adjustment Plans attached thereto) shall be subject to TxDOT review and approval as part of a Utility Assembly.

DB Contractor shall obtain approval by TxDOT of any language modification to a PUAA by the Utility Owner and DB Contractor.

14.1.3.2 **UAAA**

Except where UAFM are permitted pursuant to Section 14.4.7, modification of an executed PUAA or any component thereof, after it has been approved by TxDOT as part of a Utility Assembly, shall be stated in a UAAA. A UAAA may be used only when the allocation of responsibility for the Utility Adjustment Work covered by that UAAA is the same as in the parent Utility Agreement; otherwise, an additional PUAA will be required.

Each UAAA (including any Utility Adjustment Plans attached thereto) shall be subject to TxDOT's approval. Except as otherwise directed by TxDOT or provided in an applicable Utility Agreement, DB Contractor shall prepare all UAAAs using the form included in Attachment 14-1 (Utility Adjustment Forms). DB Contractor shall include any proposed changes to the form (other than filling in the blanks specific to a particular Utility Owner) in a Utility Owner-specific addendum.

DB Contractor shall obtain TxDOT approval of all changes to a UAAA prior to execution by the Utility Owner.

14.1.4 **Recordkeeping**

DB Contractor shall maintain construction and inspection records in order to ascertain and demonstrate that Utility Adjustment Work is accomplished in accordance with the approved Utility Adjustment Plans and as required by the Contract Documents and the applicable Utility Agreement(s).

14.2 **Administrative Requirements**

14.2.1 **Standards**

All Utility Adjustment Work shall comply with all applicable Laws, Codes (including, but not limited to, 43 TAC, Part 1, Chapter 21, Subchapter C, UAR), requirements within the Contract Documents, including the UAR, the TxDOT *ROW Utility Manual*, Section 4.5 of the General Conditions (as amended by Exhibit 23 to the DBA), and the requirements specified in this Item 14.

14.2.2 **Communications**

14.2.2.1 **Communication with Utility Owners**

DB Contractor is responsible for holding meetings and otherwise communicating with each Utility Owner as necessary to timely accomplish the Utility Adjustments in compliance with the Contract Documents.

DB Contractor shall notify TxDOT of all meetings, and TxDOT may participate in these meetings if requested by the Utility Owner or DB Contractor or otherwise as TxDOT deems appropriate.

Before distribution of any mass mailings to Utility Owners, DB Contractor shall submit to TxDOT, 21 days in advance of distribution for its review and comment, the form, content and addressees of any such mass mailings. For purposes of this Item 14, the term "mass mailing" means correspondence that is sent to 50% or more of Utility Owners within a three-week time period, and contains substantially the same content with respect to each Utility Owner.

14.2.2.2 **Meetings**

At least three Business Days in advance of each scheduled meeting, DB Contractor shall provide notice and an agenda for the meeting separately to TxDOT first and then to the appropriate Utility Owner unless otherwise provided. DB Contractor shall prepare minutes of all meetings and shall keep copies of all correspondence.

DB Contractor shall prepare meeting minutes within five Business Days after the conclusion of each meeting. At a minimum, DB Contractor shall include the following items in the meeting minutes:

- A complete list of attendees (including their affiliations, telephone numbers and e-mail addresses)
- Documentation of the issues discussed and any associated solutions or resolutions
- Description of remaining open issues and action items (including the person(s) responsible for follow-up and target date for resolution)

DB Contractor shall submit draft versions of all meeting minutes to TxDOT for review before distributing final versions to the meeting attendees and appropriate Customer Groups.

To the extent set forth in the Austin Water Utility Agreement and as requested by TxDOT, DB Contractor shall participate in all meetings and dispute resolution procedures provided for under the Austin Water Utility Agreement. DB Contractor shall designate a "Design Build Contractor Utility Manager" in accordance with the Austin Water Utility Agreement to serve as DB Contractor's representative for coordinating all matters with Austin Water and TxDOT under the Austin Water Utility Agreement.

14.2.3 Utility Adjustment Team

DB Contractor shall provide a Utility Adjustment team whose members have all appropriate qualifications and experience to perform the Utility Adjustment Work. DB Contractor shall provide a list of the names and contact details, titles, job roles and specific experience of the team members in the PMP. Specifically, DB Contractor shall provide a UM and a UDC to manage all aspects of the Utility Adjustment process. If DB Contractor assigns the construction activities to a Subcontractor or Affiliate, DB Contractor shall provide a DB Contractor Utility Coordinator (DUC) as described herein.

The UM's primary work responsibility shall be the performance of all DB Contractor's obligations with respect to Utility Adjustments. The UM shall have a bachelor's degree and have relevant experience in coordinating and solving complex Utility Adjustments on highway improvement projects. DB Contractor shall authorize the UM to approve all financial and technical modifications associated with Utility Adjustments and modifications to the Utility Agreement.

The UDC shall be a PE. The UDC shall be responsible for coordinating the Utility Adjustment design with the overall design features during the planning, design and construction phases of the Work.

If applicable, the DUC shall hold a bachelor's degree and have relevant experience in ROW and Utility coordination activities involving large transportation projects. The DUC will be responsible for tracking and following DB Contractor's Affiliate's and Subcontractor's activities and communicating the progress to DB Contractor. The DUC will assist with developing good working relationships with the Utility Owners and assisting DB Contractor in all Utility coordination matters.

For the performance of the design of the Austin Water Utility Adjustments, DB Contractor shall retain an engineering firm that (i) has designed at least two large diameter (at least 48") water and wastewater lines for municipal utilities, and (ii) has provided construction phase services on at least five completed water or wastewater line projects. DB Contractor shall cause such engineering firm to comply with all of the requirements and obligations of the "Design Build Contractor Utility Design Firm" under the Austin Water Utility Agreement.

14.2.4 Real Property Matters

DB Contractor shall provide the services described below in connection with the existing and future occupancy of property by Utilities.

14.2.4.1 Documentation of Existing Utility Property Interests – Affidavits

For each Existing Utility Property Interest within the Project ROW claimed by any Utility Owner, DB Contractor shall include an Affidavit of Property Interest in the applicable Utility Assembly, with documentation of the Existing Utility Property Interest (e.g., an easement deed) attached. Any such claim shall be subject to TxDOT's review as part of a Utility Assembly approval. Except as otherwise directed by TxDOT, DB Contractor shall prepare all Affidavits of Property Interest using the forms included in Attachment 14-1 (Utility Adjustment Forms) or on TxDOT's website (https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/row.html).

14.2.4.2 Acquisition of Replacement Utility Property Interests

Each Utility Owner will be responsible for acquiring any Replacement Utility Property Interests that are necessary for its Utility Adjustments. DB Contractor shall have the following responsibilities for each acquisition, except for acquisitions of Replacement Utility Property Interests for water utility service meters under the Austin Water Utility Agreement:

- DB Contractor shall coordinate with, and provide the necessary information to, each Utility Owner as necessary for the Utility Owner to acquire any Replacement Utility Property Interests required for its Utility Adjustments; and
- If any DB Contractor-Related Entity assists a Utility Owner in acquiring a Replacement Utility Property Interest, such assistance shall be by separate contract outside of the Work, and DB Contractor shall ensure that the following requirements are met:
  - The files and records must be kept separate and apart from all acquisition files and records for the Project ROW;
  - The items used in acquisition of Replacement Utility Property Interests (e.g., appraisals, written evaluations and owner contact reports) must be separate from the purchase of the Project ROW;
  - Any DB Contractor-Related Entity personnel negotiating the acquisition of Replacement Utility Property Interests must be different from those negotiating the acquisition of the Project ROW; and
  - DB Contractor is not responsible for Utility Owner condemnation proceedings, except for DB Contractor's cost share set forth in Section 4.5.6 of the General Conditions. The Utility Owner is responsible for utilizing its authority for condemnation proceedings for all Replacement Utility Property Interests.

For Austin Water Utility Adjustments, DB Contractor shall perform all work necessary to acquire Replacement Utility Property Interests for water utility service meters, except for compensating property owners and prosecuting condemnation proceedings for such Replacement Utility Property Interests.

14.2.4.3 Relinquishment of Existing Utility Property Interests

DB Contractor shall cause the affected Utility Owner, other than Austin Water, to relinquish to the State each Existing Utility Property Interest within the Project ROW, unless the existing Utility occupying such interest is either (a) remaining in its original location or (b) being reinstalled in a new location still subject to such interest.

14.2.4.4 Quitclaim Deeds

Except as otherwise directed by TxDOT, DB Contractor shall prepare and record in the appropriate jurisdiction a Quitclaim Deed for each relinquishment of an Existing Utility Property Interest using the TxDOT form included in Attachment 14-1 (Utility Adjustment Forms). Each Quitclaim Deed is subject to TxDOT's approval.

DB Contractor understands and expects that a Utility Owner will not relinquish any Existing Utility Property Interest until after the Utility Adjustment has been accepted by the Utility Owner in its new location. Accordingly, instead of an executed Quitclaim Deed, the Utility Assembly for such Utility Adjustment shall include a letter signed by the Utility Owner's authorized representative confirming that the interest will be quitclaimed upon completion of the Utility Adjustment, with a copy of the unsigned Quitclaim Deed. In these cases, DB Contractor shall obtain the executed Quitclaim Deed within 90 days of completion of the Utility Adjustment or unless otherwise approved by TxDOT in writing. The Quitclaim Deed must be approved by TxDOT prior to DB Contractor recording such deed in the local real property records.

14.2.4.5 UJUAs and Utility Installation Request, Form 1082 Requirements

DB Contractor shall prepare a UJUA for each Utility that will remain within the boundaries of its Existing Utility Property Interest location within the Project ROW. DB Contractor shall prepare all UJUAs using the TxDOT form included in Attachment 14-1 (Utility Adjustment Forms). DB Contractor also shall prepare all required documentation to be included with each UJUA.

DB Contractor shall arrange for the Utility Owner to execute each UJUA or Utility Installation Request, Form 1082, which shall be subject to TxDOT's written approval as part of a Utility Assembly.

DB Contractor shall prepare a Utility Installation Request, Form 1082, for each Utility that will remain or be relocated within the Project ROW and is not located within an Existing Utility Property Interest held by the Utility Owner.

14.2.4.6 **Documentation Requirements**

DB Contractor shall prepare, negotiate (to the extent permitted by this Section 14.2.4), and obtain execution by the Utility Owner of (and record in the appropriate jurisdiction, if applicable) all agreements and deeds described in this Section 14.2.4, including all necessary exhibits and information concerning the Project (e.g., reports, Plans and surveys). Each agreement or deed shall identify the subject Utility(ies) by the applicable Utility Assembly Number and shall also identify any real property interests by parcel number or highway station number, or by other identification acceptable to TxDOT.

14.2.5 **Utility Management Plan**

DB Contractor shall prepare and submit a Utility Management Plan in accordance with the requirements in Section 4.2.8 of the General Conditions.

14.3 **Design**

14.3.1 **DB Contractor's Responsibility for Utility Identification**

Except as expressly provided in the DBC, DB Contractor bears sole responsibility for locating and identifying, at its own expense, all Utilities, including all Service Lines, within the Project ROW or otherwise affected by the Project, whether located on private property or within an existing public ROW. DB Contractor shall utilize the City of Austin's one call center to assist with locating and identifying Austin Water Utilities.

During the course of field investigations and construction, whenever DB Contractor exposes an existing utility line, and as permitted by the Utility Owner, DB Contractor shall place a PVC riser pipe to identify the location of such utilities in the field.

DB Contractor shall prepare and submit to TxDOT prior to the first Utility Assembly submission a utility strip map showing the information obtained and confirmed pursuant to this Section 14.3.1. DB Contractor's utility strip map shall show in plan view all Utilities within the Project ROW and those outside of the Project ROW which are otherwise impacted by the Project. The map shall detail the type of Utility facility (e.g., communication, gas, oil, water, etc.) size, material, and the Utility Owner's name and contact information. The scale of DB Contractor's utility strip map shall be 1 inch = 100 feet on 11x17 sheets. DB Contractor shall verify and update the "Utility Strip Map" provided in the RID with SUE data obtained by DB Contractor and incorporate such SUE data into DB Contractor's Utility Strip Map.

14.3.2 **Technical Criteria and Performance Standards**

DB Contractor shall ensure that all design plans for Utility Adjustment Work, whether furnished by DB Contractor or by the Utility Owner, are consistent and compatible with:

- the applicable requirements of the Contract Documents, including Section 14.2.1 and Exhibit 23 to the DBA;
- the Project design;
- any existing and proposed Utility facility;
- all applicable Governmental Approvals; and
- approvals of all private sector third parties necessary for such Work.

For any utility relocation that utilizes trenching where the proposed adjustment is to be under the roadway pavement or shoulders that is approved through an exception to the UAR by TxDOT, DB Contractor shall place a trench backfilled with flowable fill up to the bottom of the pavement section.

14.3.3 **Utility Adjustment Concept Plans**

DB Contractor shall prepare and submit to TxDOT, a proposed conceptual Utility design (a Utility Adjustment Concept Plan) for the Project (or proposed Utility Adjustment Concept Plans for various segments of the Project, as appropriate), showing the approximate location of each existing Utility in accordance with Section 14.3.1, the existing Utilities to remain, the proposed location of each Utility, and DB Contractor's Utility Adjustment recommendations.

In accordance with the PMP, DB Contractor shall submit the proposed Utility Adjustment Concept Plan(s) to TxDOT for its review. The Utility Adjustment Concept Plan(s) shall be submitted in both tabular and plan formats. The tabular format shall identify and numerically list each Utility conflict and each associated Utility. The plan(s) shall be color-coded and shall utilize a scale that clearly depicts all of the required information.

DB Contractor shall coordinate with each affected Utility Owner as necessary to obtain its respective concurrence with the Utility Adjustment Concept Plan(s) and with any subsequent revisions. The Utility Adjustment Concept Plan is a working document, and DB Contractor shall modify the plan as more project information becomes available. DB Contractor shall make the updated Utility Adjustment Concept Plans available to TxDOT upon request. Each executed PUAA or UAAA will identify and approve the Utility location.

14.3.4 Utility Adjustment Plans

DB Contractor shall ensure that all Utility Adjustment Plans, whether furnished by DB Contractor or by the Utility Owner, are signed and sealed by a PE unless such requirement is waived by TxDOT at its discretion and as allowed by governmental regulations and industry practice.

14.3.4.1 Plans Prepared by DB Contractor

In the event that DB Contractor and the Utility Owner have agreed that DB Contractor will furnish a Utility Adjustment design or as required in the Austin Water Utility Agreement, DB Contractor shall prepare and obtain the Utility Owner's approval of plans, specifications and applicable cost estimates for the Utility Adjustment (collectively, "Utility Adjustment Plans") by having an authorized representative of the Utility Owner sign the plans as "reviewed and approved for construction." The Utility Adjustment Plans (as approved by the Utility Owner) shall be attached to the applicable Utility Agreement, which DB Contractor shall include in the appropriate Utility Assembly for TxDOT's approval.

Unless otherwise specified in the applicable Utility Agreement(s), all changes to Utility Adjustment Plans previously approved by the Utility Owner (excluding estimates, if the Utility Owner is not responsible for any costs) shall require written Utility Owner approval. DB Contractor shall transmit any TxDOT comments to the Utility Owner and shall coordinate any modification, re-approval by the Utility Owner and re-submittal to TxDOT as necessary to obtain TxDOT's approval.

14.3.4.2 Plans Prepared by the Utility Owner

For all Utility Adjustment Plans furnished by a Utility Owner, DB Contractor shall coordinate with the Utility Owner as necessary to confirm compliance with the applicable requirements as referenced in Section 14.2.1. Utility Owner-prepared Utility Adjustment Plans shall be attached to the applicable Utility Agreement, which DB Contractor shall include in the appropriate Utility Assembly for TxDOT's approval. DB Contractor shall transmit any TxDOT comments to the Utility Owner and shall coordinate any modification, review by DB Contractor, and re-submittal to TxDOT as necessary to obtain TxDOT's approval.

14.3.4.3 Design Documents

Each existing Utility and each proposed Utility Adjustment shall be shown in the Design Documents, regardless of whether the Utility Adjustment Plans are prepared by DB Contractor or by the Utility Owner.

14.3.4.4 Certain Requirements for Underground Utilities

Casing as specified in the UAR shall be used for all underground Utilities crossing the Project ROW. However, high-pressure gas and liquid petroleum pipelines may be allowed to cross the Project ROW without steel casing as long as the requirements of the UAR are met. All high-pressure gas pipelines within the Project ROW shall comply with a design factor "F" = 0.6 or less as required by the class location of the pipeline. The Utility Owner is required to submit or approve in writing the Barlow's Formula calculation(s) to be included in the Utility Assembly.

Underground communication facilities, including multiple conduits, that cross the roadway, including side roads, shall be encased in Schedule 80 PVC or SDR 11 HDPE pipe as long as it is one continuous piece.

14.3.4.5 Utility Assemblies

Each Utility Adjustment, in addition to each Utility remaining in place in the Project ROW and not requiring any Protection in Place or other Utility Adjustment, shall be addressed in a Utility Assembly prepared by DB Contractor and submitted to TxDOT for its review and comment and for TxDOT's approval of any items for which this Item 14 requires TxDOT's approval. Temporary Adjustments that are installed within the Project ROW must also be included with an assembly for TxDOT's prior approval, unless TxDOT waives such requirement or allows other approval methods concerning temporary Adjustments. Each Utility Adjustment shall be addressed in a full Utility Assembly, unless it is appropriate for a UAAA or Abbreviated Utility

Assembly, as described below. DB Contractor shall coordinate with the Utility Owner to prepare all components of each Utility Assembly. Completion of the review and comment process for the applicable Utility Assembly, as well as receipt of any required TxDOT approvals, shall be required before the start of construction for the affected Utility Adjustment Work.

Provisions governing the procedure for and timing of Utility Assembly Submittals are in Section 14.5.

All Utility Adjustments covered by the same parent PUAA, or in the case of Austin Water Utilities, the Austin Water Utility Agreement, can be addressed in a single full Utility Assembly.

Each Utility Assembly shall include the following:

(a) A transmittal memo recommending approval and detailing any unique characteristics or information pertaining to the Adjustment. The transmittal memo shall also describe any applicable amendment (UAAA) and explain why the amendment is necessary;

(b) A completed Utility Assembly Checklist;

(c) A TxDOT approved Utility Adjustment Agreement;

(d) Plans which:

  (i) Show the existing and proposed Utility facilities;

  (ii) Show existing and proposed grades for all Utility crossings;

  (iii) Show the existing and Project ROW lines along with the control of access denial line;

  (iv) Show an offset distance from the Project ROW line to all longitudinal Utilities within the Project ROW;

  (v) Present sufficient information to enable TxDOT to verify compliance with the UAR requirements for each Utility located within the Project ROW, including highway design features; and

  (vi) Are folded to 8.5-inch by 11-inch size, unless waived by TxDOT.

(e) Excluding Austin Water Utilities, estimate(s) from the Utility Owner (and also from DB Contractor, where DB Contractor is furnishing design and/or performing construction), which estimates shall, without limitation, detail material type and quantity (material quantities detailed on the estimates must correlate to the materials shown on the plans described in (d) above), labor, and engineering. The estimate must list and identify the estimated amount of reimbursement to the Utility Owner, taking into consideration the Betterment credit calculation, salvage credit, and any applicable eligibility ratio. The estimated cost(s) associated with DB Contractor's internal coordination costs and overheads shall not be included in this estimate;

(f) A proposed UJUA or Utility Installation Request, Form 1082;

(g) Statement of Work form, if applicable;

(h) Affidavit(s) of Property Interest form (with property interest instrument of conveyance attached), if applicable;

(i) A ROW map showing the existing and proposed Utility facilities identified on a plan view. This ROW map will only be required to be included with TxDOT's copy of the Utility Assembly, unless otherwise approved by TxDOT; and

(j) All Utility No Conflict Sign-Off Forms.

14.3.4.5.1 UAAAs

For each UAAA, DB Contractor shall prepare an additional Utility Assembly for the relevant initial PUAA (an Assembly), covering all Utility Adjustments addressed in the UAAA. The Assembly shall contain all requirements listed in (a) through (j) as identified in this Section 14.3.4.5.

14.3.4.5.2 Abbreviated Utility Assemblies

DB Contractor shall prepare an Abbreviated Utility Assembly for each Utility proposed to remain in its original location within the Project ROW that is not required to be addressed in a PUAA or UAAA, unless an

Adjustment is required pursuant to Section 14.1.1. If DB Contractor is reimbursing the Utility Owner any of its costs, a PUAA or UAAA is required. Each Abbreviated Utility Assembly shall contain a transmittal memo recommending that the subject Utility(ies) remain in place, a set of plans detailing UAR compliance, a completed Utility Assembly Checklist, a certification from the Utility Owner approving leaving the Utility(ies) in place, as well as UJUA(s) or Utility Installation Request, Form 1082 as required by Section 14.2.4.5 and Affidavit(s) of Property Interest, if applicable. Each of the foregoing items shall comply with the requirements for same described in Attachment 14-1 (Utility Adjustment Forms).

14.4 Construction

14.4.1 Reserved.

14.4.2 General Construction Criteria

All Utility Adjustment construction performed by DB Contractor shall conform to the requirements listed below. DB Contractor shall conduct all Work necessary to meet the requirements for this Item 14 in accordance with the requirements of this Item 14 and TxDOT Standard Specifications.

In addition, DB Contractor is responsible for verifying that all Utility Adjustment construction performed by each Utility Owner conforms to the requirements described below. In case of nonconformance, DB Contractor shall cause the Utility Owner (and/or its contractors, as applicable) to complete all necessary corrective work or to otherwise take such steps as are necessary to conform to these requirements:

- All criteria identified in Section 14.3.2;
- The Utility Adjustment Plans included in the Utility Agreement approved by TxDOT (other than UAFM complying with Section 14.4.7;
- All Project safety and environmental requirements;
- All pre-construction meeting requirements;
- The ROW acquisition schedule described in Item 15, “ROW,” and
- Utility(ies) standards provided in the Utility Agreement.

14.4.2.1 Reinstatement of Utility Cuts

After installation of drainage structures, storm sewers or any other public or private Utility facility by open cut across existing pavements, the pavement shall be restored and maintained to a normal satisfactory riding surface equal to or better than the existing.

14.4.2.2 Austin Water Utilities Construction Criteria

DB Contractor shall comply with the requirements set forth in this section and in the “Project Manual” identified in the Austin Water Utility Agreement, to the extent the standards and requirements in the Project Manual do not conflict with the Austin Water Utility Agreement, including the “City Drawings”.

14.4.2.2.1 Protection of Austin Water Utility Facilities

DB Contractor shall be responsible for protecting all Austin Water Utilities during all phases of Project construction. DB Contractor shall be responsible for the cost of repairing any damage to existing or adjusted water or wastewater facilities caused by DB Contractor. DB Contractor shall not repair any water or wastewater lines it damages without prior written consent from Austin Water.

14.4.2.2.2 Operation of Austin Water Valves

Neither DB Contractor nor any of its subcontractors shall be allowed to operate any water valves in the Austin Water Utility distribution system. In the event damage to a water facility requires the closing of a water valve, DB Contractor or its subcontractor shall immediately call Austin Water Dispatchers at (512) 972-1000. If a live water line is damaged or cut, DB Contractor or its subcontractor shall crimp the line to stop flow and immediately notify Austin Water.

14.4.2.2.3 Covering Appurtenances

DB Contractor shall not place or store any material upon, cover, bury, pave over or otherwise obstruct any cleanout, valve, meter, fire hydrant, manhole, or other Austin Water Utility appurtenance during any phase of Project construction without written authorization from the Austin Water.

14.4.2.2.4 Water Line Shut Offs

Prior to conducting any water line shut offs or limiting any wastewater service, DB Contractor shall provide Austin Water with at least five (5) Business Days notice by e-mail. The notice must identify any affected lines and valves and the location and dates of water shut offs and limited wastewater service. DB Contractor shall allow Austin Water inspectors to conduct a test shut-off of the affected lines and valves prior to the actual shut off.

DB Contractor shall provide affected customers with five (5) Business Days verbal notice and at least 72 hours written notice prior to conducting any water line shut offs or limiting any wastewater service.

14.4.3 **Inspection of Utility Owner Construction**

DB Contractor shall set forth procedures in the PMP for inspection of all Utility Adjustment Work performed by Utility Owners (and its contractors) to verify compliance with the applicable requirements described in Section 14.4.2. DB Contractor is responsible for quality control and quality assurance for all Work performed by the Utility Owners and its contractors.

14.4.4 **Scheduling Utility Adjustment Work**

The Utility Adjustment Work (other than construction) may begin at any time following issuance of NTP1. Refer to Section 8.1.2 of the General Conditions for the conditions to commence construction of Utility Adjustment Construction Work by DB Contractor. DB Contractor shall not arrange for any Utility Owner to begin any demolition, removal or other construction work for any Utility Adjustment until all of the following conditions are satisfied:

- The Utility Adjustment is covered by an executed Utility Agreement (and any conditions to commencement of such activities that are included in the Utility Agreement have been satisfied);
- Pre-construction meeting, in accordance with Section 14.2.2.2, shall be required after execution of the Utility Agreement and prior to commencement of any construction activities, unless otherwise approved by TxDOT;
- Availability and access to affected Replacement Utility Property Interests have been obtained by the Utility Owner (and provided to DB Contractor, if applicable);
- If any part of the Utility Adjustment construction work will affect the Project ROW, availability and access to that portion of the Project ROW has been obtained in accordance with the applicable requirements of the Contract Documents;
- If applicable, the Alternate Procedure List has been approved by TxDOT, as authorized by the FHWA, and either (a) the affected Utility is on the approved Alternate Procedure List, as supplemented, or (b) the Utility Owner is on the approved Alternate Procedure List, as supplemented;
- The review and comment process has been completed and required approvals have been obtained for the Utility Assembly covering the Utility Adjustment;
- All Governmental Approvals necessary for the Utility Adjustment construction have been obtained and any pre-construction requirements contained in those Governmental Approvals have been satisfied; and
- All other conditions to that Work stated in the Contract Documents have been satisfied.

14.4.5 **Standard of Care Regarding Utilities**

DB Contractor shall carefully and skillfully carry out all Work impacting Utilities and shall mark, support, secure, exercise care, and otherwise act to avoid damage to Utilities. At the completion of the Work, the condition of all Utilities shall be restored to existing condition.

14.4.6 **Emergency Procedures**

DB Contractor shall provide Emergency procedures with respect to Utility Adjustment Work in the PMP. DB Contractor shall obtain Emergency contact information, establish Emergency procedures with each Utility Owner and immediately notify the Utility Owner in the event of rupture, break or damage to the Utility Owner's Utility facilities.

14.4.7 **UAFM**

DB Contractor shall establish a procedure in the Utility Management Plan to address a UAFM as proposed by either DB Contractor or a Utility Owner, after the Utility Assembly (which includes the Utility Adjustment Plans) has been approved. The procedure shall provide, at minimum, the following:

- The Utility Owner's review and approval of a UAFM proposed by DB Contractor, or DB Contractor's review and approval of a UAFM proposed by the Utility Owner. DB Contractor shall obtain all required approvals of the UAFM prior to commencement of construction. All revisions shall be signed and sealed by a PE, unless otherwise permitted by TxDOT in its discretion;
- Transmittal of UAFMs to the appropriate construction field personnel; and
- Inclusion of any UAFMs in the Record Drawings for the Project.

DB Contractor shall cause the procedure to be followed for all UAFMs, whether the construction is performed by DB Contractor or by the Utility Owner.

14.4.8 **Switch Over to New Facilities**

After a newly adjusted Utility has been accepted by the Utility Owner and is ready to be placed in service, DB Contractor shall coordinate with the Utility Owner regarding the procedure and timing for placing the newly adjusted Utility into service and terminating service of the Utility being replaced.

14.4.9 **Utility Record Drawings**

DB Contractor shall provide Utility Record Drawings to each Utility Owner for its adjusted Utilities where the Utility Adjustment Work was performed by DB Contractor. For the purpose of this Item 14, Utility Record Drawings means construction drawings and related documentation revised to show approved changes made during the construction process, usually based on marked-up Released for Construction Documents furnished by DB Contractor.

DB Contractor shall provide Utility Record Drawings to TxDOT (regardless of whether design and/or construction of the subject Utilities was furnished or performed by DB Contractor or by the Utility Owner). Utility Record Drawings shall show the location of all abandoned Utilities, shall show and label all other Utilities (both remaining in place and relocated) that are located within the Project ROW or impacted by the Project, and shall comply with Item 4 of the General Conditions. DB Contractor shall provide the Utility Record Drawings for each Adjustment to TxDOT prior to Final Acceptance.

Prior to Final Acceptance, DB Contractor shall provide to TxDOT an overall inventory set of utility plans of all final Utility facility locations (both Owner-Managed and DB Contractor-Managed) that include Utilities that remained in place, were adjusted in place or relocated. The plan view must detail the Utility facility horizontal alignment with highway stationing, ROW lines, roadway features, Utility Owners name, Utility facility type, size and Utility Assembly Number. This overall inventory set of plans is separate from the individual Record Drawing plans required for each Utility Assembly.

14.4.9.1 **Austin Water Utilities – Utility Record Drawings**

DB Contractor shall provide electronic PDF Utility Record Drawings to Austin Water within 60 days of activating a water or wastewater line. The Utility Record Drawing must include GPS coordinates of items not installed in accordance with the Released for Construction Documents plans for the Austin Water Utilities. The Utility Record Drawings must also include the limits of encasements such as steel and flowable fill as well as the revised plan sheets.

14.4.10 **Maintenance of Utility Service and Access**

All Utilities shall remain fully operational during all phases of construction, except as specifically allowed and approved in writing by the Utility Owner. DB Contractor shall schedule Utility Adjustment Work in order to

minimize any interruption of service, while at the same time meeting the Project Schedule and taking into consideration seasonal demands.

Each Utility Adjustment or remain in place location must allow for adequate access during construction and after completion of the Project. All access and access locations to the Utility facility must be agreed to by the Utility Owner and approved by TxDOT.

14.4.11 Traffic Control

DB Contractor shall be responsible for the TMP. The TMP shall cover all traffic control made necessary for Utility Adjustment Work, whether performed by DB Contractor or by the Utility Owner. Traffic control for Adjustments shall be coordinated with, and subject to approval by, the local agency(ies) with jurisdiction. Traffic control shall comply with the guidelines of the TMUTCD and of Item 26, "Traffic Control."

14.4.12 Substantial Completion and Final Acceptance Requirements for Austin Water Utilities

DB Contractor shall be responsible for the maintenance of adjusted Austin Water Utilities until Austin Water delivers a "Certificate of Final Acceptance" for the applicable Austin Water Utilities pursuant to the Austin Water Utility Agreement. DB Contractor shall be responsible for meeting all requirements for substantial completion and final acceptance of adjusted Austin Water Utilities under the Austin Water Utility Agreement.

14.5 Utility Assembly Submittals

DB Contractor shall time all Submittals described in this Section 14.5 to meet the Project Schedule, taking into account the maximum number of Submittals set forth in this Section 14.5 or, if not stated therein, then as stated in Section 5.2.1 of the General Conditions. All Submittals shall conform to the standards required in the PMP. Any deliverable submitted by DB Contractor to TxDOT for review after 11:59 a.m. will be considered as submitted on the next business day.

All Submittals described in this Item 14 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 14-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, and Adobe Acrobat files, unless otherwise indicated.

Table 14-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Any proposed changes to the provided TxDOT DB ROW Utility forms	As necessary	Approval	14.1
DB-ROW-U-1818 (Buy America Material Statement), if applicable	Prior to the Utility Owners receiving final payment from DB Contractor or TxDOT	Approval	14.1
Project Utility Adjustment Agreement	After NTP1, based on DB Contractor schedule	Approval	14.1.3.1
Utility Adjustment Agreement Amendments	After NTP1, based on DB Contractor schedule	Approval	14.1.3.2
Any mass mailings to Utility Owners	In advance of distribution	Review and Comment	14.2.2.1
Meeting Agendas	In advance of each scheduled meeting	For information	14.2.2.2
Meeting Minutes	After attendee comment and after the conclusion of the meeting and prior to final distribution	Review and Comment	14.2.2.2
Names, contact details, etc. for the Utility coordination team	Prior to NTP2, in the applicable chapter of the PMP	Approval	14.2.3
Affidavit of Property Interest	In the applicable Utility Assembly	Approval	14.2.4.1

Table 14-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Draft Quitclaim Deeds	Prior to submission of Utility Assembly	Approval	14.2.4.4
Letter of Confirmation (relinquishment of interest once Adjustment completed) from Utility Owner and/or Utility Owner's authorized representative, if applicable	In the applicable Utility Assembly, including copy of unsigned Approved Draft Quitclaim Deed	Approval	14.2.4.4
Executed Quitclaim Deeds	1. Prior to recording deed in local real property records, and 2. After the completion of Utility Adjustment, or unless otherwise directed by TxDOT in writing	For information	14.2.4.4
Utility Joint Use Acknowledgments	In the applicable Utility Assembly	Approval	14.2.4.5
Utility Installation Request, Form 1082	In the applicable Utility Assembly	Approval	14.2.4.5
PMP – Utility Management Plan	Prior to NTP2	Approval prior to issuance of NTP2	14.2.5
DB Contractor's Utility Strip Map	(i) After NTP2 or (ii) before the first assembly package submission	Review and information	14.3.1
Utility Adjustment Concept Plan(s)	(i) After NTP2 or (ii) before the first assembly package submission (this plan is a working document and shall be continuously updated and modified as more project information becomes available)	Review and, if applicable, Comment	14.3.3
Utility Adjustment Plans	In the applicable Utility Assembly	Approval	14.3.4.1, 14.3.4.2
Utility Assemblies	Prior to start of the affected Utility Adjustment Work	Approval	14.3.4.5
Temporary Adjustments	In the applicable Utility Assembly, if applicable, unless TxDOT waives/allows other method	Approval	14.3.4.5
Abbreviated Utility Assemblies	As necessary	Approval	14.3.4.5
Quality control/Quality assurance procedures for Utility Adjustment Work	In the applicable chapter of the PMP and PSQMP	Approval	14.4.3, 14.4.4
Utility Adjustment Work emergency procedures and contact information	In the applicable chapter of the PMP and PSQMP, and prior to any construction activities	Approval	14.4.6

Table 14-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Set of Record Drawings and overall plan view maps of final Utility locations	1. After Utility Owner acceptance, Utility Adjustment completion, or prior to deadline specified elsewhere in the Contract Documents or by TxDOT 2. Preliminary overall plan view map upon completion of 50% of required Utility Adjustment Work	Review, Comment, and if applicable, Approval	14.4.9, 14.5.3
Individual Record Drawing plans	In the applicable Utility Assembly, and at Project closeout	Approval	14.4.9, 14.5.3
Utility Tracking Report (UTR)	Monthly	Information	14.5.2
Utility Assembly Submittal log	With each Submittal or group of Submittals	For Information	14.5.3
Closeout information and documentation	After each Utility has been relocated, fully reimbursed and accepted by the Utility Owner	Information	14.5.3
Alternate Procedure List	Prior to commencement of any demolition, removal or other construction work for any Utility Adjustment	Approval	14.5.4

14.5.1 **Maximum Number of Submittals**

DB Contractor shall coordinate all Submittals required pursuant to this Section 14.5. In each 10 Business Day period, DB Contractor shall not submit more than:

- Five Utility Assemblies (excluding Abbreviated Utility Assemblies and Utility Assemblies related to Austin Water Utilities); and
- Five of any other Submittals required under this Item 14 and requiring TxDOT review and approval.

Where the number of Submittals exceeds these limits, the Submittals shall be considered excess and TxDOT may defer its review of any such excess Submittals to a subsequent 10 Business Day period, as necessary.

14.5.2 **DB Contractor's UTR**

DB Contractor shall maintain a UTR in tabular form, listing all Utilities located within the Project ROW or otherwise potentially affected by the Project. DB Contractor shall submit the UTR to TxDOT on a monthly basis in the format described below unless otherwise approved by TxDOT. The UTR shall, at a minimum, contain the following information for each Utility:

- The name of the Utility Owner and the Utility Assembly Number;
- Utility size and type;
- Location of the Utility based upon station and offset;
- The proposed method of treatment;
- State whether the Adjustment will be Owner or DB Contractor-Managed;
- Dates on which the Utility Agreement was executed by TxDOT, the Utility Owner and DB Contractor, as applicable;
- Dates on which the UJUA or Utility Installation Request, Form 1082, was executed by the Utility Owner and TxDOT;

- The Utility Owner's existing right of occupancy of the ROW for each Utility (e.g., UJUA, permit, easement or combination);
- Whether any Replacement Utility Property Interest will be necessary;
- Estimated cost approved in the PUAA/UAAA;
- Amounts and dates of payments made by DB Contractor to the Utility Owner, listing in each case the type of payment (final, partial or lump sum);
- Scheduled start and completion date for construction of each Adjustment;
- Percent complete of construction;
- Whether any Betterment is included in the Adjustment; and
- Whether TxDOT form 1818 (Buy America Material Statement) is required for each Adjustment.

The UTR shall also include a separate section for Replacement Utility Property Interest including each necessary Replacement Utility Property Interest with the names of property owners or parcel number(s), Utility Assembly Numbers, status of the acquisition, acquisition cost and other information as necessary. DB Contractor shall maintain this section of the UTR and submit to TxDOT in the same manner as all other portions of the UTR.

14.5.3 Utility Assembly Submittals and Final Closeout Procedures

The following procedures shall govern submittal, review and final closeout of each Utility Assembly, including UAAA and Abbreviated Utility Assemblies:

- Before submitting a Utility Assembly to TxDOT, DB Contractor shall:
  - Verify that each subject Utility (or the Utility Owner) is on the approved Alternate Procedure List, if applicable;
  - Submit the complete Utility Assembly to the quality control/quality assurance entity designated by DB Contractor in accordance with the PMP and the PSQMP; and
  - Resolve all comments made by the quality control/quality assurance entity, coordinating with the Utility Owner as appropriate.
- DB Contractor shall submit to TxDOT three identical and complete originals of each Utility Assembly, each of which shall be bound and labeled "DB Contractor Copy," "TxDOT Copy," or "Utility Owner Copy," as appropriate. The "TxDOT Copy" shall be color-coded and shall include the Project ROW map with the existing and proposed Utility facilities identified on a plan view. These Submittals shall be for TxDOT's review and comment, except for any components of the Utility Assembly for which TxDOT's approval is required by this Section 14.5.
- DB Contractor shall submit to TxDOT a Utility Assembly Submittal log with each Submittal or group of Submittals. The Utility Assembly Submittal log shall establish the review priority.
- TxDOT will review the Utility Assembly for compliance with the requirements of this Section 14.5.3, and within 10 Business Days will return the Utility Assembly to DB Contractor with the appropriate notations pursuant to Section 5.2.1 of the General Conditions to reflect its responses. DB Contractor shall transmit any TxDOT comments to the Utility Owner and shall coordinate any modification, review and approval by the Utility Owner and re-submittal to TxDOT, as necessary to resolve all TxDOT comments and/or obtain TxDOT's approval, as applicable. Upon (a) TxDOT's approval of any Utility Assembly components for which TxDOT's approval is required, and (b) completion of the review and comment process for all other Utility Assembly components, TxDOT will sign three originals of any approved UJUA and of any other components of the Utility Assembly for which this Item 14 requires TxDOT signature.
- DB Contractor shall provide closeout information and documentation within 90 days after each Utility has been relocated, fully reimbursed and accepted by the Utility Owner. The closeout information shall contain the following:
  - The Utility Agreement form (PUAA, UAAA, et al);
  - Record Drawings ("as-built") plans;

- UJUA or Form 1082;
- Quitclaim form (D-15-30);
- Actual cost and summary of the Adjustment; and
- TxDOT form 1818 Buy America Material Statement.

DB Contractor shall address conditions of approval, if any, for each Utility Assembly prior to completing the final closeout procedure.

14.5.4 FHWA Alternate Procedure

DB Contractor shall develop the Alternate Procedure List that includes the Utility Owner's name, approximate station numbers and estimated cost of Utility Adjustments. TxDOT is authorized by the FHWA to utilize the Alternate Procedure process. Upon receipt of the required information, TxDOT shall then consider and approve the list and notify DB Contractor. Promptly upon determining that any additional Utility Owner not referenced on the Alternate Procedure List is impacted by the Project, DB Contractor must submit to TxDOT all documentation as referenced above in order to amend the Alternate Procedure List.

Item 15
Right of Way (ROW)

15.1 **General Requirements**

DB Contractor's obligations in respect of the acquisition of Project ROW are set forth in Section 4.4.1 of the General Conditions.

This Item 15 sets forth the ROW activities assigned to DB Contractor, including pre-acquisition and acquisition activities, and designates which ROW activities TxDOT will conduct. This Section 15.1 also sets forth the requirements applicable to the Work assigned to DB Contractor related to the acquisition of Project ROW. TxDOT will make available for Construction Work certain parcels in Schematic ROW by the dates listed in Table 15-1. The DB Contractor shall not be permitted access to unacquired parcels until granted permission from TxDOT. The term "make available," as used herein, means to make available for (a) relocation of occupants and personal property, for occupied parcels, (b) demolition, for unoccupied, improved parcels, or (c) construction, for unoccupied, unimproved parcels.

DB Contractor shall provide all services necessary to acquire title to the Project ROW, in form and substance acceptable to TxDOT, in the name of the State; relocate displacees; and clear/demolish improvements from the Project ROW, as more fully described in the following sub-sections.

Except as otherwise set forth in the DBA, DB Contractor's Project ROW staff and/or Subcontractors will function as independent contractors while acquiring Project ROW, and not as an agent, representative, or employee of TxDOT.

DB Contractor shall provide TxDOT copies of all property agreements it obtains to facilitate design, construction or maintenance in relation to the Project. No conveyance documents shall be used for the purpose of Construction Work other than a PUA, a deed, or an award, unless otherwise approved by TxDOT.

Table 15-1: Schematic ROW Parcel Availability

Availability Date	Parcels
Make available by NTP1	1, 2, 3, 4, 7, 8, 9, 12, 13, 17, 19, 20, 21, 22, 24 OAS, 24, 31, 32, 35, 41, 49, 53, 55, 64, 70, 72, 79, 80, 81, 82, 83, 84, 85, 86, 87, 92, 93, 95, 96, 98
Make available by NTP1 + 90 days	30, 33, 50, 59, 94, 102
Make available possession by NTP1 + 180 days	10, 15, 16, 26 (Parts 1 and 2), 36, 43, 44, 45, 46, 47, 51, 52, 56, 57, 58, 60, 61, 63, 71, 75E, 99, 103, 104
Make available by NTP1 + 270 days	5, 6, 23 (Parts 1, 2, 3 and 6), 54, 65 OAS, 65, 67, 73 OAS, 73, 97, 100, 101, 102 OAS, 105, 106, 107, 108, 109, 110, 115, 116

15.2 **Administrative Requirements**

15.2.1 **Standards**

DB Contractor shall acquire all Project ROW in accordance with State and federal Law and the practices, guidelines, procedures, and methods and contained in the following available at http://onlinemanuals.txdot.gov/manuals:

- All TxDOT ROW Manuals;
- TxDOT *Access Management Manual*; and
- TxDOT *Survey Manual*.

Pursuant to the applicable federal regulations, DB Contractor shall (i) acquire ROW parcels for the Project on behalf of the State, but without the direct participation of TxDOT, subject to TxDOT's rights of review,

approval, and audit; (ii) utilize the TxDOT ROW Manuals; (iii) provide adequate access to all occupied properties; (iv) maintain Utility service to occupied properties until relocation is complete; and (v) not permit open burning within 1,000 feet of an occupied dwelling.

DB Contractor shall maintain a complete set of the TxDOT ROW Manuals, TxDOT *Access Management Manual*, TxDOT *Survey Manual*, and a current approved Project ROW map for public use. DB Contractor's complete set of TxDOT ROW Manuals shall be current as of the Effective Date. Any TxDOT forms referenced in this Section 15.2.1 may be found in the TxDOT ROW Manuals or will be provided by TxDOT.

All real estate activities of the Project ROW must be completed and documented in compliance with all applicable Laws, including the Uniform Act, the rules and regulations for implementing the Uniform Act, and 23 CFR Part 710 governing the use of federal funds for acquisition, management and disposal of real property.

15.2.2 **Software Requirements**

DB Contractor shall utilize software that is fully compatible with the software in use by TxDOT, or fully transferable to TxDOT's systems, including TxDOT's interactive SharePoint site (for uploading, review, document retrieval, etc.). DB Contractor must maintain parcel-by-parcel status on a spreadsheet provided by TxDOT that incorporates the fields and information required by TxDOTConnect or other TxDOT current system. DB Contractor must maintain and participate in any other required ROW tracking system required by the Contract Documents.

15.2.3 **ROW Acquisition Management Plan**

DB Contractor shall prepare a ROW Acquisition Management Plan in accordance with the requirements contained in Section 4.2.9 of the General Conditions.

15.2.4 **Schedule and Review Procedures**

The Project Schedule shall indicate the date to begin the acquisition of the Project ROW and the anticipated completion date of acquisition activities for each parcel. DB Contractor shall advise TxDOT of all Additional Properties and temporary rights or interests in real property to be acquired by DB Contractor. In developing the Project Schedule, DB Contractor shall give priority to the acquisition of parcels that have significant impact on the Project Schedule or affect the Critical Path. The monthly Project Schedule Update required by Item 8 of the General Conditions shall provide updated projections for the acquisition date of each parcel.

In developing the Project Schedule, DB Contractor shall incorporate adequate time periods for TxDOT review and approval of Acquisition Packages and Condemnation Packages. TxDOT intends to review the completed Acquisition Package Submittals and Condemnation Package Submittals as expeditiously as possible; *however,* for the purposes of the Project Schedule, DB Contractor shall assume that the reviews performed by TxDOT will require 10 Business Days for Acquisition Packages and Condemnation Packages (collectively) that DB Contractor submits as final and complete in accordance with Section 15.3.6 and Section 15.4.4, up to a maximum of five Acquisition Packages and Condemnation Packages (collectively), unless otherwise directed by TxDOT. Any Submittals that would require TxDOT to review more than five Acquisition Packages and Condemnation Packages (collectively) within any given 10 Business Day period shall be considered excess, and TxDOT may defer its review of any such Acquisition Packages and/or Condemnation Packages to a subsequent 10 Business Day period (or periods as necessary). TxDOT will notify DB Contractor of its election to defer any excess Acquisition Packages and/or Condemnation Packages within 10 Business Days after receipt. The balance of Acquisition Packages and Condemnation Packages (collectively) in excess of five will be rolled over to the next 10 Business Day period and added to the Acquisition Package Submittals and Condemnation Package Submittals made by DB Contractor in that period. When DB Contractor submits more than five Acquisition Packages and Condemnation Packages (collectively) at any given time, DB Contractor shall indicate the priority of review.

DB Contractor shall also assume that the reviews performed by TxDOT will require 10 Business Days for the following Submittals: payment identification number (PIN) Submittals, payment Submittals, relocation Submittals, administrative settlement Submittals, and closing Submittals, up to a maximum of five submissions for each type of Submittal noted above, in addition to the Acquisition Packages and Condemnation Packages. With the combination of the above, DB Contractor shall not submit more than 25 total Submittals, in any given 10 Business Day period.

If TxDOT notifies DB Contractor that any submitted Acquisition Package or Condemnation Package has a deficiency, DB Contractor shall correct such deficiency and resubmit the package to TxDOT. Resubmissions shall be treated as a new Acquisition Package or Condemnation Package, as applicable, for purposes of the limitations on the number of Submittals that may be submitted in a 10 Business Day period. An Acquisition Package or Condemnation Package shall be deficient, as determined by TxDOT, if any of its components fails to meet any of the criteria established by this Section 15.2.4 for such component, or contains any material errors or omissions. Schedule delays resulting from inadequate or incomplete submissions of Acquisition Packages and/or Condemnation Packages shall be the responsibility of DB Contractor and will not be eligible for treatment as a Change Order.

TxDOT shall have the right to undertake additional review and extend the review time for an additional 10 Business Days on any ROW Submittal related to this Item 15 that contains or identifies facts or issues of an unusual nature or which do not clearly fit within TxDOT Standards. In such event, TxDOT will notify DB Contractor in writing that the review period will be extended by an additional 10 Business Days before rendering a decision regarding approval of the package to DB Contractor.

DB Contractor may request TxDOT to perform a preliminary review of the survey, Project ROW map and appraisal before the complete Acquisition Package is submitted. TxDOT may elect in its discretion to review the preliminary submission of the survey, map and appraisal, and notify DB Contractor of any deficiencies after TxDOT's receipt and review of such preliminary submission. There will be no time limits associated with these preliminary reviews.

15.2.5 DB Contractor's Project ROW Scope of Services

DB Contractor shall complete all administrative activities and prepare all documentation sufficient for DB Contractor to acquire the Project ROW. DB Contractor shall obtain TxDOT's review and prior written approval of all Project ROW maps and surveys, appraisals, legal descriptions, acquisition documentation, purchase price, requests to acquire Project ROW, condemnation-related activities, and funding/closing procedures. For such Project ROW acquisition documentation, TxDOT will (a) approve and return the Submittal, (b) provide review comments for incorporation by DB Contractor in accordance with Section 15.2.4, or (c) in the case of a ROW Submittal that is deficient, notify DB Contractor of the deficiency(ies) to be corrected by DB Contractor prior to resubmission in accordance with Section 15.2.4. Except as otherwise authorized by applicable State and Federal policy and regulations for early acquisition and approved by TxDOT, DB Contractor shall not proceed with acquisition of the Project ROW until the NEPA Approval is issued, public involvement procedures have been completed, and ROW maps and legal descriptions for the applicable constructible segment as established by the logical termini of the Project have been prepared and approved by TxDOT. TxDOT will provide a separate release for each NEPA approved highway segment. Further, DB Contractor shall not commence any negotiations with the owner of a parcel, and TxDOT will not begin eminent domain procedures with respect to the parcel until after the Acquisition Package for that particular parcel is approved by TxDOT.

If DB Contractor and the landowner cannot negotiate an agreed-upon conveyance by deed acceptable to TxDOT, DB Contractor shall recommend for TxDOT to commence acquisition of the property through eminent domain procedures. TxDOT will initiate eminent domain procedures at its discretion. DB Contractor shall not recommend any condemnation action through the statutory "Special Deposit and Possession" procedure. TxDOT will not acquire any property through the condemnation process via the "Special Deposit and Possession" procedure.

Neither DB Contractor nor its Subcontractors shall begin construction of any type on any parcel of real estate unless and until all requirements under the Uniform Act have been met (including relocation assistance in accordance with Section 15.4.2) and (i) property rights for the parcel have been conveyed and recorded in favor of TxDOT, (ii) possession has been obtained through eminent domain or any other method provided for by the standards set forth in Section 15.2.1, or (iii) a PUA has been executed and delivered by all necessary parties in accordance with Section 15.4.1.

15.2.6 Acquisition Process Summary

DB Contractor's major activities with respect to the acquisition of the Project ROW include:

- Project ROW surveying and mapping;
- Project ROW and Utility cost estimates and updates;

- Title services;
- Appraisal services;
- Appraisal review;
- Negotiations;
- Closing services;
- Relocation assistance;
- Condemnation support services;
- Clearance and demolition of Project ROW;
- Environmental due diligence;
- Documentation and document control;
- Progress reports;
- Project ROW administration and management;
- Project ROW quality management;
- Letter from DB Contractor's design engineer certifying that the required Project ROW acquisition is necessary and that any proposed alternatives are not feasible or are cost prohibitive; and
- Obtaining ROEs, as necessary.

15.2.7 **ROW Personnel Qualifications**

DB Contractor's ROW AM shall have at least five years' experience managing the acquisition of no less than 200 parcels (with a preference for a greater number) for transportation ROW projects for a condemning authority, be licensed as a real estate salesman or broker pursuant to the *Texas Real Estate License Act* or rules established by the TREC, be familiar with appraisal and appraisal report review pursuant to the USPAP, and be familiar with the Uniform Act and applicable Laws of the State of Texas.

Quality Control Specialist(s) – DB Contractor shall designate a specific person(s) responsible for internal quality control. This individual shall review all DB Contractor deliverables associated with survey, title, appraisal, acquisition, relocation, and eminent domain prior to the deliverable being delivered to TxDOT for review.

Appraiser and Appraisal Reviewer – Each appraiser and appraisal reviewer shall be licensed as a certified general appraiser in the State of Texas and shall have a minimum of seven years' experience in appraising real property for eminent domain purposes, including partial taking appraisal, partial taking appraisal review and expert witness testimony. Each individual must have been actively and continuously engaged for at least five years immediately preceding their selection for this Project in appraisal work primarily in the county(ies) where the Project is located, and as approved and pre-certified by TxDOT. The appraisers and the appraisal reviewers shall have separate and distinct duties, and appraisers must be employed by different firms from the appraisal reviewers. Each appraiser shall be required to submit three samples of previous appraisal work prepared for eminent domain purposes. All appraisers preparing and signing appraisals must be approved and pre-certified by TxDOT before performing any appraisals on the Project. If required by TxDOT, the appraiser will be required to demonstrate his or her skills at expert witness testimony.

Land Planner – Each land planner shall have a minimum of five years' experience in land planning including experience with expert witness testimony in eminent domain proceedings. Each individual must have been actively and continuously engaged for at least three years immediately preceding selection for this Project in land planning work primarily in the county(ies) where the Project is located, or as approved and pre-certified by TxDOT. DB Contractor shall provide a minimum of two land planners to assist appraisers and complete land plans.

Relocation Agent – Each relocation agent shall have a minimum of seven years' experience in relocation assistance for ROW projects pursuant to the Uniform Act. A relocation agent's responsibilities shall include the following: determination of eligibility of all displacees, contacting all displacees and informing them of their benefits, maintaining a file of all documentation concerning the relocation of the displacees, and extending all relocation assistance advisory services.

Negotiator – Each ROW negotiator shall be licensed as either a Real Estate Sales Agent or broker pursuant to the *Texas Real Estate License Act* or rules established by the TREC, and shall be familiar with appraisal and appraisal report review pursuant to the USPAP. The negotiator shall have a minimum of three years' experience in ROW negotiations. The ROW negotiator's responsibilities shall include the following: contact with property owners on the Project to discuss the acquisition of property needed for the Project, maintaining complete and accurate files of all transactions and contacts with the property owners and their representatives, and actively working toward a joint resolution to acquire the property with the property owner.

Eminent Domain Specialist – Each eminent domain specialist shall have a minimum of five years' experience with TxDOT procedures and policies as related to acquisition of property through the use of eminent domain. The eminent domain specialist must have demonstrated experience in all activities necessary with the acquisition of parcels through the TxDOT Eminent Domain process. This includes correctly completing all TxDOT forms including the ROW-E-49, filing the eminent domain forms, coordinating the hearing with all appropriate parties, ensuring that the Award of Special Commissioners is deposited into the registry of the Court and all notices sent to the appropriate parties, and reporting on the status of objections to the Special Commissioners' award and any mediation or settlement discussions.

Real Estate Attorney – Each real estate attorney shall be licensed by the State of Texas and shall have at least five years' experience in title review and curative matters. The real estate attorney's responsibilities shall include coordinating and clearing all title issues, and compliance assistance with State and Federal acquisition requirements for the properties acquired for the Project.

ROW personnel shall have at least three years' experience in title review and curative matters. ROW personnel's responsibilities shall include, but not be limited to the following: maintain complete and accurate files of all transactions and contacts with the property owners and/or their representatives, coordinate and clear all title issues and assist at closing for properties acquired for the Project.

15.2.8 DB Contractor Conflict of Interest

If at any time, to the best of DB Contractor's knowledge, any DB Contractor-Related Entity directly or indirectly (a) acquires or has previously acquired any interest in real property likely to be parcels of the Project ROW or the remainders of any such parcels, (b) has any financial interest in any real property likely to be a Project ROW parcel, or the remainder of any such parcel that is not a whole acquisition, or (c) purchases or has previously purchased from an existing mortgagee the mortgage instrument that secures an existing loan against real property likely to be a Project ROW parcel, or the remainder of any such parcel, DB Contractor shall promptly disclose the same to TxDOT. In the case of acquisitions, loans or mortgage purchases that occurred prior to the Effective Date, such disclosure shall be made within 10 days after the Effective Date.

In the event that DB Contractor, or any subsidiary, sister, or parent company of DB Contractor, acquires a real property interest, whether title or mortgage, in parcels of the Project ROW, the real property interest acquired or a release of mortgage as the case may be, shall be conveyed to the State of Texas without the necessity of eminent domain.

DB Contractor shall not acquire or permit the acquisition by DB Contractor or any DB Contractor-Related Entity of any real property interest in a Project ROW parcel, whether in fee title or mortgage, for the purpose of avoiding compliance with the Laws, practices, guidelines, procedures and methods described in Section 15.2.1.

15.2.9 Meetings

DB Contractor shall attend meetings as requested by TxDOT. At such meetings DB Contractor shall provide exhibits, take minutes, and distribute the minutes to all attendees for review and comment. Minutes will not be finalized until all attendees agree on content. DB Contractor shall provide meeting minutes to TxDOT upon request. TxDOT will respond within five Business Days or at the next occurrence of the meeting. DB Contractor shall provide proposed agendas three Business Days prior to each meeting.

15.2.10 Documentation and Reporting

DB Contractor shall provide TxDOT with all specific reports and supporting documentation for review and approval during the acquisition process. All correspondence with TxDOT and property owners relating to acquisition of real property shall include a heading with the following information (at a minimum):

- County;
- CSJ number;
- ROW CSJ (RCSJ) number;
- Federal Project Number (if applicable);
- Highway designation;
- Project limits;
- Parcel number; and
- Name of record owner(s).

DB Contractor shall utilize TxDOT's approved naming convention for all electronic files and reporting fields.

In administering and managing its Project ROW acquisition activities, DB Contractor shall:

- Maintain parcel records on file of all aspects of the acquisition process in accordance with TxDOT requirements and applicable Law. Each parcel file shall include all documents required by the Contract Documents, FHWA, and TxDOT.
- Provide monthly summaries for the cost of Project ROW acquisition and related relocation assistance, including amounts authorized and amounts paid on a parcel-by-parcel basis and cost forecasting on an overall Project basis as requested by TxDOT.
- Maintain and electronically transmit to TxDOT, in a format acceptable to TxDOT, monthly status reports, including appraisal, acquisition, eminent domain and relocation status of all parcels and activities related to Project ROW, acquisition and disposition of Additional Properties, acquisition and disposition of temporary easements and other property interests, and provide weekly (unless directed otherwise) updates to TxDOT.
- Evaluate and report to TxDOT, Subcontractor status and performance on a monthly basis or more frequently as requested.
- Prepare and submit electronically to TxDOT, on a weekly basis, a spreadsheet that contains Project ROW specific data required in order to complete the fields in TxDOTConnect or current system or as directed by TxDOT.
- Input and update parcel status on a monthly basis in TxDOT approved web-based tracking system or as directed by TxDOT.

15.2.11 Responsibilities of DB Contractor

As set forth in Section 4.4 of the General Conditions and as more fully described in this Section 15.2.11, DB Contractor shall be responsible for all services and preparation of all documentation for all Project ROW acquisition, easement acquisition, permitting and related relocation assistance for the Project. The Work related to Project ROW acquisition includes, but is not limited to, mapping, surveying, environmental assessment, testing and remediation, appraisal, appraisal review, negotiation, acquisition, relocation advisory assistance and determination of relocation benefits to be provided, procurement of title insurance, clearing of title, closing of acquisitions, and condemnation support including expert witnesses required by TxDOT or the Office of the Attorney General for all condemnation proceedings. DB Contractor shall also be responsible for all expert witness testimony, exhibits, transcripts, and photos associated with condemnation services and proceedings required by the Office of the Attorney General or TxDOT for Special Commissioner's hearings, jury trials and appeals, through Final Acceptance.

DB Contractor shall not contact the Office of the Attorney General or an Assistant Attorney General handling a specific parcel that has been filed for eminent domain action or is in the process of settlement unless authorized by TxDOT.

DB Contractor acknowledges it has incorporated the value of saleable improvements into DB Contractor's Project ROW acquisition costs, and DB Contractor shall concurrently, with conveyance of the real property interest to the State, and without the necessity of further documentation executed by the State, obtain the rights to said saleable improvements. TxDOT has received the benefit of the saleable value of the improvements by a reduced Price. DB Contractor shall not be entitled to a credit for any improvements retained by a property owner or TxDOT. Upon conveyance of the real property interest to the State, DB Contractor shall comply with all applicable Laws with respect to relocation assistance and demolition.

DB Contractor shall be responsible for the costs of acquisition and documentation for the acquisition of any temporary right or interest in real property not necessary for the Project, but that DB Contractor deems advisable to acquire for work space, contractor lay-down areas, material storage areas, borrow sites, or any other convenience of DB Contractor. Except as otherwise authorized by Law for temporary areas necessary for construction of the Project, TxDOT shall not be obligated to exercise its power of eminent domain in connection with DB Contractor's acquisition of any such temporary right or interest, and TxDOT shall have no obligations or responsibilities with respect to the acquisition, maintenance or disposition of such temporary rights or interests.

DB Contractor shall be responsible for processing payment Submittals as described in Section 15.4.6 and distributing all payments of: agreed purchase prices or court awards and judgments; Special Commissioner's awards; relocation assistance payments; all legal, administrative, and incidental expenses of, or related to, Project ROW for which TxDOT is responsible for such costs.

DB Contractor is responsible for the payment of and all closing costs associated with the purchase of Project ROW in accordance with the Uniform Act and TxDOT policies. TxDOT shall be responsible for the purchase price of title insurance for Project ROW in accordance with Section 4.4.2 of the General Conditions.

DB Contractor's cost for Project ROW shall include all costs not paid by TxDOT.

DB Contractor shall be responsible for submitting to TxDOT the completed files in accordance with the closeout procedures as defined by TxDOT within 90 days of the completed ROW parcel activity. DB Contractor shall provide the following documentation including, but not limited to:

- Appraisal report(s) (initial appraisal and all other issued appraisal reports, approved and not approved, with most recent appraisal report on top);
- Original conveyance document(s) (PUA(s), deed(s), easement(s), judgment(s), Award of Special Commissioners);
- Original title insurance policy or attorney's certificate;
- MOA; and
- Negotiator's certificate.

For relocation and general correspondence, the following shall be included:

- Relocation files (in chronological order);
- Offer letters;
- Negotiator reports and contact sheets;
- General correspondence; and
- All other documentation regarding the parcel.

15.2.12 **Responsibilities of TxDOT**

TxDOT will have the following responsibilities in connection with acquisition of Project ROW:

- Except as otherwise set forth in this Item 15, provide final approval for all Acquisition Packages, Condemnation Packages, PIN requests, payment Submittals, relocation eligibility, relocation appeals, relocation Submittals, administrative settlement Submittals, closing Submittals, court settlement requests, and other approvals required by the Contract Documents, by the State, or by applicable Law subject to submission requirements and timelines in Section 15.2.4.
- After receiving a complete Condemnation Package from DB Contractor in accordance with Section 15.2.4 and Section 15.4.4, TxDOT will submit a minute order request on the agenda of the next scheduled Texas Transportation Commission meeting; provided the completed Condemnation Package is submitted 10 Business Days before ROW Division's required deadline for eminent domain minute order requests.
- After receiving a complete payment Submittal from DB Contractor in accordance with Section 15.2.4 and Section 15.4.6, TxDOT will submit a payment request to the Texas State Comptroller's Office. Upon receipt of the State warrant, TxDOT will notify DB Contractor that the State warrant is available for pickup within five Business Days.

- TxDOT will coordinate with the Office of the Attorney General to provide legal counsel to prepare and deliver to TxDOT the condemnation petition within 20 Business Days after the Attorney General's receipt of the condemnation packet, including Commission minute order approval. TxDOT will deliver the condemnation petition to DB Contractor within 10 Business Days after receipt of the condemnation petition from the Office of the Attorney General. If e-filing is not applicable, DB Contractor shall follow the standard procedures as described in the TxDOT ROW Manuals.
- If applicable, TxDOT will provide all e-filed documents to DB Contractor as part of DB Contractor's support of the condemnation process and invoice DB Contractor for all e-filed charges. DB Contractor is responsible for reimbursing TxDOT all e-filed invoices. If e-filing is not applicable, DB Contractor shall follow the standard procedures as described in the TxDOT ROW Manuals.
- TxDOT will provide all coordination services between DB Contractor and the Office of the Attorney General for prosecution of jury trials.
- TxDOT will provide a ROW Project Manager to serve as the point of contact for all Project ROW issues as set forth in 23 CFR § 710.313(d)(7).
- TxDOT will review and approve the completed, final closeout files in accordance with the closeout procedures.

15.2.13 **TxDOT Project Monitor/Reviewer**

In addition to its review and approval authority as expressly set forth in other provisions of this Item 15, TxDOT may, at its discretion, audit and monitor the ROW activities and services performed by DB Contractor. TxDOT may contract with independent entities to assist it in fulfilling the audit/monitoring function provided that the audit authority is not delegated. In addition to any Submittal components specifically required to be provided to TxDOT, DB Contractor shall provide information to TxDOT as requested to assist in its review and assessment of the progress, timeliness, adequacy and sufficiency of DB Contractor's Project ROW activities.

15.2.14 **Responsibilities of the Office of the Attorney General**

The Office of the Attorney General, with the assistance of DB Contractor and coordination of TxDOT, will be responsible for implementing all necessary legal actions for acquiring and obtaining possession of the Project ROW (and any necessary temporary construction easements approved by TxDOT for acquisition by condemnation) through the eminent domain process and eviction process. The responsibilities of the Office of the Attorney General will include:

- Represent TxDOT as the State's Attorney of Record;
- Preparation of complete petitions for condemnation with the appropriate court for a cause number to be assigned;
- If applicable, e-file condemnation documents and coordinate delivery of filed documents with TxDOT;
- Coordination with TxDOT on all legal matters concerning acquisition processes, including negotiated settlements;
- Analysis of recommended parcel values and/or appraisal issues;
- Additional legal advice and opinions as needed by TxDOT;
- Special Commissioners' hearings;
- Jury trials including determination of expert witnesses and all appeals; and
- Preparation, obtaining, and filing of all necessary legal documentation for eviction of property owners or tenants.

15.3 **Pre-Acquisition Activities**

15.3.1 **Project ROW Surveying and Mapping**

DB Contractor shall perform all Project ROW surveying and mapping and shall prepare Project ROW documents in accordance with applicable TxDOT Standards, including the TxDOT ROW Manuals, the TxDOT *Survey Manual*, and the TxDOT *GPS User's Manual*. DB Contractor shall refer to the current *Manual*

of Practice by the Texas Society of Professional Land Surveyors and the *U.S. National Map and Accuracy Standards*. DB Contractor shall refer to Item 17, "Land Surveying," for additional survey requirements.

The Project ROW map shall be prepared by DB Contractor and submitted to TxDOT for review and approval. The Project ROW map may be prepared in separate constructible segments established by the logical termini of the Project. TxDOT shall have 10 Business Days for review of each submitted ROW map, each containing up to a maximum of 25 parcels. Any Submittals that would require TxDOT to review more than 25 parcels within any given 10 Business Day period shall be considered excess, and TxDOT may defer its review of any such excess parcels to a subsequent 10 Business Day period (or periods as necessary).

DB Contractor may use Acquisition Survey Documents prepared by TxDOT, if available, for the purpose of performing ROW acquisition work at DB Contractor's risk.

DB Contractor shall submit for approval Acquisition Survey Documents and obtain TxDOT approval prior to being included in the submission of the Acquisition Package. The Acquisition Survey Document shall include:

- Three half size ROW maps on paper, Scale 1 inch = 100 feet (11 inches by 17 inches);
- One separate set of originals signed and sealed by a RPLS, legal descriptions and parcel sketch, traverse closure sheets and a copy of the parent tract deeds and subdivision plat if tract is a platted lot;
- A USB with DGN Master file, map sheets, Excel point list, raw data file and/or field notes, and scanned copies of the instruments of record or other pertinent documents;
- One set of folders for each parcel, Parts 1 & 2, etc., would be considered one folder. With one copy (signed and sealed) legal description, sketch, closure sheet, parent tract deed and subdivision plat if tract is a platted lot (and bi-section, if applicable) secured inside on the right side;
- Three copies (signed and sealed) of each legal and sketch;
- One separate set (copies) of legal and sketch of each parcel for TxDOT records;
- One separate set (copies) of legal and sketch of each parcel for title company; and
- One separate set of originals legal and sketch signed and sealed by a RPLS to be kept in mapping files.

In addition to the foregoing, DB Contractor shall prepare all Project ROW surveying and mapping in accordance with the following:

- DB Contractor shall assemble an Acquisition Survey Document. The Acquisition Survey Document shall include the Project ROW map, a parcel (metes and bounds) description, and a parcel plat, with a closure report for each of these three items for each of the parcels to be acquired. The latter three items shall be on standard 8-1/2-inch by 11-inch bond paper. The Project ROW map sheets shall be on 22-inch by 34-inch paper. Each final submission to TxDOT shall include two sets of each document, unless otherwise directed. Each map sheet and document page shall have an "as of" date near the lower right-hand corner. The parcel plat and parcel description for a given parcel should show identical "as of" dates.
- The ROW map sheet and plat shall show all areas of denied access for the parcel according to the current TxDOT *Access Management Manual* and amendments.
- The POB shall be located on the proposed Project ROW line and shown in all documents with its centerline (survey baseline) station and offset or as reviewed and approved by TxDOT.
- The POC, where applicable, shall be a well-defined monument or monument of record, and shall be tied to the POB by measured bearing and distance. The POC shall not be located on any proposed Project ROW line, or existing Project ROW line within the proposed Project ROW.
- The centerline (survey baseline) station and offset shall be shown on the Project ROW map sheets for all significant points along the Project ROW line such as PC, PT, PI, PCC, and PRC, and for property line intersections (PLI) with the Project ROW line, and for any other monumentation points on the Project ROW line.

- The centerline (survey baseline) station and offset shall be shown in the parcel description and parcel plat at the beginning and ending, being the points with the lowest station and the highest station, of each parcel along the proposed Project ROW line.
- Project ROW map sheets shall include all curve data, with the station and coordinates of the PI, and the stations at each end (PC, PT, PRC, PCC), for every centerline (survey baseline) curve on that map sheet.
- Any existing ROW lines being incorporated into the proposed Project ROW, including intersecting ROW, shall be surveyed and monumented (if not previously monumented).
- All Project ROW maps (and on the title sheet) and all parcel descriptions (at the end of the description) shall include a notation that identifies the State Plane Coordinate System and UTM zones, datum (NAD83) (1993 adj), or as shown on the current ROW maps, and the Project grid-to-surface coordinate adjustment factor or refer to Primary Project Controls provided by TxDOT (refer to Section 17.3).
- A Project ROW map title sheet with signature blocks shall be produced for each portion of the Project. DB Contractor shall sign the Project ROW map.
- All Project ROW maps shall include a control sheet(s), to show the primary survey control points with their location relative to the Project.
- The parcel description and parcel plat documents shall all be referenced as parts of the exhibit recorded with the deed, so the pages shall be numbered accordingly. For example, if the parcel description is two pages, the parcel plat is one page, and then the first page of the parcel description is denoted “Page 1 of 3” and the parcel plat is denoted “Page 3 of 3.”
- Improvements within 100 feet outside of all proposed Project ROW shall be depicted on the Project ROW map sheets. All improvements shall be current as of the date of the on-the-ground property survey.
- All visible improvements (buildings and structures) within 50 feet outside of the proposed Project ROW line shall be located by an “on-the-ground” survey and documented on the Project ROW map sheets and the parcel plats by measured offset distance from the proposed Project ROW line. Clearly indicate which distances are surveyed on-the-ground.
- Calculated points shall be shown by a symbol on the drawing, with their relationship to the found reference points.
- All property, city, county, abstract, section and survey lines shall be indicated appropriately. A map legend should clearly define the line styles and symbols used.
- Upon final submittal from DB Contractor of the Project ROW documents to TxDOT, DB Contractor shall cause the surveyor to mark on the ground, using permanent and stable monuments as defined in Section 663.17 of the General Rules of Procedures and Practices of the TBPLS, all significant points along the Project ROW line, as described above, and all property line intersections with the Project ROW line. TxDOT requires these monuments to be a 5/8-inch iron rod, driven just below surface level, capped by a TxDOT-labeled aluminum cap (rod-and-cap monument).
- Prior to acceptance of the ROW maps and surveys by TxDOT, DB Contractor shall cause a TxDOT Type II monument to be set at all significant points on the Project ROW line and at intersections with existing Project ROW lines, replacing monuments as described above (construct according to the TxDOT ROW Manuals and TxDOT *Survey Manual*), unless otherwise directed by TxDOT.
- As part of the survey process, DB Contractor shall cause a TxDOT Type II monument to be set at all significant points such as PCs, PTs, angle points and at 1,500-foot intervals along tangent sections on the Project ROW line and at intersections with existing Project ROW lines, replacing monuments as described above, unless otherwise directed by TxDOT. Project ROW line intersections with property lines shall remain monumented by a 5/8-inch iron rod with a TxDOT aluminum cap (rod-and-cap monument). A TxDOT Type II monument shall be set on the Project ROW lines, perpendicularly left and right of each significant centerline point, regardless of the relative orientation of the final Project ROW line.

- For any required revisions, DB Contractor shall resubmit to TxDOT all documents pertaining to the parcel to reflect the most recent revision date, and shall add a notation on the appropriate documents to state briefly the reason for the revision.
- Documents shall contain deed references (survey name, abstract number, volume and page or document number, grantee, and area) for all existing public ROW encountered within the Project limits. If there is no recorded information found, a note shall state "Based upon our research, there appears to be no recorded vesting deed for the public ROW as shown hereon."
- The documents produced by the surveyor are the property of TxDOT, and release of any document shall be subject to TxDOT's prior written approval.
- DB Contractor shall cause the surveyor to include the denial of access line on the Project ROW map sheets and on the parcel plats, as required for controlled access facilities. DB Contractor also shall cause the surveyor to describe the area of denied access in the parcel description and monument on the ground with a 5/8" iron rod with a TxDOT aluminum cap stamped "TxDOT ADL" the limits of the denial of access.
- The Project ROW map and each parcel plat shall include a parcel information table containing the areas, expressed in square feet, of the following: 1) the parent ownership as stated in all adjoining record vesting deeds or converted from the stated record acreage in those vesting deeds; 2) the parcel to be acquired as shown on the closure report for that parcel; and 3) the remainder tract (item 1 *minus* item 2). If the parcel to be acquired consists of multiple parts, the Project ROW map shall show the net remainder. The parcel information table shall also contain the areas, expressed in acres, of the parent tract, the parcel to be acquired, and the remainder. This acreage (except stated record) shall be converted from the square footage as contained in the table. A note shall be included on the Project ROW map and on each parcel plat stating: "The acreage calculated and shown hereon is converted from the square footage shown hereon, and is for informational purposes only." Parcels with area less than one acre will not require acreage units to also be shown. All parcels, including parcels acquired by TxDOT or a Governmental Entity, shall be included on the Project ROW map.
- Within the proposed Project ROW, all property owned by a city, county, or other local public agency in fee or easement that does not have a vesting deed shall be identified by a parcel number and included on the Project ROW map. DB Contractor shall cause the surveyor to prepare a parcel description and parcel plat for use as an exhibit in the Project ROW acquisition (property transfer) documents.
- DB Contractor shall cause an independent RPLS to review the Acquisition Survey Document for consistency as to the information delineated thereon and for compliance with all applicable Design-Build Specifications and survey documents. The boundary location and the survey methods remain the responsibility of DB Contractor, and are not part of this review process. TxDOT will have no obligation to accept the Acquisition Survey Document as complete until the reviewing RPLS has signed and sealed the compliance certificate (compliance certificate form to be provided by TxDOT).
- Parcel numbering shall follow the TxDOT ROW Manuals. Parcels are to be numbered based upon the parent tract. DB Contractor shall revise parcel numbering due to subsequent transactions as in the following example: From a 50-acre parent tract, with a proposed Project ROW acquisition parcel identified as Parcel 14, a 5-acre parent tract is sold which will also require Project ROW acquisition. The result is, Parcel 14 is "Not Used", and the two new Project ROW acquisition parcels are identified as Parcel 14A and 14B. If the property containing Parcel 14B sells a portion, then 14B is "Not Used" and the new Project ROW acquisition parcels are identified as Parcel 14C and 14D, etc. DB Contractor shall not use the letter "E" to avoid confusion with easement designations. Parcel numbering shall be sensitive to the appraisal of the required parcels.
- Complicated portions of a Project ROW acquisition survey can cause the Project ROW Map to be very difficult to read. TxDOT's preferred solution is to create an additional Project ROW map sheet or sheets for details, curve data, general notes, etc. The primary page would still retain the whole property inset, record ownership data, and most of the usual information. The additional sheet(s) should be clearly referenced and be numbered as the next sequential

page(s). Pages numbered with a letter added (for example: 6A, 6B) are for revisions and corrections. DB Contractor shall use the preferred solution unless TxDOT approves an alternate method.

- An ownership sheet or sheets, containing an index to the information for all the parcels, shall be included and located near the beginning of the Project ROW map, after the title sheet and control sheet. The ownership sheet index shall include the parcel numbers, the names of the property owners, the vesting deed recording information, the record area of the parent tract, the area of parcel(s) to be acquired, the area of the remainder(s) left and right, the beginning and ending stations of the parcel along the Project ROW line, and the sheet number in the Project ROW map where the parcel is located.
- At property corners where more than one monument is found, a detail shall be provided to show the measured relationship between the monuments found and the monument set or held.
- DB Contractor shall purchase all materials, supplies and all other items necessary for proper survey monumentation. DB Contractor may purchase Type II monuments from TxDOT. TxDOT shall make available for pick-up by DB Contractor Type II monuments within 75 days after TxDOT receives from DB Contractor a written order, specifying the number of monuments to be purchased. Payment for TxDOT-supplied monuments shall be due within 30 days after TxDOT delivers to DB Contractor a written invoice. DB Contractor may use these monuments only for this Project and shall be responsible for proper storage thereof.
- DB Contractor, at the request of the property owner or TxDOT, shall re-stake the proposed ROW with a flagged wooden stake.

Design Certification. DB Contractor shall provide sufficiency of design to determine the ROW need and produce ROW maps that delineate the proposed ROW and potential impacts to the remaining ROW. DB Contractor shall provide a design certification of ROW for each parcel which confirms that the proposed ROW acquisition is adequate and necessary to construct and perform operations and maintenance on the Project and that other ROW acquisition alternatives are not feasible and/or are cost prohibitive.

15.3.1.1 ArcGIS ROW Mapping Files

DB Contractor shall submit for review and approval GIS files of the Acquisition Survey Documents in accordance with the standards and required deliverables detailed in Chapter 4, Section 8 of the TxDOT "ROW Preliminary Procedures for the Authority to Proceed" Manual. DB Contractor shall submit GIS files concurrent with the Acquisition Survey Document and prior to submitting the first Acquisition Package and provide updates as needed.

15.3.2 Additional Reporting Requirements

In addition to the Project ROW map, parcel description, and parcel plats, DB Contractor shall submit the following reports and electronic files:

- Monthly Parcel Report: a report, prior to the first of the month, listing all parcel deletions, parcel additions, and parcel splits;
- Monthly Progress Report: a report, prior to the first of the month, of all survey activity that occurred during the previous month, including a two-week look ahead of anticipated survey activity; and
- CADD files: digital CADD files in MicroStation format which include property lines and/or existing ROW lines, as surveyed, proposed ROW lines, parcel numbers, resource files, level assignments, and plot files. DB Contractor shall submit CADD files prior to submitting the first Acquisition Package and provide updates as needed.

15.3.3 Title Services

With respect to title services, DB Contractor shall comply with the applicable standards identified in Section 15.2.1, including the following requirements:

- Select and contract with one or more title companies approved by TxDOT and submit with the Acquisition Package for each parcel to TxDOT a five year sales history, a preliminary title commitment or preliminary title report, and, if necessary or appropriate, copies of all

underlying documents and a plot of all easements, including Existing Utility Property Interests, referenced therein for each parcel (including fee acquisitions, slope easements, other drainage and roadway ROW or easements and abandonment of Utility easements) to be acquired by TxDOT for the Project. Each title report shall be dated not more than 90 days prior to the date of submittal to TxDOT of the Acquisition Package for such parcel. DB Contractor shall, at its own cost, review each title report to ensure that it complies with the format required by the Contract Documents. DB Contractor shall, at its own cost, retain the services of a real estate attorney, licensed and located in the State of Texas, to be available for title support and acquisition assistance. All title reports must be in the following required format: clearly indicate which exclusions and exceptions shall be deleted upon acquisition of the subject parcel, and clearly indicate any required deliverables to the title company to clear identified exclusions and exceptions. Title reports shall be in accordance with Good Industry Practice. DB Contractor shall notify the title company, by letter, which exceptions should be removed, including easements that (a) are appurtenant to and/or of benefit to the parcel but are not included in the parcel to be acquired, and (b) are a burden on the parcel and not acceptable.

- Review the preliminary title commitment or report to ensure that all current owners of record title are contacted and that negotiations or condemnation actions are conducted with all appropriate parties.
- Work with the current owners of record title to each parcel or interest in a parcel or their designee and all other appropriate parties to clear any title exceptions or exclusions not acceptable to TxDOT.
- Secure an owner's policy of title insurance in the amount of the total acquisition cost, to include the cost of the property, improvements and damages to the remainder of the property, for each parcel from a title company acceptable to TxDOT for each parcel acquired, whether by deed or eminent domain judgment, insuring title as required by TxDOT. All Project ROW shall be acquired, and TxDOT's title in the Project ROW shall be insured, in fee simple absolute or easement interest as appropriate, free and clear of any and all liens and encumbrances. Title policies must be in a form and substance approved by TxDOT. Title to the Project ROW shall be insured in the name of the "State of Texas by and through the Texas Transportation Commission."

15.3.4 Introduction to Property Owners

DB Contractor shall provide TxDOT the current property owner list, with addresses, and shall pay for the distribution of initial contact letters of introduction to both property owners and displacees. The letters shall clearly describe the Project, TxDOT's need for the owner's property, and shall include the name and telephone number of a DB Contractor's representative. TxDOT's ROW Project Manager or designee will sign the letters on TxDOT letterhead. The forms for these letters will be approved by TxDOT prior to use. DB Contractor shall provide translation for property owners or displacees unable to read or understand the notices.

DB Contractor shall furnish a copy of the State of Texas Landowner's Bill of Rights for each property owner for inclusion with the letter of introduction. The copy of the Bill of Rights shall be the latest version as shown on the Office of Attorney General website:
https://www.texasattorneygeneral.gov/agency/Landowners_billofrights.pdf.

15.3.5 Appraisals

15.3.5.1 Appraisal Services

DB Contractor shall submit to TxDOT market value appraisals prepared by appraisers meeting the minimum qualifications established herein. DB Contractor shall ensure that all appraisals are prepared in conformance with applicable Law (including the Uniform Act), and in accordance with professional appraisal methods and applicable TxDOT Standards for all parcels to be acquired by TxDOT. DB Contractor shall:

- Select appraisers from TxDOT's list of pre-certified fee appraisers meeting the requirements specified in Section 15.2.7. TxDOT shall have final approval of the selection of each appraiser and appraisal reviewers submitted by DB Contractor. DB Contractor must identify and receive

written TxDOT approval of the appraiser who will be responsible for the appraisal work product and who will be signing the reports.

- Establish personal pre-appraisal contact with each owner of record title and each occupant, and document all contacts utilizing forms provided by TxDOT.
- If necessary, make a diligent effort to secure a written agreement between the record title owner and DB Contractor granting TxDOT, DB Contractor or assignees permission to enter the applicable parcel to be acquired (an "ROE Agreement"). DB Contractor may, at its discretion and expense, offer to pay reasonable compensation for any required ROE Agreements. If DB Contractor, after best efforts, is unable to secure a ROE Agreement from the property owner, DB Contractor shall provide documentation acceptable to TxDOT indicating conversations, correspondence, and efforts used to attempt to secure the ROE Agreement.
- Contact the record title owners or their designated representatives, in writing, to offer them the opportunity to accompany the appraiser on the appraiser's inspection of the parcel, and maintain a record of all such contacts and attempts to contact in the parcel file.
- Cause the appraiser to prepare a complete appraisal report for each parcel to be acquired to include the whole property, the portion to be acquired, and any damage to the remainder. It shall also include all improvements on the whole property, unless otherwise directed by TxDOT. The appraisal reports shall comply with and include all matters required by this Section 15.3.5 and TxDOT ROW related manuals, and shall satisfy the requirements of the USPAP in effect at the time the appraisal is submitted. Special analyses, studies or reports, as necessary, shall be made a part of each appraisal. The appraiser must use the most current edition of the USPAP standards referenced above and continually monitor these standards to ensure the appraisals conform to the most current requirements of professional appraisal practice. All appraisals shall utilize TxDOT form ROW-A-5 – Real Estate Appraisal Report, except for outdoor advertising signs which shall utilize TxDOT form ROW-A-5 OAS – Real Estate Appraisal Report. In very limited situations and with written permission from TxDOT on a per parcel basis, the appraiser may utilize TxDOT form ROW-A-6 for less complicated parcels. All appraisals must be performed utilizing guidance from the TxDOT ROW Manuals. All appraisals for condemnation proceedings shall utilize TxDOT form ROW-A-5 – Real Estate Appraisal Report.
- Obtain and provide TxDOT with copies of all written leases, licenses and other occupancy agreements, including outdoor advertising/sign agreements that are not already included in the title commitment.
- Perform an evaluation of all outdoor advertising signs, as required, utilizing the appropriate forms as instructed by TxDOT. The forms shall be completed and executed by the outdoor advertising sign owner.

For all parcels to be acquired that have off-premise outdoor advertising signs (sign structure), the preliminary appraisal package or the appraisal in the Acquisition Package, submitted for TxDOT approval, must include:

- Completed and executed appropriate TxDOT forms; and
- DB Contractor shall prepare a valuation of the sign structure.

DB Contractor shall:

- Cause the appraiser(s) to testify as an expert witness(es) or provide expert witness(es) approved by TxDOT in Special Commissioners' hearings or eminent domain proceedings through jury trial and be available for depositions, other discovery, pre-hearing or pre-trial meetings and appeals, as directed by TxDOT in accordance with the TxDOT ROW Manuals and USPAP. DB Contractor shall also provide administrative and/or technical support for such proceedings as requested by TxDOT.
- Coordinate with the review appraiser regarding corrections and additional information that may be required for a particular appraisal.
- Cause a report to be prepared by an environmental professional that meets the qualifications set forth in ASTM E-1527-13, Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process, documenting the environmental condition of each

parcel, which may be used on field investigations and/or historical review, as appropriate for the particular parcel. As directed by TxDOT, DB Contractor shall submit a summary report of the Phase I site assessment. Upon completion, the report shall be made available to the appraiser(s). A Phase I environmental site assessment or a report provided in a manner approved by TxDOT shall be performed for all properties and submitted with the Acquisition Package. If it is determined that there is a potential environmental risk based on the Phase I report or other reports, then a Phase II investigation shall be performed and submitted to TxDOT before a payment Submittal is submitted for the purchase of the parcel or a Condemnation Package is submitted for approval. A Phase III investigation shall be performed if the Phase II report justifies it. The Phase III report must indicate the approximate cost to remediate the parcel to achieve its current use and its highest and best use. DB Contractor shall prepare timely written notification to TxDOT of any environmental or other concerns associated with the Project ROW to be acquired that could require environmental remediation or other special attention or which would cause a report to be prepared. In the event that DB Contractor has exhausted all means possible and is unable to access the properties to perform an Environmental Site Assessment Phase II and/or III, DB Contractor may submit the Acquisition Package and Condemnation Package without the Environmental Site Assessment reports. However, DB Contractor shall be responsible for performing and receiving approval from TxDOT for all required Environmental Site Assessments after possession of the property has been obtained through condemnation before commencement of construction.

- Engage the services of, and cause, a land planner to perform or otherwise assist in the preparation of, any and all appraisals. The land planner shall be involved with all parcels with a valuation analysis indicating a highest and best use that is other than the current use of such parcels, or as directed by TxDOT, for certain other appraisals. DB Contractor shall notify TxDOT in writing of each and every instance when the highest and best use of a parcel is different, in which event TxDOT will determine to what degree land planner services will be utilized by DB Contractor.
- Cause the appraiser(s) to prepare new appraisals, as well as new appraisal reviews, when required by TxDOT or as needed during eminent domain proceedings. At a minimum, these new appraisals must include:
  - A letter of transmittal with a specific reference to the original appraisal report, any changes in market conditions since the original appraisal, any changes in the subject property since the original appraisal, a statement of the current value or extension of the original value opinion, and the listing of the current date of value.
  - Any qualifying and limiting conditions or general assumptions by the appraiser shall be clearly stated and attached.
  - A copy of the survey and legal description of the property being acquired, current photographs of the subject property clearly showing the area being acquired, even though the original appraisal report contained photographs of the subject and the area of the acquisition. If there are significant changes to the subject property, the area being acquired, access to the remainder property, damages to the remainder(s), market conditions, the subject property's highest and best use from the previous appraisal, or significant changes in the approaches to value, the property shall be reappraised using the TxDOT form ROW-A-5 – Real Estate Appraisal Report and TxDOT form ROW-A-5 OAS – Real Estate Appraisal Report. Appraisers shall refer to the TxDOT *ROW Appraisal and Review Manual* for additional guidance. DB Contractor shall follow these guidelines in producing updated appraisal reports or new assignments and shall discuss specific updating requirements for any complex appraisals with TxDOT before beginning the assignment.
- Prepare and deliver to TxDOT, upon request, a copy of all file documents, as formally requested in discovery motions or request for production.
- Complete with the property owner and furnish, to the appraiser and Relocation Agent, TxDOT form ROW-A-9 – Property Classification Agreement, before appraisal is completed.

15.3.5.2 **Appraisal Review**

In connection with appraisal review, DB Contractor shall:

- Select review appraisers from TxDOT's list of pre-certified fee appraisers meeting the requirements of Section 15.2.7. The review appraiser selected must follow the appraisal guidelines and procedures found in the TxDOT *ROW Appraisal and Review Manual*.
- Determine, in consultation with TxDOT, if additional appraisal reports or technical expert reports are required. Initiate, review, and reconcile each report required.
- Review all appraisal reports for each parcel to determine consistency of methodology, supporting documentation related to the conclusion reached, and compliance with TxDOT Standards, as defined in Section 15.3.5.1 and this Section 15.3.5.2, the TxDOT *ROW Appraisal and Review Manual*, the *Uniform Appraisal Standards of Federal Land Acquisitions*, and the requirements of the Appraisal Foundation's USPAP in effect at the time the appraisal is reviewed. The review appraiser must use the most current edition of the standards referenced above and continually monitor these standards to ensure the appraisals conform to the most current requirement of professional appraisal practice.
- Inspect the subject properties and the sale properties used in direct comparison for each appraisal being reviewed.
- Upon completion of the review outlined above, the review appraiser shall certify in writing to TxDOT that all required standards have been met. This certification will occur by signing on Page 1 of the TxDOT form ROW-A-5 – Real Estate Appraisal Report and TxDOT form ROW-A-5 OAS – Real Estate Appraisal Report, in the block provided. The review appraiser will also complete TxDOT form ROW-A-10 – Tabulation of Values, to accompany each appraisal.
- For appraisal updates or new assignments, the review appraiser shall perform a complete review of the updated or new appraisal, re-inspecting the subject property and the comparable sales used, as of the current date of value. The review appraiser shall follow the procedures outlined in the TxDOT *ROW Appraisal and Review Manual*. A new TxDOT form ROW-A-10 – Tabulation of Values, will be required for each updated appraisal or new assignment.
- DB Contractor's Quality Control Specialist(s) as referred to in Section 15.2.7, shall ensure that appraisal consistency and quality for the entire Project is monitored for Project-wide controls and consistency.

15.3.6 **Project ROW Acquisition Package Approval**

Acquisition Packages submitted by DB Contractor for TxDOT's approval shall include the following items, prepared for each parcel in accordance with the requirements of this Section 15.3.6:

- A cover sheet setting forth the following information for each parcel:
  - Parcel number and number of parts;
  - Station number;
  - CSJ number;
  - Federal Identification Number (if applicable);
  - Location of parcel;
  - Name of owner;
  - County and/or other jurisdiction;
  - Extent of acquisition (partial or whole acquisition); and
  - Type of conveyance (fee, easement, etc.).
- A complete legal description of the parcel adequate to effect the desired acquisition of the parcel, signed and sealed by a RPLS. A legal description and parcel plat are required for each parcel. Control of access shall be addressed in all legal descriptions. All descriptions shall be in recordable form and shall be prepared in a form and manner acceptable to TxDOT in all respects.

- The parcel plat, as prepared by the RPLS, and a half-size (11 inches by 17 inches) copy of the ROW map sheet(s) pertaining to the parcel, such plat to include control of access designations.
- A title report, current within 90 days, including copies of all documents identified in the exceptions listed therein and a plot of all easements identified therein. The Acquisition Package shall include DB Contractor's analysis of each preliminary title report or title commitment to determine potential problems and proposed methods to cure title deficiencies. DB Contractor shall perform title curative work. DB Contractor shall provide TxDOT with copies of all curative documents.
- A copy of the appraisal report with an effective date no earlier than 180 days prior to the date of submission of the Acquisition Package.
- A copy of the Environmental Site Assessment and all amendments as described in Section 15.3.5.1.
- A real/personal property report (TxDOT form ROW-A-9 – Property Classification Agreement) detailing the items making up each parcel that are classified as real estate, tenant-owned improvements or personal property. Particular attention shall be paid to items that have questionable classifications.
- Replacement Housing Calculations, notification of business eligibility, completed displacee interviews, all comparables used in estimating the Replacement Housing Calculations, and letter to displacee(s) explaining Replacement Housing Calculations. The calculations and replacement housing benefit package shall be prepared and reviewed by a qualified specialist, in conformance with TxDOT's standard relocation procedures and applicable State and federal Laws.
- The proposed initial offer letter, MOA, deed, and any other documents, which shall be prepared by DB Contractor as required or requested by TxDOT, on DB Contractor's letterhead or as otherwise directed. TxDOT will provide the format for preparing these documents. Documents referred to in this Section 15.3.6 are standardized by TxDOT and modification of standardized documents shall be kept to a minimum. All changes are subject to approval by TxDOT in writing, in TxDOT's discretion.
- Any other required TxDOT forms, such as record of all contacts with the property owner or any party with a compensable interest.

No Acquisition Packages will be approved if prepared or submitted by appraisers or agents not previously approved by TxDOT for this Project.

Upon TxDOT's written approval of the Acquisition Package, DB Contractor may proceed with the offer to the property owner.

15.4 Acquisition Activities

15.4.1 ROW Negotiations

DB Contractor shall conduct all negotiations in accordance with the requirements of applicable Law. In conjunction with negotiations, DB Contractor shall:

- Within 10 Business Days of TxDOT's approval of the Acquisition Package, contact each property owner or owner's designated representative, in person where practical, to present the offer and deliver an appraisal report (not more than six months old) and appropriate brochures. The approved appraisal shall be sent by certified mail, return receipt requested. A copy of the appraisal report for the subject property shall be provided to the property owner or authorized representative at the time of initial offer. All appraisal reports produced or acquired by TxDOT relating specifically to the property owner's property and prepared in the 10 years preceding the date of the offer must also be delivered to the property owner. DB Contractor shall also maintain a file record of receipt of appraisal signed by the property owner. DB Contractor shall also maintain follow-up contacts and secure the necessary documentation and title curative Work upon acceptance of the purchase offer.
- At the time of offer, produce and distribute to all property owners and displacees, TxDOT approved informational brochures and the State of Texas Landowner's Bill of Rights as

updated on the Office of the Attorney General's website: https://www.texasattorneygeneral.gov/agency/Landowners_billofrights.pdf.

- Identify lessees, licensees, occupants, or other parties with potential compensable interests including outdoor advertising sign owners, and, if appropriate, after consultation with TxDOT, negotiate with such parties for the acquisition of their compensable interests.
- Advise the property owners, lessees, licensees, occupants, and other holders of compensable interests, as applicable, of the administrative settlement process. Confer with and transmit to TxDOT's ROW Project Manager any settlement request from property owners, lessees, licensees, occupants, or other holders of any compensable interest, as applicable, including a detailed recommendation from DB Contractor in accordance with standards, manuals and procedures as defined in Section 15.2.1. TxDOT shall determine whether to accept a settlement request. Delivery of the administrative settlement request and DB Contractor's recommendation to TxDOT must occur within 15 Business Days following DB Contractor's receipt of the administrative settlement request.
- DB Contractor, at its request or the request by TxDOT or the TxDOT Administrative Settlement Committee, may participate in the evaluation of the administrative settlement request and attend the committee meeting.
- DB Contractor shall provide a letter stating the TxDOT Administrative Settlement Committee's response to the property owner, lessee, licensee, occupant, or other holder of a compensable interest, as applicable. DB Contractor shall deliver all settlement responses (if within reasonable proximity of the Project) by hand within three Business Days after receipt. If this delivery method is not feasible, DB Contractor shall mail (return receipt requested) response letters not more than three Business Days following any decision by the TxDOT Administrative Settlement Committee. If DB Contractor selects the mailing option, DB Contractor shall contact the property owner to discuss the settlement offer prior to mailing the response letter. The TxDOT ROW Project Manager, on an as-needed basis, will convene the TxDOT Administrative Settlement Committee.
- Notwithstanding an unsuccessful completion of the formal administrative settlement process, DB Contractor may engage in ongoing negotiations with the owners of compensable interests. DB Contractor shall develop and incorporate in its ROW Acquisition Management Plan a procedure for these negotiated settlements. Said negotiations may continue until such time as the Texas Transportation Commission adopts a minute order authorizing the filing of a condemnation petition. DB Contractor shall submit its recommendation to TxDOT of a negotiated settlement and obtain TxDOT's consent prior to acceptance of any settlement.
- Provide timely (i.e., not more than 2 Business Days after inquiry) response to the verbal or written inquiries of any property owner, lessee, licensee, occupant or other holder of a compensable interest, as applicable.
- Prepare a separate negotiator contact report for each meeting or conversation with any person (or other appointed representative(s) supported by a written confirmation of appointment) who has a compensable interest in each parcel on TxDOT form ROW-N-94 – Negotiator's Report. Contact reports shall also be prepared for unsuccessful attempts to contact such persons.
- Maintain a complete parcel file for each parcel. All original documentation related to the purchase of the real property interests shall be maintained (housed separately from the relocation files) in conformance with TxDOT Standards, manuals, and procedures, as defined in Section 15.2.1. All original Project ROW documents shall be retained and properly secured in DB Contractor's Project office or as otherwise approved by TxDOT. During the acquisition process, signed original documents shall be forwarded to TxDOT with a transmittal form periodically or as requested by TxDOT; *provided, however*, that all remaining original documents shall be forwarded upon completion of the acquisition of Project ROW for the Project.
- Prepare and deliver documents of conveyance (including bisection clause and access clause, if applicable) to the property owner, lessee, licensee, occupant, or other holder of any compensable interest, as applicable, and obtain their execution of the same. All signatures on documents to be recorded shall be notarized in accordance with State Laws.

- Pursue and obtain a PUA concurrently with the parcel negotiations. Except as otherwise set forth in this paragraph, each PUA shall include an incentive in the form of market rental consideration for the advance possession and use of the property and shall be in the form of Form ROW-N-PUAIC included in Attachment 15-1 (Form ROW-N-PUAIC). The amount of the market rental consideration shall be 10% of the approved value of the property, provided the minimum amount of the incentive shall be $3,000 per parcel and the maximum amount shall be $25,000 per parcel. For properties for which the Special Commissioners' hearing is within 30 days of the date of the PUA, the PUA shall not include market rental consideration and shall be in the form of Form ROW-N-PUA included in Attachment 15-2 (Form ROW-N-PUA). Such agreements shall be sought and negotiated by DB Contractor strictly in accordance with the Law and only with the prior written consent of TxDOT. If DB Contractor uses a TxDOT PUA, DB Contractor shall obtain a deed or commence action on condemnation proceedings by submitting a Condemnation Package to TxDOT for approval within six months from the date of the PUA. No other conveyance documents shall be used for the purpose of Construction Work unless otherwise approved by TxDOT.
- Consider all reasonable settlement requests (that comply with the regulations as outlined in this Section 15.4.1) from the property owners, which are feasible and help expedite the Project ROW acquisition process. DB Contractor acknowledges and understands that TxDOT encourages all positive and creative solutions which satisfy the property owner and promote the success of the Project.
- DB Contractor shall prepare and deliver a final offer letter to the property owners, lessees, licensees, occupants, or other holders of any compensable interest, as applicable. The letter shall be on DB Contractor's letterhead and shall be signed by the ROW AM. The final offer letter shall allow a property owner lessee, licensee, occupant or other holder of compensable interest at least 14 days as the consideration time period to review the final offer. DB Contractor shall submit to TxDOT, a copy of the final offer letter within two days of delivery to the property owner.

If the final offer letter is not accepted, DB Contractor shall follow the procedures established for condemnation.

15.4.2 Relocation Assistance

DB Contractor shall coordinate and perform the administrative requirements necessary to relocate any occupants and personal property from Project ROW and certain remainders, as permitted by TxDOT. All Work prepared by DB Contractor with respect to relocation assistance shall be performed in accordance with applicable Law, including the Uniform Act and TxDOT Standards, and in accordance with all provisions of the DBA and these Design-Build Specifications.

DB Contractor shall be available to all displacees for relocation services at the convenience of the displacees.

DB Contractor's major activities with respect to the relocation assistance of occupants from Project ROW include:

- Prepare a Relocation Plan in accordance with the TxDOT ROW Manuals within 90 days after receipt of NTP1, as part of an updated ROW Acquisition Management Plan.
- Monitor relocation assistance activities and provide advisory services.
- Prevent fraud, waste and mismanagement.
- Assist with all requests and be responsible for carrying out decisions made by TxDOT, the review/appeal process and judicial reviews.

DB Contractor shall provide relocation assistance strictly in accordance with the Law, and, in particular, the Uniform Act and TxDOT Standards. With respect to relocation assistance, DB Contractor shall:

- Provide written notice to all property owners, lessees, licensees, occupants, other holders of compensable interests, and other potential displacees regarding relocation assistance and produce and provide them with a relocation assistance brochure that has been approved by TxDOT. DB Contractor shall perform relocation interviews, complete and maintain interview

forms and discuss general eligibility requirements, programs, and services with potential displacees. DB Contractor shall maintain a written record of all verbal contacts.

- Give written notice of the pending acquisition to any non-eligible occupants. Any questions as to the eligibility of a potential displacee shall be directed in writing to TxDOT's ROW Project Manager.
- Contact and provide relocation assistance to those parties affected by the Project ROW acquisition and complete forms for all displacees, as required.
- Locate, evaluate and maintain files on comparable available housing, commercial, retail and industrial sites.
- Calculate replacement supplement benefits.
- Compute and submit requests for relocation rental/housing supplement to TxDOT prior to submission to relocatees. All relocation supplements shall be subject to TxDOT's written approval.
- Perform a DSS inspection for each replacement housing comparable, photograph the comparable and complete the DSS inspection form, TxDOT form ROW-R116 – Replacement Housing Inspection.
- Obtain at least two moving estimates from moving companies to effect relocation of personal property or consistent with the Uniform Act.
- Prepare moving plan with appropriate photos, sketches and inventory of personal property to be moved.
- Coordinate moves with displacees and moving companies in accordance with TxDOT Standards and the Uniform Act.
- Maintain relocation contact logs on a TxDOT form ROW-R96-R – Relocation Advisory Assistance – Parcel Record.
- Attend all closings on replacement properties, if requested by any party involved, and assure supplemental payments, if any, are properly distributed.
- Process and compute increased interest payments on the mortgage of owner-occupied dwellings, as required.
- Deliver to displacees a 90-day notice of eligibility letter simultaneously with the delivery of the relocation benefits package. Deliver a 90-day letter to displacees with the location of the comparable property used to compute the supplement.
- Deliver a 30-day notice to displacees and property owners upon Possession of Project ROW.
- Notify TxDOT, in writing, when displacee has vacated or abandoned the affected dwelling or structure. In addition, insure displacee has removed all personal property from the Project ROW.
- Notify TxDOT's ROW Project Manager office immediately if a displacee has not moved after 30-day notice expires. Special effort and consideration should be extended to the displacees in the move out process. If the displacees have not moved from the State-owned ROW and eviction is necessary, DB Contractor must provide written request to TxDOT to begin eviction proceedings. The request must include written evidence of the due diligence efforts to vacate the displacees. Prepare a written recommendation to facilitate the displacee's move.
- Be available for any appeals or hearings.
- Prepare relocation payment claim submissions for all displacees and all relocation assistance benefits.
- Verify DSS dwelling criteria on all replacement housing as selected by the displacees.
- Secure dwellings and structures no later than 2 days after vacancy and protect the Project ROW following acquisition and relocation. It is DB Contractor's responsibility to ensure that all occupied and vacated improvements maintain insurance coverage or assume liability through completion of demolition.
- Maintain a complete file, separate from acquisition files, on each displacee and make available for inspection.

- Be responsible for all relocation activities that may occur after deposit of the Special Commissioner's award in the courts, including instances when a parcel referred to the Office of the Attorney General for eminent domain also has a relocation issue. Relocation computations shall be adjusted based on the approved administrative settlement and court award.
- Prepare all correspondence to the displacees or their representative(s) on DB Contractor's designated relocation letterhead and have DB Contractor's correspondence signed by the Project ROW relocation agent.
- Deliver to each displacee the relocation assistance payments according to the TxDOT ROW Manuals.
- Assist TxDOT and the Office of the Attorney General with eviction proceedings. Serve notice of eviction proceedings to the occupant(s) of the property who have not complied with move dates. Coordinate the eviction process with the local authorities and accompany the Sheriff's Department when the local authorities are carrying out eviction.

15.4.3 **Closing Services**

For purposes of closing services, DB Contractor shall:

- Prepare the escrow agreement and closing documents, including a closing memorandum identifying all parties involved in the closing, and listing all documents to be executed and/or delivered in connection with the closing.
- Attend closings; provide curative documents and exhibits, as required, and in conjunction with the applicable title company. Confirm that all conditions to closing are satisfied and notify TxDOT of all closing appointments.
- Obtain and submit to TxDOT a copy of the issued title insurance policy and recorded conveyance document based on the approved updated title commitment within 45 days following closing.

15.4.4 **Condemnation Support**

DB Contractor shall support condemnation efforts as directed by TxDOT and further delineated as follows:

- Conduct all applicable eminent domain-condemnation activities in accordance with the policies and procedures as described in the TxDOT ROW Manuals; in Chapter 21 of the Texas Property Code; and Senate Bill 18.
- Communicate with TxDOT as to the parcel status on a monthly basis or as requested by TxDOT.
- Notify TxDOT of any potential condemnation and document the reason(s) for condemnation including recommendations for property closure.

15.4.4.1 **Condemnation Package Preparation**

DB Contractor shall support condemnation efforts as directed by TxDOT and further delineated as follows:

- After non-response or upon receipt of a copy of the rejected final offer from a property owner or other property right holder entitled to compensation, request an updated title report from the title company issuing the original title commitment.
- Provide to TxDOT, within 10 days following non-response or rejected certified mailing, notification thereof together with a signed and sealed parcel description and parcel plat, and a bisection clause and access clause, if necessary, with the clauses attached to a property exhibit containing the parcel description and parcel plat.
- Use the information from the title report to join all parties having a property interest on the applicable TxDOT form. Spouses of property holders with compensable rights must also be joined.
- Upon completion of TxDOT form ROW-E-49 – Request for Eminent Domain Proceedings, prepare a condemnation packet containing two copies each of the following documents: the completed TxDOT form, negotiation logs, the updated title report not more than 30 days old, appraisal receipt acknowledgment, pre-appraisal contact sheet, signed and sealed field notes,

parcel sketch, bisection clause and access clause exhibits (if necessary), initial offer letter and final offer letter reflecting the latest appraisal, complete minute order request form (form to be provided by TxDOT), any correspondence sent by DB Contractor, the owner of the compensable interest or any of their representatives, one copy of all the appraisal reports and evidence of a bona fide offer to the property owner. Submit two complete Condemnation Packages to TxDOT's ROW Project Manager for review and approval.

15.4.4.2 **Condemnation Support Upon Approval of a Condemnation Package**

DB Contractor shall support condemnation efforts as directed by TxDOT and further delineated as follows:

- Send a copy of the complete petition to the title company and confirm with the title company that the appropriate parties were joined in the case and that no changes in title have occurred since the original litigation guaranty was issued.
- File the petition for condemnation with the appropriate court clerk after a determination that a timely settlement is not feasible. In counties that require e-filing, the Office of the Attorney General will efile as appropriate and provide a copy of the petition to TxDOT. DB Contractor shall record the lis pendens in deed records with the appropriate county. No later than three Business Days from the date of filing, DB Contractor shall send a copy of the petition and lis pendens, by certified mail, return receipt requested, to the owner, lessee, licensee, occupant or other holder of compensable interest. DB Contractor shall provide a copy of the petition and lis pendens to TxDOT.
- Coordinate and provide technical support to TxDOT, as required to facilitate filing the petition. The Office of the Attorney General will file petitions as required by Law. DB Contractor shall provide the location and setting of a hearing date.
- Make available to TxDOT on behalf of the Office of the Attorney General an agent who will be expected to assist in making arrangements for conferences with witnesses prior to trial, filing the condemnation petition, informing all parties as to the filing date of the petition and the case number assigned to the suit, and perform any other duties which will assist in the successful prosecution of the suit, including his or her attendance in court and filing necessary documents to complete all eminent domain proceedings.
- Depending on the market conditions or if over six months have elapsed since the date of the initial offer, notify TxDOT. TxDOT will contact the Assistant Attorney General handling the case for TxDOT and confer about the advisability of preparing an updated appraisal. If it is determined that an updated or new appraisal is necessary or desirable, obtain such appraisal using the same procedures as described in Section 15.3.5.1. DB Contractor must also undertake appraisal review as described in Section 15.3.5.2.
- Submit the updated appraisal or new assignment to TxDOT for review and approval. Once approved, TxDOT shall transmit the approved appraisal to the Office of the Attorney General. TxDOT must approve any updated appraisals or new assignments. If an updated appraisal or new assignment is approved, notify the property owner or other holder of a compensable interest, as applicable, and submit a copy to TxDOT.
- Be responsible for coordinating the pre-hearing meeting with TxDOT on behalf of the Office of the Attorney General and all others required for testimony or exhibit preparation.
- Schedule all court reporter services, transcription services, expert witnesses, exhibits, and exhibit workbooks as directed by TxDOT.
- Serve in person, a "Notice of Hearing" not later than 20 days before the date of the Special Commissioners' hearing or other hearings and notice requirements as directed or authorized by the court.
- Call and send reminder letters two to three weeks in advance of any hearing to the assigned attorney, engineer, technical experts, appraiser, the commissioners, court reporter, and TxDOT's ROW Project Manager concerning hearing dates.
- Upon completion of the hearing, prepare TxDOT form ROW-E-73 – Data Sheet – Special Commissioner's Hearing, and Commissioners' time sheets. DB Contractor shall make payment to all commissioners involved in the hearing and include payment for commissioners as part of general Project ROW services.

- Timely file and provide proper service of citations if objections are filed after completion of the Special Commissioner's hearing and promptly submit evidence of filing and copies of all filed documents to TxDOT. As directed by TxDOT and the Office of the Attorney General, DB Contractor, at its cost, shall order transcripts of such hearing.
- Coordinate and provide support to TxDOT's counsel, and facilitate distribution of copies of award, prepare request for payment, and file notice of deposit.

15.4.4.3 **Condemnation Support by an Expert Witness**

DB Contractor shall support condemnation efforts as directed by TxDOT and further delineated as follows:

- DB Contractor shall provide an individual or individuals having sufficient knowledge of the design of the Project to appear as an expert witness for testimony at the Special Commissioners' hearing or other proceedings. This individual or individuals are also responsible for preparing exhibits as requested by TxDOT or the Office of the Attorney General in support of said testimony. Exhibits shall be left in the custody of TxDOT at the close of the hearing.
- DB Contractor shall coordinate with TxDOT on behalf of the Office of the Attorney General regarding expert witnesses needed to testify on behalf of the State at the Special Commissioners' hearing and subsequent proceedings, including jury trials. At the request of the Office of the Attorney General or TxDOT, DB Contractor shall provide all necessary expert witnesses including: engineering, land planners, real estate specialists, cost estimators, outdoor advertising sign experts, and environmental specialists, and DB Contractor shall appear as expert witness or fact witness, as requested. DB Contractor shall also make any Subcontractors available to appear as an expert witness or fact witness, as requested at the Special Commissioners' hearing or subsequent proceedings until Final Acceptance of the construction project and through any maintenance agreement periods. The selection of all expert witnesses to be used for jury trials shall be determined by the Office of the Attorney General.
- DB Contractor shall require expert witnesses with all exhibits and documents to be present at a pre-hearing meeting.
- Coordinate with TxDOT on behalf of the Office of the Attorney General as to expert witnesses as required by the Office of the Attorney General. DB Contractor shall provide the expert witnesses at the request of TxDOT or the Office of the Attorney General. The expert witness report, if required, shall be completed and forwarded to the appraiser before the updated appraisal is completed.
- Appear or provide for the appearance of expert witness(es) or fact witness(es) when requested by TxDOT or the Office of the Attorney General. The appearances may include pre-commissioner's hearing preparations, Special Commissioner's hearings, subsequent proceedings including jury trials and related proceedings and as other needs arise.

15.4.5 **Clearance/Demolition of Project ROW**

Prior to demolition of any improvements, DB Contractor shall provide to TxDOT photographs of the subject property and all improvements. If legal proceedings are initiated, all photos of personal property and any other items in dispute shall be in, and of a quality suitable for presentation as, evidence in court. Following acquisition or possession of any parcel of Project ROW, DB Contractor shall:

- As soon as practicable or within two business days from vacancy of the property, secure and protect the buildings, improvements and fixtures on the Project ROW until they are disposed of or demolished. DB Contractor shall board-up, mow, fumigate and winterize as required by TxDOT or applicable Law.
- Coordinate with the owner and occupants to assure the clearance of personal property from the Project ROW, as applicable.
- Provide for any insect and rodent control and initiate extermination as required to protect the adjacent properties and rid the Project ROW from infestations.

- Secure Governmental Approvals required for demolition and environmental surveys or tests, notify TxDOT in writing of all such activities, and provide copies of such Governmental Approvals to TxDOT.
- To the extent required by Section 15.2.11, prepare necessary documentation for disposal of improvements, fixtures and buildings in accordance with applicable Laws and submit the same to TxDOT.
- Provide written notification to TxDOT of any abandoned personal property remaining on the Project ROW.
- Terminate all utility service(s) when appropriate.
- Process all required forms, documents and permit applications in order to proceed with the timely demolition or removal of any and all improvements, buildings and fixtures located within the Project ROW, as applicable.
- Demolish and/or remove all improvements.
- Notify TxDOT upon completion of the demolition and clearance of the Project ROW, as applicable.

For areas within the Project ROW where encroachments exist (e.g. – parking lots, irrigation systems, bushes), DB Contractor shall provide 120 days advanced written notice to TxDOT before removal of encroachments on existing ROW. TxDOT shall provide notice to the property owner.

15.4.6 **Payment Submittal**

DB Contractor must submit a payment Submittal for any item that is a TxDOT payment responsibility as outlined in this Item 15. A payment Submittal shall consist of:

- completed payment request forms for each type of payment;
- all required appropriate documents as shown on each payment request form; and
- A ROWIS or current system generated payment request form inclusive of all key information including a payment identification number (PIN).

The State's warrant will be returned to DB Contractor's ROW AM.

15.4.7 **Property Fence**

In connection with fences, DB Contractor shall comply with the policies and procedures of the TxDOT ROW Manuals, as well as the TxDOT Standard Specifications. Fencing standards for DB Contractor-provided fencing shall conform to the overall aesthetics requirements in the Contract Documents and referenced standards.

15.4.8 **Property Fencing for Public Properties**

Where public facilities now exist that are in high risk areas for public use (particularly those containing parks, sport areas, schools or any highly traveled pedestrian areas), DB Contractor shall construct similar like fence as in the preexisting condition or, at a minimum, construct a 6-foot-high chain-link fence with metal posts if no fence was in the preexisting condition. DB Contractor shall use Good Industry Practice in fencing public properties to control public access to the Project.

15.4.9 **Property Fencing for Private Properties**

DB Contractor shall instruct the appraiser to use the "Cost to Cure" format to compensate an owner of private property for a replacement fence when the Project ROW line leaves one or more unfenced remainder property(ies) that were fenced before the taking. Compensation for the new fencing will be based upon the same type of fence as the property owner's existing fence.

When the property owner is paid through the appraisal process for the cost to rebuild the fence on the remainder property, DB Contractor shall include the following clause in the MOA or the purchase agreement for such property:

"It is further understood and agreed that the Grantor has been compensated for the construction of a new fence and shall be responsible for constructing the necessary fencing within 30 days from the date of closing. Grantor specifically understands and agrees that the fences are the property of the Grantor and they shall be liable and responsible for any reconstruction, maintenance, or adjustment with regard to such fencing."

DB Contractor shall make reasonable and good faith efforts to ensure that the property owners, who have been compensated for fencing of the remainder properties, erect the fence in accordance with the construction schedule.

If necessary to maintain the Project construction schedule and to control unauthorized access to the Project ROW by the public or livestock, DB Contractor shall be responsible for providing temporary fencing in cases where the property owner refuses to fence the property within 30 days from the date of closing.

After the property owner's retention period has expired and if any existing fencing remains, DB Contractor shall remove the existing fences from the newly acquired Project ROW and will be responsible for all costs associated therewith.

15.5 **Early ROW Acquisition**

TxDOT will notify DB Contractor if certain Project ROW parcels are scheduled to be acquired by TxDOT or Governmental Entities prior to NTP2. TxDOT will update DB Contractor regularly on the status of the acquisition process for each parcel.

Subject to TxDOT's commitment to make available for Construction Work the parcels in Section 15.1, DB Contractor shall complete the acquisition process for Project ROW parcels not acquired by TxDOT, including early acquisition parcels, and coordinate the scheduling of all remaining Project ROW acquisitions.

15.6 **Submittals**

All Submittals described in Item 15 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 15-2. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated. Any deliverable submitted by DB Contractor to TxDOT for review after 11:59 a.m. will be considered as submitted on the next Business Day.

Table 15-2: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Copies of all property agreements	Upon Request	Information	15.1
PMP – ROW Acquisition Management Plan	After NTP1	Approval prior to issuance of NTP2	15.2.3
Updates for the projected acquisition of each parcel	Monthly	Information	15.2.4
Meeting Agendas	Prior to each meeting	Information	15.2.9
Meeting Minutes	After the date of the meeting	Review and Comment	15.2.9
All specific reports and supporting documentation during acquisition process	1. Prior to Acquisition Package submission, Condemnation Package submission, and as often as requested by TxDOT 2. Final reports and supporting documentation to be provided with retirement of all acquisition, relocation, condemnation, and property management files	Approval	15.2.10
Cost Summaries	Monthly	Information	15.2.10
Status Reports	Monthly	Information	15.2.10
Status Updates	Weekly or as requested	Information	15.2.10
Subcontractor Status Report	Monthly or as requested	Information	15.2.10
TxDOTConnect or current system compatible spreadsheet of ROW data	Weekly	Information	15.2.10

Table 15-2: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Completed closeout files	After the completed ROW parcel activity (within 90 days)	Review, Comment, and Approval	15.2.11
Project ROW map	Part of the Acquisition Survey Document	Approval	15.3.1
Acquisition Survey Document	Prior to being included in the submission of the Acquisition Package	Approval	15.3.1
GIS Files	Concurrent with the Acquisition Survey Document and prior to submission of the first Acquisition Package	Approval	15.3.1.1
Monthly Parcel Report	Monthly	Information	15.3.2
Monthly Progress Report	Monthly	Information	15.3.2
ROW CAD Files	Prior to submission of the first Acquisition Package	Information	15.3.2
TxDOT Introduction letter and Landowner Bill of Rights to Property Owners and Displacees	After ROW Acquisition Management Plan approval	Approval and signature	15.3.4
Appraisal Reports	Prior to submission of the first Acquisition Package, and as requested	Approval	15.3.5
Acquisition Packages	Prior to delivering the offer to each property owner	Approval	15.3.6
Administrative Settlement Submittals	As necessary	Approval	15.4.1
Relocation Assistance Submittals	As part of the respective parcel's Acquisition Package or separately	Approval	15.4.2
Relocation Plan	After NTP1, as part of a ROW Acquisition Management Plan update	Approval prior to commencement of Construction Work	15.4.2
Closing Submittals	Prior to closing	Approval	15.4.3
Condemnation Packages	Prior to TxDOT submission to ROW Division for a minute order	Approval	15.4.4
Notice of Encroachment	As necessary	For information	15.4.5
Payment Submittals	As necessary	Approval	15.4.6

Item 16
Geotechnical

16.1 **General Requirements**

DB Contractor shall perform all investigations, testing, research, and analyses necessary to effectively determine and understand the existing surface and subsurface conditions within the Project ROW needed to carry out the Work.

DB Contractor shall ensure the geotechnical investigations and analyses are both thorough and complete, to provide accurate information for the design of roadways, pavements, foundations, structures, embankments, excavations, slopes, temporary special shoring, and other facilities that result in a Project that meet the requirements of the Contract Documents.

All geotechnical work shall be performed in accordance with the latest versions of the TxDOT *Geotechnical Manual* and the TxDOT *Pavement Manual*.

DB Contractor shall comply with the TxDOT *Pavement Manual* and this Item 16 for the pavement design and quality acceptance process. Where there is a conflict between the requirements of these documents, the requirements in these Design-Build Specifications shall take precedence.

16.2 **Geotechnical Investigation**

16.2.1 **Geotechnical Investigation for Pavement Design**

DB Contractor shall determine the specific locations, frequency, and scope of all subsurface investigations, testing, research, and analyses necessary to design a safe and reliable pavement foundation for the Project in accordance with TxDOT's geotechnical requirements in the TxDOT *Pavement Manual* and this Item 16. DB Contractor shall take all soil borings within and along the proposed roadbed alignment.

DB Contractor shall utilize drilling and field investigation measures that safeguard groundwater from contamination, and shall be responsible for any mitigation or restoration associated with the geotechnical investigation work.

DB Contractor shall prepare and amend as needed its Geotechnical Engineering Reports documenting the assumptions, conditions, and results of the geotechnical investigation and analyses in accordance with the TxDOT *Pavement Manual*.

Each Geotechnical Engineering Report, upon completion and including any later supplements or amendments, shall be submitted to TxDOT for review and comment no later than 10 Business Days prior to commencement of the applicable Design Work.

DB Contractor shall submit the final Geotechnical Engineering Report and the Pavement Design Report to TxDOT for approval with the Released for Construction Documents no later than 10 Business Days prior to commencement of the applicable Construction Work. Each report shall be signed and sealed by a PE.

16.2.1.1 **Soil Testing Requirements**

DB Contractor shall use the TxDOT *Pavement Manual* to determine the frequency of subgrade soil survey exploration for use in determining plasticity index, liquid limit, moisture content, organic content, sulfate concentration, soil classification and calculating PVR (Tex-124-E) as it relates to pavement design. Borings shall terminate at the depth recommended in the PVR evaluation below the top of the proposed untreated subgrade elevation, and sampling shall be performed with Shelby tubes or a continuous sampler system.

DB Contractor shall develop the scope of testing and the evaluation for analyzing the subgrade and existing pavement structure to supplement the Pavement Design Report. DB Contractor shall use the TxDOT test procedures in Table 16-1 to characterize the subgrade soils or borrow material for pavement design:

Table 16-1: Soil Exploration & Testing

Testing	Properties
Dynamic Cone Penetrometer (DCP) (ASTM D6951)	subgrade soil shear strength
Soil Classification (Tex-104-106-E, Tex-110-E, Tex-142-E)	plasticity, particle distribution, percent binder and soil classification
Soil Mineralogy (Tex-145-E, Tex-148-E)	sulfate content (ppm) and percent organic content
Soil Treatment Design (Tex-120-E, Tex-121-E, Tex-127-E)	target stabilizer content, compressive strength, max. dry density, and optimum moisture content

16.2.1.2 **PVR Requirements for Rigid and Flexible Pavement**

DB Contractor shall design the new pavement to have a PVR no greater than 1.5 inches for main lanes and 2.0 inches for non-main lane pavements as calculated in accordance with TEX-124-E.

DB Contractor shall calculate PVR using the default empirical volumetric swell curves in Tex-124-E or alternatively, by directly determining the percent volumetric swell for the in-situ soil column by measuring the volumetric swell properties at the associated depth and load (effective stress) of each soil strata in the soil column, in accordance to ASTM D4546. DB Contractor shall calculate PVR for a soil column 15 feet deep as measured from the top of the proposed finished pavement grade. PVR can be calculated using a 10-foot soil column from the top of the proposed finished pavement grade if subsurface soils consist primarily of impermeable, high plasticity clays (CH) are present within the top 5 feet of the soil column.

If the PVR of the in-situ conditions exceed the maximum allowable levels, DB Contractor shall determine the depth of mitigation required to comply with PVR limits and implement mitigation measures to comply with PVR requirements. Any mitigation measures shall take into account fluctuations of the water table. At a minimum, DB Contractor shall utilize the following mitigation measures which may be used independently or in combination:

- Where chemical soil treatment is used, it shall be in accordance with TxDOT's Guidelines for Modification and Stabilization of Soils and Base for Use in Pavement Structures. Only material meeting the definition of treated subgrade or treated subbase in Section 16.3 shall be used to provide a permanently treated subgrade.
- Undercut, remove and replace expansive soils with select fill subbase. Only material meeting the definition of select fill subbase in Section 16.3 shall be used; all other unbound materials used as a pavement layer that do not meet this definition shall be considered untreated subgrade/embankment.

Adopting mitigation measures does not excuse DB Contractor from meeting Performance Requirements set forth in Section 27.3 of the Design-Build Specifications.

16.2.2 **Geotechnical Investigation for Other Elements**

The subsurface investigation shall include, but not be limited to, soil borings, test pits, rock coring and pavement coring. DB Contractor shall determine the specific locations, frequency, and depth of test holes in accordance with the guidelines in TxDOT *Geotechnical Manual*. The scope of the subsurface geotechnical investigations shall include field and laboratory testing, research, and analysis that DB Contractor considers necessary to provide a safe and reliable roadway, embankment and cut slopes, bridge foundations, noise and sign structures, drainage structures, temporary and permanent retaining walls, excavation support systems, and any other facilities for the Project.

DB Contractor shall ensure the depth of the test hole is adequate for the anticipated structure foundation type and loading, excavation depths, and scour.

DB Contractor shall ensure that the groundwater monitoring methods and durations are adequate to determine groundwater levels and their impacts on the design and construction. DB Contractor shall employ field investigation measures that avoid groundwater contamination and shall be responsible for all mitigation and/or restoration associated with the geotechnical investigations.

DB Contractor shall prepare and amend, as needed, its Geotechnical Engineering Reports documenting the assumptions, conditions, and results of the geotechnical investigation and analyses, including the following:

- The geology of the Project area, including soil and/or rock types, and drainage characteristics.
- Descriptions of field investigations and laboratory test results used to characterize subsurface conditions. Boring logs shall be provided including descriptions of the soil/rock, Texas Cone Penetration test results, in-situ test results, and percent recovery and RQD for rock cores. TxDOT log form 513 shall be used as required by TxDOT *Geotechnical Manual*.
- Laboratory testing shall include moisture content, plasticity index, gradations for each major soil strata change, levels of shrink/swell potential, soil corrosivity, soil compressibility, compaction characteristics (Proctor tests), and properties in accordance with TxDOT and ASTM geotechnical testing standards. Other field exploration and laboratory testing shall be performed as appropriate.
- A discussion of surface and subsurface site conditions and testing results with reference to specific locations on the Project.
- Design and construction parameters resulting from the geotechnical investigation and analysis.
- Discussions of structure foundation type selection considerations including suitability of subsurface conditions anticipated loads, scour, and construction staging. As required by TxDOT *Geotechnical Manual*, bridge foundations shall consist of either drilled shafts or piling.
- Geotechnical analyses for foundations of drainage structures, bridge structures, noise and sign structures, retaining walls, sound walls and embankments. The analyses shall include recommended bearing strata, deep foundation length and evaluations of bearing capacities and predicted settlements.
- Slope stability analyses for embankment and excavation, including roadway section, and retaining wall slopes including both short-term (undrained) and long-term (drained) conditions, and discussion of design measures undertaken to ensure stability and safety of all slopes. The design minimum factor of safety required for global stability of all slopes and retaining walls shall be in accordance with the TxDOT *Geotechnical Manual*. The analysis shall consider the potential for long-term surficial slide failures common to high plasticity clays in Texas, and specific recommendations shall be provided to minimize their occurrence.
- Evaluation of applicable retaining wall types including design and constructability considerations. Both temporary and permanent retaining walls shall be evaluated. DB Contractor shall ensure the design retaining walls are evaluated in accordance with the TxDOT *Geotechnical Manual* and the associated TxDOT Standards for the wall type considered. Analyses of global stability for each retaining wall shall be performed to ensure the minimum factors of safety for global stability required by the TxDOT *Geotechnical Manual* have been achieved.
- Quantitative settlement analyses are intended to predict the post-construction settlements at the finished ground surface. These analyses shall consider both total and differential settlements. Quantitative settlement analyses shall consider the compressibility of the proposed fill and the underlying soil and rock and their potential for settlement due to the weight of the fill and the weight of proposed structures. These evaluations shall consider, but not be limited to, primary consolidation, secondary compression, hydro-compression, and expansion. Settlement analyses shall be performed for all approach embankments to grade separation and other bridge structures.
- Recommendations for instrumentation and monitoring of settlement, stability, vibrations, etc. during construction as required to achieve safe and reliable construction staging and to ensure safety of existing facilities and travelling public.
- Plan view of field sampling locations (field test plan), boring logs and other field data, laboratory test results, calculations, and analyses that support design decisions.

The report shall:

- Document that adequate investigation, testing, analysis, design, mitigating measures and construction planning are applied to assess and provide for the effects of swell pressures from expansive soil and rock materials on foundations, pipes, and earth retaining structures.

- Provide design and construction parameters derived from geotechnical investigations for the design of structure foundations, pipes, pavements, slopes, embankments, the detention pond and earth retaining structures
- Assess the corrosion potential of the soil and rock materials and conditions that will be encountered, and the impacts to planned surface and subsurface facilities.

Each Geotechnical Engineering Report, upon completion and including any later supplements or amendments shall be submitted to TxDOT for review and comment.

16.3 Pavement Materials Requirements

DB Contractor shall incorporate the following requirements into the pavement designs, plans, quality control and quality assurance programs, and the field construction procedures. DB Contractor shall conduct all Work necessary to meet the requirements for this Item 16 in accordance with the requirements of this Item 16 and TxDOT Standard Specifications.

16.3.1 Subgrade Material Composition

DB Contractor shall analyze subgrade material composition, and perform necessary construction procedures to address the following subgrade soil limitations.

- **Sulfate Content.** DB Contractor shall mitigate soluble sulfate induced heave by reducing soluble sulfate concentration to a level under 3000 ppm. DB Contractor shall follow Tex-145-E for measuring sulfate contents. When quantities of soluble sulfates detected are greater than 3000 ppm, DB Contractor shall determine the source of the sulfates and whether there are even greater concentrations in the general proximity or that would be created when materials are pulverized in and surrounding the sampled location. DB Contractor shall use the TxDOT *Guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures* and TxDOT *Standard Specification Items 260, 265 and 275* for testing and detection and integrate these procedures with construction practices.
- **Organic Content.** DB Contractor shall evaluate subgrade soils for organic content using Tex-148-E and in accordance with general guidelines given in Chapter 3 of the TxDOT *Pavement Manual*, considering soil variability within the Project limits. If the organic content of the soils is greater than 1%, DB Contractor shall determine the appropriate type and quantity of additives to compensate for these organic levels to obtain minimum subgrade treatment requirements. As a minimum, stabilizer contents shall meet the requirements of Tex-121-E, Part III.

16.3.2 Select Fill Material

DB Contractor shall furnish select fill material from the bottom of the base course as needed to mitigate non-compliant PVR and at locations specified in Table 16-8 meeting the requirements shown below in Table 16-2. Untreated granular base meeting the requirements of TxDOT *Standard Specification Item 247*, for any grade except Grade 4 may be used without restriction. At depths greater than two feet, DB Contractor shall use TxDOT existing select fill specifications.

Table 16-2: Select Fill Material Requirements

		(Percent Retained-Sieve)						LL	PI	PI
TxDOT *Standard Specification*	Description	3”	1 ¾”	7/8”	3/8"	#4	#40	Max	Max	Min
Item 132	Embankment (Density Control or Ordinary) (TY C1 – Select Fill)	0	0-10	-	-	45-75	60-85	45	20	6

16.3.3 Treated Subgrade

For lime treatment, DB Contractor shall meet the requirements of Part III of Tex-121-E. For cement treatment, DB Contractor shall meet the requirements of Tex-120-E. For lime-fly ash treatment, DB Contractor shall meet the requirements of Tex-127-E. Any subgrade that does not conform to these treatment requirements shall not be included in the pavement design. To use the treated layer as part of the

proposed pavement structure DB Contractor shall use the TxDOT *Guidelines for Modification and Stabilization of Soils and Base for Use in Pavement Structure*.

No structural credit shall be allowed, and treated subgrade used as a construction platform will not receive structural credit.

For fill, at grade, and cut sections, if the proposed structural pavement section exceeds the project PVR requirements in Section 16.2.1.2, then DB Contractor shall stabilize the moisture conditions in the pavement structure by extending the treated subgrade to at least four feet beyond the edge of the pavement.

16.3.4 Treated Base

Treated base may be modified with cement, lime, lime-fly ash, or asphaltic binders.

Base materials to be treated shall meet the specifications for the type and grade specified in accordance with TxDOT *Standard Specification Item 247*. Cement treatment wet/dry strengths shall meet the strength requirements in Table 16-3. For other stabilizers, DB Contractor shall meet the requirements set forth in the applicable TxDOT Standard Specification.

When cement is used to treat the base materials, DB Contractor shall determine the target cement content meeting the minimum and maximum UCS and 24-hour submerged strength requirements shown in Table 16-3 when tested in accordance with Tex-120-E.

Table 16-3: Minimum and Maximum Strength Values to be Achieved When Using Cement for Treatment, by Pavement Type

Pavement Type	Minimum 24-hour submerged strength (psi)	Minimum 7-day UCS (psi)	Maximum 7-day UCS (psi)
Flexible pavement	240	300	500
Rigid pavement	400	500	No maximum

When lime is used to treat the base materials, DB Contractor shall determine the required lime content using Tex-121-E.

For cement treated base under flexible pavements, microcracking shall be performed per TxDOT *Standard Specification Item 276, Section 4.5*. The IQFM and TxDOT shall be notified 24 hours before the microcracking begins.

When lime-fly ash is used to treat the base materials, DB Contractor shall determine the required lime-fly ash content using Tex-127-E.

When asphalt is used to treat the base materials, DB Contractor shall determine the required asphalt content using Tex-126-E and an approved TxDOT Standard Specification.

Treated base shall be compacted using density control.

For fill, at grade, and cut sections, if the proposed structural pavement section exceeds the project PVR requirements in Section 16.2.1.2, then DB Contractor shall stabilize the moisture conditions in the pavement structure by extending the treated base and subbase for at least four feet beyond the edge of pavement.

For rigid pavements, the treated base shall extend a minimum 2 feet outside the edge of pavement to provide a stable area for the paving equipment.

16.3.5 Tack Coat

For flexible pavements, DB Contractor shall place a non-tracking tack coat directly beneath the final surface course in accordance with the applicable specification for the final surface as shown in the TxDOT Standard Specifications. No tack shall be required if hot mix asphaltic concrete pavement is on a freshly laid seal coat free of objectionable material such as moisture, dirt, sand, organic material, and other loose impediments as determined by the CQCM.

16.3.6 Surface Mix Type

Where flexible pavement structures are used, the surface mix shall be either PFC, SMA, or TOM meeting TxDOT *Standard Specification Items 342, 346, or 347*. Surface mix shall meet the requirements for PG 76-22

and SAC-A. PFC-C mixes placed on frontage roads shall meet the requirements of *Special Provision to* TxDOT *Standard Specification Item 300 "High Performance-Graded Binders"* provided in the RIDs. DB Contractor shall obtain components for the surface mix material from a vendor listed at http://www.txdot.gov/business/resources/producer-list.html.

The performance-graded asphalt binder in the asphalt mixture directly beneath the surface mixture shall have the same high temperature performance grade as the asphalt surface layer. The minimum thickness of this layer shall be 2.0 inches.

16.3.7 Underseal

DB Contractor shall place a one course surface treatment as an underseal directly above the existing concrete surface or above the shot-blasted new concrete surface prior to all HMA, SMA, or PFC overlays at widened sections and overlaid sections to seal all construction joints and pre-existing cracks.

For areas of rigid pavements that have a PFC overlay, DB Contractor shall place an underseal course directly above the existing concrete surface or above the shot-blasted new concrete surface. The use of emulsified asphalt shall not be permitted as an underseal course for PFC.

Underseal courses shall be constructed based on TxDOT *Special Specification Item 3067* using a tracking-resistant asphalt interlayer (TRAIL), a spray applied underseal membrane, or a single layer of seal coat.

16.3.8 Final Surface

Level up shall not be considered part of the final surface course thickness.

DB Contractor shall design and construct the final layer of pavement for US 290 and SH 71 frontage roads and cross streets to extend beyond any existing striping that was impacted by traffic control inside and outside of the Project limits. Additional surface requirements for specific pavement areas are outlined in Section 16.4.1 and Section 16.4.2 below.

If TOM (Item 347) is used, DB Contractor shall construct the final surface course while the surface temperature is at or above 70°F (regardless of the use of a thermal imaging system).

16.4 Design

16.4.1 New Pavement

16.4.1.1 Design Traffic Considerations

The corridor traffic data used for the project is described in "Oak Hill Parkway Pavement Report-20190819.pdf" included in the RIDs and shall be deemed a minimum acceptable traffic volume and composition to be used by DB Contractor for the purpose of pavement design for the mainlanes. DB Contractor is responsible for determining appropriate traffic to be used as a minimum for the design of cross street and frontage roads. DB Contractor shall not be entitled to rely on the corridor traffic data provided in the RID for the purpose of meeting the Performance Requirements of these Design-Build Specifications. The final pavement design shall be a DB Contractor risk regardless of whether the actual traffic volume and composition exceeds that identified in the RID.

16.4.1.2 Subgrade Considerations

For flexible pavement, DB Contractor shall be responsible for determining the design value for subgrade using testing as desired. DB Contractor shall inform TxDOT of the method prior to commencement of construction.

For rigid pavement, DB Contractor will select the subgrade classification of "CL" for the input in the design program except for the mainlane widening from station 414+00 to station 495+00 where the subgrade classification of "GW" is required. The subgrade K value for the inputted subgrade classification is hard-coded in the design program.

The IQF shall ensure the final design subgrade modulus is achieved during construction using methods in Section 16.5.

16.4.1.3 Pavement Type Requirement

The proposed new pavement for mainlanes, frontage roads, cross streets, and intersections shown in "Oak Hill Parkway Pavement Designations" shown in the RIDs shall be constructed utilizing the pavement layer types and specifications shown in Tables 16-4 and 16-5. The pavement layer thicknesses shown in Tables 16-4 and 16-5 set the minimum thickness values acceptable to TxDOT. DB Contractor may increase these thicknesses subject to the DB Contractor's pavement design and taking into consideration the requirements of Section 16.4.1.1.

Pavement for the shoulders of all roadways shall be the same section (materials and depth) as the adjacent roadway pavement.

DB Contractor shall place specific types of pavement at the locations shown in "Oak Hill Parkway Pavement Designations" shown in the RIDs, with the exception of PFC pavement. The areas of PFC pavement shown in the RID referenced above are the maximum limits that PFC pavement may be used. DB Contractor shall only utilize PFC pavement as a last resort for the purposes of achieving water quality requirements, as approved by TxDOT in its sole discretion. Multiple transitions of surface pavement (PFC and ACP) are not allowed within the calculated limits of need for PFC. PFC areas must be continuous from the western limits to eastern limits of calculated need without transitions. PFC is required on ramps and collector-distributors when PFC is used on the main lanes.

16.4.1.3.1 Main Lanes

The new pavement for mainlanes showing the pavement layer types and minimum pavement layer thicknesses are shown in Table 16-4 below:

Table 16-4: Pavement Types and Minimum Thicknesses (New Construction)

Facility	Pavement Section	Pavement Design	TxDOT Specification
US 290 mainlanes	New CRCP	Sealant NGCS 11.5" CRCP[a] 1" D-GR HMA Ty-D or Ty-F 6" CTB	Item 10,004 Item 10,004 Item 360 Item 341 Item 276
	New CRCP (with PFC)	1.5" PFC-C Underseal Course (TRAIL)[b] 11" CRCP[c] 1" D-GR HMA Ty-D or Ty F 6" CTB	Item 342 Item 3067 Item 360 Item 341 Item 276
SH 71 mainlanes	New CRCP	Sealant NGCS 11.5" CRCP[a] 1" D-GR HMA Ty-D or Ty F 6" CTB	Item 10,004 Item 10,004 Item 360 Item 341 Item 276
	New CRCP (with PFC)	1.5" PFC-C Underseal Course (TRAIL)[b] 11" CRCP[c] 1" D-GR HMA Ty-D or Ty F 6" CTB	Item 342 Item 3067 Item 360 Item 341 Item 276

a. Surface shall be constructed with Next Generation Concrete Surface (NGCS) using diamond grinding and grooving techniques in accordance with Item 10,004, "Next Generation Concrete Surface (NGCS) Grinding."
b. Apply a TRAIL underseal course per Section 16.3.7.

c. Surface shall receive a burlap/turf drag surface texture (no tining) during construction, followed by membrane curing per Item 360. Shotblasting shall be applied after at least 72 hours of curing and prior to placement of the TRAIL underseal.

16.4.1.3.2 **Ramps, Collector Distributors, and Direct Connectors**

Ramp, collector distributor, and direct connector pavements shall be constructed with the same section (materials and depths) as the adjacent main lane pavement.

16.4.1.3.3 **Frontage Roads, Cross Streets, and Intersections**

The new pavement for frontage roads, cross streets and intersections showing the pavement layer types and minimum pavement layer thicknesses are shown in Table 16-5 below:

Table 16-5: Pavement Types and Minimum Thicknesses (New Construction)

Facility	Pavement Section	Pavement Design	TxDOT Specification
Frontage roads and cross streets and intersections[b]	New 1	1" TOM-C Underseal Course[a] 2" D-GR HMA Ty-D 7.5" D-GR HMA Ty-B 8" Flexible Base	Item 347 Item 3067 Item 341 Item 341 Item 247
	New 1 (with PFC)	1.5" PFC-C Underseal Course[a] 1.5" D-GR HMA Ty-D 7.5" D-GR HMA Ty-B 8" Flexible Base	Item 342 Item 3067 Item 341 Item 341 Item 247
	New 2	1" TOM-C Underseal Course[a] 2" D-GR HMA Ty-D 6" D-GR HMA Ty-B (paver) 8.5" D-GR HMA Ty-B (blade)	Item 347 Item 3067 Item 341 Item 341 Item 340
	New 2 (with PFC)	1.5" PFC-C Underseal Course[a] 1.5" D-GR HMA Ty-D 6" D-GR HMA Ty-B (paver) 8.5" D-GR HMA Ty-B (blade)	Item 342 Item 3067 Item 341 Item 341 Item 340

a. Apply an underseal course per Section 16.3.7.
b. PFC shall not be utilized at intersections.

16.4.1.3.4 **Shoulders**

Pavement for the shoulders of all roadways shall be the same section (materials and depths) as the adjacent roadway pavement.

16.4.1.3.5 **Driveways**

Driveways shall be constructed in accordance with Section 19.2.

16.4.1.4 **Required Pavement Design Reports**

The pavement designs developed by DB Contractor shall be signed and sealed by a PE.

In addition to those requirements in the TxDOT *Pavement Manual*, Pavement Design Report(s) shall document the assumptions, considerations, and decisions contributing to DB Contractor's pavement designs, including the following:

- Pavement design details by location, including structural layer materials, general specifications, and thicknesses;
- Basic life-cycle cost considerations as described in Chapter 2 of the TxDOT *Pavement Manual*. Use an LCCA tool that allows for input of essential cost items; at a minimum consider future maintenance, resurfacing, reconstruction and other rehabilitation measures, describing what these activities are likely to entail. Do not include user costs.
- Relevant pavement evaluation data (structural and functional) and condition information on adjacent roads;
- Site conditions which might influence the design and performance of pavements;
- Relevant geotechnical data and drainage requirements, including boring logs, laboratory soil test results, and active or passive drainage system design;
- Design criteria used in determining the pavement design(s), including traffic loads, pavement material characterization, environmental conditions, and pavement design life; and
- Other considerations used in developing the pavement design(s), including subgrade preparations and stabilization procedures.
- Description for selection of material types and grades.

DB Contractor shall include the proposed permanent, detour, temporary, transition pavement (from concrete to flexible) and rehabilitated pavement designs for the Project in its final design and shall indicate the applicable roadway and station limits for each pavement design. DB Contractor shall provide a tabulation of all pavement design software input values for each pavement layer, falling weight deflectometer (FWD) data, or other basis for the pavement thickness designs, and include station limits.

16.4.1.5 Flexible Pavement Design Requirements

DB Contractor shall use FPS 21 software as the sole design methodology for flexible pavements. DB Contractor shall check all pavement thickness designs using the Modified Texas Triaxial design method, and other analyses methods necessary to prevent premature failure from subgrade rutting and fatigue. DB Contractor shall use design values recommended by the TxDOT *Pavement Manual*, Chapter 5, except as noted below.

16.4.1.5.1 Minimum Layer Thickness

Minimum layer thickness for all unbound materials used in flexible pavement designs shall be 6 inches.

16.4.1.5.2 Pavement Analysis Period (design life)

DB Contractor shall use 30 years for flexible pavement types.

16.4.1.5.3 Minimum time to first overlay

DB Contractor shall use 15 years for all flexible pavement types.

16.4.1.5.4 Reliability Level

DB Contractor shall use Level C (95%) for flexible pavement designs.

16.4.1.5.5 Design Moduli

Design moduli shall not exceed the maximum values in Table 16-6, as established from methods and criteria stated below, and in accordance with layer thickness specified in Table 16-6.

Table 16-6: Design Structural Values for HMA Pavements

Material Type	TxDOT Standard Specification(s)	Modulus for TxDOT FPS 21
Dense-Graded Hot Mix Asphalt	Item 341 (for permanent pavement)	Combined HMA thickness: ≤ 4.0 inches use 500 ksi > 4.0 inches use 650 ksi
PFC	Item 342	500 ksi
Superpave Mixtures	Item 344	Combined HMA thickness: ≤ 4.0 inches use 650 ksi 4.0 inches < T ≤ 6.0 inches use 750 ksi > 6.0 inches use 850 ksi
SMA	Item 346	Same as Item 344
TOM	Item 347	Same as Item 344 (maximum thickness of 1.0 inches)
Thin Bonded Friction Courses	Item 348	Same as Item 344
Flexible Base (Unbound Base)	Item 247, Grades 1-2 or 5	*75 ksi (no more than 4X the untreated subgrade modulus)
Treated Base	Item 275	*150 ksi.
	Item 276	*200 ksi
	Foam or Emulsion	*150 ksi
	Item 292	*300 ksi
Treated Subgrade or Subbase	Item 260	*35 ksi**
	Item 275	*35 ksi**

* Maximum design values.
**Minimum modulus value for perpetual pavement design must be 35 ksi

16.4.1.6 **Rigid Pavement Design Requirements**

DB Contractor shall use the design procedures outlined in the TxDOT *Pavement Manual* as the design methodology for all rigid pavement design. TxCRCP-ME is the required design procedure for CRCP. DB Contractor shall use design values recommended by the TxDOT *Pavement Manual*, Chapter 8, and the TxDOT Standard Specifications for joint and reinforcement design. CRCP design will require a maximum of 10 punch outs per mile, except for the mainlane widening from station 414+00 to station 495+00 where a maximum of 11 punch outs per mile are required. DB Contractor shall select one of the two base layer combinations in the TxDOT *Pavement Manual*, Chapter 8.

DB Contractor shall use a 30 year pavement analysis period (design life) for all rigid pavement types and locations.

DB Contractor shall use Level C (95%) for rigid pavement designs.

DB Contractor shall use 570 psi for the 28-day modulus of rupture for concrete.

The maximum modulus of base layer shall be 500 ksi for cement treated base and 400 ksi for asphalt treated base or hot mix asphalt.

16.4.2 **Rehabilitation Pavement (Widening and Overlay)**

16.4.2.1 **Rehabilitation Pavement (Widening and Overlay) Areas**

The Project includes areas of pavement, the maximum extents of which are defined within the "Oak Hill Parkway Pavement Designations", shown in the RIDs, within which DB Contractor may retain some or all of the existing pavement cross section in place, provided that:

- At minimum, a new surfacing course shall be provided meeting or exceeding the smoothness requirements of Section 16.5.2;
- The rehabilitated pavement design meets or exceeds the design criteria specified in Section 16.4.2.3 below.

If either of the above conditions are not met, DB Contractor shall perform further rehabilitation or shall design and construct New Pavement in accordance with Section 16.4.1, as necessary to achieve the specified conditions before Substantial Completion.

16.4.2.2 Rehabilitation Pavement Type Requirement

The proposed rehabilitation pavement for mainlanes and frontage roads shall be constructed utilizing the pavement layer types and specifications shown in Tables 16-7 and 16-8. The pavement layer thicknesses shown in Tables 16-7 and 16-8 set the minimum thickness values acceptable to TxDOT. DB Contractor may increase these thicknesses subject to the DB Contractor's pavement design and taking into consideration the requirements of Section 16.4.2.3.

DB Contractor shall place specific types of pavement at the locations shown in "Oak Hill Parkway Pavement Designations" shown in the RIDs. Options may be selected and utilized in the designated areas at DB Contractor's discretion. PFC pavement may only be utilized as a last resort for the purposes of water quality calculations, as approved by TxDOT in its sole discretion, in areas specified in the RID referenced above.

16.4.2.2.1 Main Lanes (Rehabilitation Pavement)

The rehabilitation pavement for main lanes showing the pavement layer types and minimum pavement layer thicknesses are shown in Table 16-7 below:

Table 16-7: Pavement Types and Minimum Thicknesses (Widening and Rehabilitation – Existing)

Facility	Pavement Section	Pavement Design	TxDOT Specification
US 290 mainlanes existing (CRCP)	Rehab	Sealant NGCS	Item 10,004 Item 10,004
	Rehab (with PFC)	1.5" PFC-C Underseal Course (TRAIL)[b]	Item 342 Item 3067
US 290 mainlanes widening (CRCP)	Widen	Sealant NGCS 10" CRCP[a] 6" HMA Ty B 12" Select Fill, Ty C1[d]	Item 10,004 Item 10,004 Item 360 Item 341 Item 132
	Widen (with PFC)	1.5" PFC-C Underseal Course (TRAIL)[b] 10" CRCP[c] 6" HMA Ty B 12" Select Fill, Ty C1[d]	Item 342 Item 3067 Item 360 Item 341 Item 132
US 290 mainlanes (flexible pavement)	Rehab (existing rehabilitation)	2" Remove (Mill) 1.5" PFC-C Underseal Course 3" D-GR HMA Ty-D	Item 354 Item 342 Item 3067 Item 341
	Widen (widening)	1.5" PFC-C Underseal Course 3" D-GR HMA Ty-D 7" D-GR HMA Ty-B	Item 342 Item 3067 Item 341 Item 341

Facility	Pavement Section	Pavement Design	TxDOT Specification
		8” Flexible Base	Item 247

a. Surface shall be constructed with Next Generation Concrete Surface (NGCS) using diamond grinding and grooving techniques in accordance with Item 10,004, "Next Generation Concrete Surface (NGCS) Grinding.”
b. Apply a TRAIL underseal course per Section 16.3.7.
c. Surface shall receive a burlap/turf drag surface texture (no tining) during construction, followed by membrane curing per Item 360. Shotblasting shall be applied after at least 72 hours of curing and prior to placement of the TRAIL underseal.
d. See Table 16-2 for select fill requirements.

16.4.2.2.2 **Frontage Roads (Rehabilitation Pavement)**

The rehabilitation pavement for frontage roads showing the pavement layer types and minimum pavement layer thicknesses are shown in Table 16-8 below:

Table 16-8: Pavement Types and Minimum Thicknesses (Widening and Rehabilitation – Existing)

Facility	Pavement Section	Pavement Design	TxDOT Specification
US 290 frontage road existing (flexible pavement)	Rehab	1” Remove (Mill) 1” TOM-C Bonding Course	Item 354 Item 347 Item 3066
	Rehab (with PFC)	2” Remove (Mill) 1.5” PFC-C Underseal Course	Item 354 Item 342 Item 3067

16.4.2.3 **Rehabilitation Pavement (Widening and Overlay) Areas Design Criteria**

DB Contractor shall meet or exceed the following criteria:

- A minimum pavement analysis period (design life) of 30 years following Substantial Completion.
- For flexible pavement a minimum initial performance period of 15 years following Substantial Completion.
- Design moduli and minimum layer thicknesses for new materials used in flexible rehabilitation pavement design per New Pavement (Section 16.4.1.3.5).
- Design values for rigid rehabilitation pavement for new materials per Section 16.4.1.
- The corridor traffic data has been provided in the RID and shall be deemed a minimum acceptable traffic volume and composition to be used by DB Contractor for the purpose of rehabilitation pavement design. DB Contractor shall not be entitled to rely on the corridor traffic data for the purpose of meeting the performance requirements of the DBC. The final pavement design shall be a DB Contractor risk regardless of whether the actual traffic volume and composition exceeds that identified in the RID.

16.4.2.4 **Rehabilitation Pavement Areas Process and Requirements**

This section provides guidelines on determining the structural capacity of existing facilities and the requirements for generating pavement designs which incorporate existing structures.

DB Contractor shall follow these of the TxDOT *Pavement Manual*:

- Chapter 3, Section 2, Geotechnical Investigations for Pavement Structures
- Chapter 4, Section 4, Non-Destructive Evaluation of Pavement Structural Properties
- Chapter 7, Flexible Pavement Rehabilitation
- Chapter 10, Rigid Pavement Rehabilitation

DB Contractor shall submit a pavement design report describing all analyses, data, policies, and other considerations used to design the structural aspects of the proposed pavement. The pavement rehabilitation designs developed by DB Contractor shall be part of the pavement design report, and include the following:

- Narrative discussing the overall objective, site particulars (location, facility type, soil conditions and drainage considerations), current pavement condition surveys conclusions, and recommended pavement structure.
- Soils map of the project area with a brief description of each type of soil located within each Rehabilitation Pavement Area. Provide information pertaining to shrink/swell potential, soil soluble sulfate content and plasticity.
- Results of non-destructive testing to characterize the existing structural condition. As a minimum, both an FWD and GPR survey shall be undertaken. The TxDOT MODULUS software summary or back calculation results are required. For existing rigid pavements, a report on the load transfer efficiency of representative joints and cracks. GPR survey results shall be used to show section uniformity and to identify possible subsurface defects, which will be validated by field coring.
- Results from field sampling to ensure materials quality and thickness, and adequate samples for any lab testing required to modify existing layers.
- Results from lab testing if any in-place stabilization is to be recommended. DB Contractor shall follow the design recommendations and criteria in TxDOT stabilization guidelines and TxDOT specifications (including special specs).
- Design input values and output reports:
    - For flexible pavement rehabilitation, DB Contractor shall use TxDOT FPS 21, Modified Texas Triaxial design check, and mechanistic checks for fatigue cracking and rutting.
    - For rigid pavement rehabilitation, DB Contractor shall use design procedures outlined in the TxDOT *Pavement Manual*.
- Existing and proposed typical sections. For the proposed structure, clearly define the various pavement layers, thickness, and materials with TxDOT Standard Specifications. Also identify localized weaker areas that will need special treatment and/or replacement. For the existing structure, sections should be as detailed as possible. Proposed or existing positive drainage systems should be indicated on the typical sections.
- Structural strength validation plan. For roadway which incorporate existing roadway materials, the design report shall include a construction validation plan to demonstrate that the completed roadway has adequate capacity to carry the proposed design traffic.
- A concise summary of recommended pavement rehabilitation designs based on the data, analyses, and procedures.
- Appendices. Additional appendices (results of borings, material lab tests, raw PMIS data, life-cycle cost analysis, drainage analysis, DCP data, design exceptional approvals, etc.), as needed.

16.4.2.5 Use of Shoulders to Carry Construction Traffic

DB Contractor shall perform a structural evaluation of all shoulders proposed to carry main lane traffic during construction. DB Contractor shall use the non-destructive testing and field sampling described above for this structural evaluation. The pavement design report shall include the results of a shoulder evaluation.

16.4.2.6 Pavement Widenings

For widening of existing pavement sections, DB Contractor shall provide documentation of criteria and rationale for the construction approaches selected to widen sections. DB Contractor shall comply with the TxDOT Pavement Manual, historical performance, and the *US290/EB/WB Mainlane – Flexible Pavement Widening and Rehabilitation – Section Detail* as shown in "Oak Hill Parkway Pavement Report-20190819.pdf" provided in the RIDs when designing the widened sections and selecting construction approaches. If DB Contractor's pavement design of the widened section does not match the existing section, DB Contractor shall submit an analysis to address concerns about blocking subsurface moisture flow and to minimize the risk of failure of the construction joint between the different pavement structures.

For widened section areas that will be used as a travel lane, DB Contractor shall develop a full pavement design report for that lane following the guidelines given in the pavement design section. In that report, DB

Contractor shall also provide a structural evaluation of the existing travel lanes and existing shoulders to ensure they are adequate to carry the design traffic loads.

Longitudinal construction joints along the existing and new pavement sections shall be placed within 6 inches from the final in-service lane stripe or the center of the lane. Geotextiles or crack attenuating mixture (CAM) may be placed over the widening joint to delay reflective cracking prior to performing asphalt overlays only.

For all widened sections, the interface between the new widened pavement and the existing pavement shall provide a uniform surface of the same material type across all adjacent lanes. In areas where an existing asphalt surface is in place and widening is required, a new surface course overlay will be required over the existing and widened pavements, with the surface HMA longitudinal joint offset from the underlying layers' longitudinal joint by at least one foot as further described in the *US290/EB/WB Mainlane – Flexible Pavement Widening and Rehabilitation – Section Detail* as shown in "Oak Hill Parkway Pavement Report-20190819.pdf" provided in the RIDs.

16.5 Construction

16.5.1 Construction Quality

The IQF shall perform independent material testing, inspection, and audits of the CQMP.

When performing construction activities under or adjacent to existing structures or Utilities, DB Contractor shall limit vertical settlements and ground deformations so as to not damage structures, including foundation elements, and/or Utilities.

For those occurrences involving third party structures and Utilities, DB Contractor shall coordinate excavation activities with Item 13, "Third Party Agreements" and Item 14, "Utility Adjustments." For those occurrences involving TxDOT's structures and Utilities, DB Contractor shall coordinate excavation activities with TxDOT.

All testing required in the TxDOT Standard Specifications and the Guide Schedule of Sampling and Testing for DB Projects by the IQF (DB Guide Schedule) shall be conducted for each pavement layer, except where superseded by these Design-Build Specifications. DB Contractor shall also ensure that the design assumptions are met by the testing requirements described in this Section 16.5.1.

16.5.1.1 Field Design Subgrade Modulus

The IQF shall perform the following field testing.

16.5.1.1.1 100 Percent Coverage Testing

The following two options are permitted for coverage testing of the compacted subgrade (both treated and untreated) layer. For untreated subgrade, the IQF shall complete the testing within 24 hours of the completion of compaction. On treated subgrade layers, the IQF shall allow the compacted material to cure a minimum of three days before testing.

Option 1 Proof Rolling: IQF shall follow the requirements of TxDOT *Standard Specification Item 216*. All areas which are determined as unstable or that rut more than 0.5 inch shall be considered as failures and require corrective action.

Option 2 Intelligent compaction (IC): to be performed on top of the compacted subgrade or treated subgrade. The IQF shall develop a color-coded "proof-mapping" chart in accordance with criteria listed in Table 1 from "TxDOT *Special Specification Item 2304"* provided in the RIDs. Red-mapped areas constituting locations not achieving at least 25% of the Intelligent Compaction Measured Value (ICMV) shall be further evaluated by the IQF with the DCP to determine depth of weak material for corrective action.

16.5.1.1.2 Point Specific - Testing

When using proof rolling, the IQF shall perform one DCP test in accordance with ASTM D6951 for every 250-linear foot section of roadbed to estimate M_R. The IQF shall use ASTM D 3665 to select one random location for each 250-foot section. All locations shall be greater than 1 foot from the future edge stripe.

When using proof-mapping IC data of the compacted layer, the IQF shall perform one DCP test in accordance with ASTM D6951 for every 250 linear foot section of roadbed for those locations classified as "red-mapped," or as directed by TxDOT. The IQF shall perform one DCP test for every 1000-linear foot

section of roadbed for non-"red-mapped" locations. The IQF shall use ASTM D 3665 to select one random location for each test section. All locations shall be greater than 1 foot from the future edge stripe.

The process for the IQF shall be as follows:

- Perform DCP tests to a depth of 3 feet. If a test location meets refusal, then select an alternate location within 2 to 5 feet to begin a new test. Refusal is defined as slow or no penetration progress where the penetration rate is less than 1 inch in a 10-blow set anywhere within the top 1 foot of subgrade material. If refusal is met after penetrating at least 1 foot, then the results to the depth of refusal shall be used.
- If the penetration rate for each 6-inch interval of penetration in the section is 35 mm/blow or less, then review proof rolling. If proof rolling passes, then accept section.
- If no estimated DCP result for any 6-inch interval of penetration exceeds a penetration rate of 60 mm/blow, take the average of results for all 6-inch intervals and compare to maximum allowable value of 35 mm/blow. If the average penetration rate for all intervals is computed to be lower than 35 mm/blow, then accept the section provided proof rolling passes. If the computed average exceeds 35 mm/blow, perform two additional DCP tests (one on either side) 10 feet longitudinally from the original test to determine the extent of the weak area. Continue testing at additional 10-foot increments until results no longer show weakness. DB Contractor shall determine a course of action to correct the weak areas. The IQF shall reevaluate following DB Contractor's corrective action.
- If DCP penetration rate for any 6-inch interval of penetration in the section exceeds 60 mm/blow, take two additional DCP tests (one on either side) 10 feet longitudinally from the original test to determine the extent of the weak area. Continue testing at additional 10-foot increments until results no longer show weakness. DB Contractor shall propose options to address these failed areas. The IQF shall reevaluate following DB Contractor's corrective action.

If corrective action is required, DB Contractor shall develop options for consideration. These could include:

- Calcium-based treatment;
- Reworking failing areas;
- Excavating existing subgrade and replacing with material meeting requirements in Section 16.3, to a depth that meets requirements; or
- Other options as recommended by DB Contractor with TxDOT approval.

Additional pavement thickness shall not be considered corrective action.

16.5.1.2 Smoothness Specification

Subject to the exceptions described in Section 16.5.2, Smoothness of the pavement constructed shall conform to the requirements of *TxDOT Standard Specification Item 585*, Ride Quality for Pavement Surfaces, amended as cited below:

Article 585.3.4. Acceptance Plan and Pay Adjustments. The entire section is voided and replaced by the following:

Only Surface Test Type B permitted; corrective action acceptable to TxDOT is required, at DB Contractor's sole expense, for any 0.1-mile section that measures an average IRI in excess of 75 inches per mile for rigid pavements overlaid with a hotmix surface, in excess of 65 inches per mile for flexible pavements, or for correction of local roughness. After making corrections, re-profile the pavement section to ensure that corrections have achieved the required level of smoothness. It is recommended to conduct profiler measurements when a HMA layer is directly below the final surface to identify need for corrective action prior to final HMA lift in order to obtain desired IRI on final surface.

For asphalt concrete pavements, DB Contractor shall fog seal the aggregate exposed from diamond grinding.

Article 585.4 Measurement and Payment. The entire section is voided.

Concrete surfacing and grinding shall only be performed during the day from 7:00am to 8:00pm due to noise concerns.

All travel lanes constructed within the Project limits and areas identified as travel lanes in the facility's final configuration shall be tested in accordance with TxDOT Standard Specifications as travel lanes.

16.5.2 **Next Generation Concrete Surface (NGCS) Grinding**

For all rigid mainlane pavement not overlaid, DB Contractor shall construct next generation concrete surfaces using diamond grinding and grooving techniques and conform to the smoothness specifications per Item 10,004, "Next Generation Concrete Surface (NGCS) Grinding."

16.5.3 **Flexible Pavement Transitions**

DB Contractor shall construct junctions of flexible pavement to rigid pavement in accordance with "JTFPCP-19(AUS)" as shown in the Austin District Standards. DB Contractor shall construct transverse butt joints with 50-foot horizontal to 1-inch vertical transition at the end of all flexible pavement surfaces. DB Contractor shall saw cut the pavement at the butt joints. All terminations of PFC shall be a butt joint.

16.6 **Uniformity of Support Layers**

For both rigid and flexible pavements, DB Contractor shall collect FWD data for information about both the adequacy and uniformity of support and shall provide the data to TxDOT. For rigid pavements, FWD testing shall be conducted on top of the asphalt base, asphalt bond breaker, or cement stabilized base layer prior to placement of any concrete. For flexible pavements, FWD testing shall be conducted on top of the base layer prior to placement of any hot mix asphalt. For treated bases, DB Contractor shall allow a minimum of three days following final compaction before testing. Testing shall be conducted at 100-foot intervals in each travel lane. The FWD shall conform to TxDOT Standard Specifications as described in the TxDOT *Pavement Manual* (seven sensors at 1-foot spacing). The test load shall be as close as possible to 9000 pounds.

16.7 **Submittals**

All Submittals described in Item 16 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 16-9. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated. Any deliverable submitted by DB Contractor to TxDOT for review after 11:59 a.m. will be considered as submitted on the next Business Day.

Table 16-9: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Traffic control plans associated with subsurface pavement investigations	Prior to performing any investigations	In accordance with Section 24	16.2.1
Preliminary Geotechnical Engineering Reports	Prior to commencement of applicable Design Work	Review and Comment	16.2.1, 16.2.2
Final Geotechnical Engineering Report	Prior to commencement of applicable Construction Work	Approval	16.2.1, 16.2.2
Preliminary Pavement Design Reports	Prior to commencement of applicable Design Work	Review and Comment	16.2.1, 16.4.1.4, 16.4.2.4
Final Pavement Design Report	Prior to commencement of applicable Construction Work	Approval	16.2.1, 16.4.1.4, 16.4.2.4
FWD data	As part of the daily QC inspection and test reports described is the TxDOT QAP for DB Projects and upon TxDOT request	For Information	16.6

Item 17
Land Surveying

17.1 **General Requirements**

DB Contractor shall provide accurate and consistent land surveying and mapping necessary to support ROW acquisition, design, and construction of the Project.

DB Contractor shall review existing survey data and determine the requirements for updating or extending the existing survey and mapping data as required to complete its Work. DB Contractor is responsible for the precision, accuracy, and comprehensiveness of all survey and mapping.

17.2 **Administrative Requirements**

17.2.1 **Standards**

DB Contractor shall ensure that all surveying conforms to the TxDOT *Survey Manual,* and the *General Rules of Procedures and Practices* of the *TBPLS*. DB Contractor shall ensure that any person in charge of a survey field party is proficient in the technical aspects of surveying.

17.2.2 **ROE**

DB Contractor shall secure written permission from the property owner prior to entering any private property outside the Project ROW. It shall be DB Contractor's sole responsibility to negotiate and obtain this permission and DB Contractor shall be responsible for any and all damages and claims resulting from that ingress. DB Contractor shall maintain proper documentation of ROE maintained at all times.

17.2.3 **Survey by TxDOT**

In performing surveys for other adjoining projects, TxDOT may need to verify and check DB Contractor's survey work. DB Contractor shall coordinate with the adjoining project regarding planned construction activities. DB Contractor shall notify TxDOT within two Business Days if TxDOT stakes and marks are altered or disturbed.

17.3 **Design Requirements**

17.3.1 **Survey Control Requirements**

DB Contractor shall base all additional horizontal and vertical control on the Level 2 and Level 3 control provided by TxDOT. DB Contractor shall be responsible for tying into TxDOT CORS vertical control and local monumentation. DB Contractor shall verify owner provided survey control.

DB Contractor shall establish and maintain additional survey control, as needed, and Project ROW monumentation throughout the Term. DB Contractor shall tie any additional horizontal and vertical control for the Project to the TxDOT-supplied Primary (Level 2) or Secondary (Level 3) control network. If DB Contractor chooses to use GPS methods, DB Contractor shall meet the accuracy of the appropriate level of survey as defined in the TxDOT *GPS User's Manual* and shall utilize the primary survey control provided by TxDOT.

DB Contractor shall establish and maintain a permanent survey control network. The control network should consist of, at a minimum, monuments set in indivisible pairs at spacing of no greater than three miles.

Monuments shall be TxDOT bronze survey markers installed in concrete and marked as directed by the TxDOT *Survey Manual*. DB Contractor shall replace all existing survey monuments and control points disturbed or destroyed during execution of the Work. DB Contractor shall make all survey computations and observations necessary to establish the exact position of all other control points based on the primary control provided.

DB Contractor shall deliver to TxDOT a listing of all primary and secondary control coordinate values, original computations, survey notes, and other records, including GPS observations and analyses, made by DB Contractor upon TxDOT request.

17.3.2 Conventional Method (Horizontal & Vertical)

If DB Contractor chooses to use conventional methods to establish additional horizontal control, DB Contractor shall meet the accuracy of the appropriate level of survey as defined in Tables 17-1 and 17-2.

17.3.2.1 Horizontal Accuracy Requirements for Conventional Surveys

Horizontal control is to be established (at a minimum) according to the appropriate level of survey as defined below in Table 17-1.

Table 17-1: Horizontal Accuracy Requirements

	TSPS First Order	TSPS Second Order	Remarks and Formulae
Error of Closure	1: 50,000	1:20,000	Loop or between monuments
Allowable Angular Closure	± 3” $\sqrt{N}$	± 8” $\sqrt{N}$	*N*= number of angles in traverse
Accuracy of Bearing in Relation to Course *	± 04”	± 10”	Maximum for any course
Linear Distance Accuracy (Minimum Length of Line)	1: 50,000 (2,500 feet)	1: 20,000 (1,000 feet)	
Positional Tolerance of Any Monument	*AC*/50,000	*AC*/20,000	*AC* = length of any course in traverse
Adjusted Mathematical Closure of Survey (no less than)	1:200,000	1:200,000	

Notes: * TxDOT policy requires all bearings or angles to be based on the following source: Grid bearing of the Texas Coordinate System of 1983, with the proper zone and epoch specified.

17.3.2.2 Vertical Accuracy Requirements for Conventional Surveys

Vertical control shall be established (at a minimum) on the North American Vertical Datum of 1988 (NAVD 1988), (Geoid 12A) and according to the appropriate level of survey as defined below in Table 17-2.

Table 17-2: Vertical Accuracy Requirements

	First Order	Second Order	Third Order	Remarks and Formulae
Error of Closure	0.013 feet $\sqrt{K}$	0.026 feet $\sqrt{K}$	0.039 feet $\sqrt{K}$	Loop or between control monuments
Maximum Length of Sight	250 feet	300 feet		With good atmospheric conditions
Difference in Foresight and Backsight Distances	±10 feet	±20 feet	±30 feet	Per instrument set up
Total Difference in Foresight and Backsight Distances	±20 feet per second	±50 feet per second	±70 feet per second	Per total section or loop
Recommended Length of Section or Loop	2.0 miles	3.0 miles	4.0 miles	Maximum distance before closing or in loop
Maximum Recommended Distance Between Benchmarks	2000 feet	2500 feet	3000 feet	Permanent or temporary benchmarks set or observed along the route
Level Rod Reading	± 0.001 foot	± 0.001 foot	± 0.001 foot	
Recommended Instruments and Leveling Rods	Automatic or tilting w/ parallel plate micrometer precise rods	Automatic or tilting w/ optical micrometer precise rods	Automatic or quality spirit standard, quality rod	When two or more level rods are used, they should be identically matched
Principal Uses	Broad area control, subsidence or motion studies jig & tool settings	Broad area control, engineering projects basis for subsequent level work	Small area control, drainage studies, some construction and engineering	

17.3.3 ROW Surveys

DB Contractor shall base all surveys on the horizontal and vertical control network provided by TxDOT.

DB Contractor shall coordinate with TxDOT regarding the assignment of RCSJ numbers for each new mapping project.

The documents produced by DB Contractor, or its Subcontractors, are the property of TxDOT, and release of any such document must be approved by TxDOT. All topographic mapping created by DB Contractor shall be provided to TxDOT in digital terrain model format using the software and version thereof being used by TxDOT at the time the mapping is developed. DB Contractor shall provide two sets of all mapping to the TxDOT District office surveyors. DB Contractor shall provide the mapping so as to allow a minimum of 20 days for TxDOT review and comment. DB Contractor shall obtain and address all TxDOT District office comments to TxDOT's satisfaction prior to signing maps.

In preparing the property description, the following will be required:

- Scanned copies of the deeds on USB flash drive and a graphics file of the abstract map; and
- Scanned copies of the field notes, control sketches, and a graphics file of all field survey data.

The Surveyor shall submit the following interim mapping products:

- A Preliminary ROW layout to determine if there are any changes to the proposed ROW; and
- An initial copy of the ROW map for review purposes.

17.3.3.1 **Accuracy Standards**

In performing ROW surveys consisting of boundary locations, DB Contractor shall meet the accuracy standards of the appropriate level of survey as defined below in Table 17-3.

Table 17-3: Chart of Tolerances

	Urban/Rural	Urban Business District	Remarks and Formulae
Error of Closure	1:10,000	1:15,000	Loop or between control monuments
Angular Closure	15" $\sqrt{N}$	10" $\sqrt{N}$	N = number of angles in traverse
Accuracy of Bearing in Relation to Source *	20 seconds	15 seconds	Sin α = denominator in error of closure divided into 1 (approximate)
Linear Distance Accuracy	0.1 foot per 1,000 feet	0.05 foot per 1,000 feet	Sin α x 1000 (approximate) where ± = accuracy of bearing
Positional Error of any Monument	*AC*/10,000	*AC*/15,000	*AC* = length of any course in traverse
Adjusted Mathematical Closure of Survey (no less than)	1:50,000	1:50,000	

NOTE: * TxDOT policy requires all bearings or angles to be based on the following source: Grid bearing of the Texas Coordinate System of 1983, with the proper zone and epoch specified.

17.3.4 **Survey Records and Reports**

DB Contractor shall produce a horizontal and vertical control report, including coordinate listing, maps showing control, preparation of standard TxDOT data sheets for all primary control, monument description and location description of all primary and secondary survey control points installed, marked and referenced, along with a listing of the existing control used to create the installed control points. The report shall provide control from adjoining, incorporated, or crossed roadway projects that are currently in design, and show a comparison of the horizontal and vertical values. DB Contractor shall provide survey records and reports to TxDOT upon request.

DB Contractor may use an electronic field book to collect and store raw data. DB Contractor shall preserve original raw data and document any changes or corrections made to field data, such as station name, height of instrument, or target. DB Contractor shall also preserve raw and corrected field data in hardcopy output forms in a similar manner to conventional field book preservation.

Field survey data and sketches that cannot be efficiently recorded in the electronic field book shall be recorded in a field notebook by DB Contractor and stored with copies of the electronic data.

All field notes shall be recorded in a permanently bound book. (Loose leaf field notes will not be allowed.) DB Contractor shall deliver copies of any or all field notebooks to TxDOT upon request.

17.3.5 **Units**

All survey Work shall be performed in the U.S customary units system of measurement. Work shall conform to Texas State Plane Coordinate System, Central Zone (4203), NAD83 (93) (HARN). The combined adjustment factor for the Project is 1.000065048.

17.4 **Construction Requirements**

17.4.1 **Survey Records**

DB Contractor shall deliver to TxDOT, for its review and acceptance, a listing of all primary, secondary control coordinate values, original computations, survey notes and other records including GPS observations and analysis made by DB Contractor prior to Final Acceptance.

17.4.2 **Construction Surveys**

DB Contractor shall perform all construction surveys in accordance with the design requirements set forth in the Contract Documents.

17.4.3 **Reserved.**

17.4.4 **ROW Monuments**

Upon final submittal of the ROW documents to TxDOT, DB Contractor shall set, using permanent and stable monuments as defined in Section 663.17 of the General Rules of Procedures and Practices of the TBPLS, all significant points along all ROW lines of the Project including the following:

- PCs;
- PTs;
- PIs;
- PCCs;
- PRCs;
- All intersecting crossroad ROW lines and all property line intersections with the ROW line. These monuments shall be 1/2-inch iron rods, driven just below surface level, capped by a TxDOT-labeled aluminum cap (rod-and-cap monument); and
- All beginning and ending points of control of access (denied) lines.

DB Contractor shall ensure that upon completion of the ROW acquisition and all Construction Work, such that the final ROW lines will not be disturbed by construction, DB Contractor shall replace all rod-and-cap monuments located on the final ROW line at all PCs, PTs, PIs, PCCs, and PRCs, and all intersecting crossroad ROW lines, with TxDOT Type II monuments (constructed according to the TxDOT ROW Manuals and the TxDOT *Survey Manual*). DB Contractor shall monument with a TxDOT Type II monument all final ROW lines where the distance between such significant ROW line points exceeds 1,500 feet. ROW line intersections with property lines shall remain monumented by a 1/2-inch iron rod with a TxDOT aluminum cap (rod-and-cap monument). DB Contractor shall ensure that the ROW monuments shall be set by a survey crew working under the direction of a RPLS, licensed to practice in Texas.

DB Contractor shall purchase all materials, supplies, and other items necessary for proper survey monumentation.

DB Contractor shall submit updated maps with the ROW monumentation information. (This is for final monumentation set, for example, type II, and type of monuments set, etc.) DB Contractor shall add all deed recording information to the map sheets in the ownership blocks on the map sheets.

17.4.5 **Record Documents**

DB Contractor shall submit the following as part of the Record Documents and as a condition of Final Acceptance:

- A listing of all primary and secondary control coordinate values, original computations and other records, including GPS observations and analysis made by DB Contractor;
- Copies of all survey control network measurements, computations, unadjusted and adjusted coordinates, and evaluation values;
- Survey records and survey reports;
- Parcels for the ROW maps in GPK format;
- Electronic files and paper copies of the ROW maps; and
- The final ROW maps consisting of the graphics files and two sets of the paper copy of the ROW maps, exhibits showing the metes and bounds description and parcel plat, signed and sealed by the Surveyor. The required geo-referenced parcel data (features) for all existing and revised parcels shall be submitted in ArcGIS 10 format or the version in use by the TxDOT at the time of the submittal, and in the format of the TxDOT ROW Geo-Database Template "ROW_Parcels_Edits."

DB Contractor shall produce reports documenting the location of the as-built alignments, profiles, structure locations, utilities, and survey control monuments as part of the Record Documents as a condition of Final Acceptance. These reports shall include descriptive statements for the survey methods used to determine the as-built location of the feature being surveyed. DB Contractor's as-built data shall include the coordinate types (x, y, and/or z) and feature codes in the same format in which the preliminary construction data was

generated. Where data has been provided to DB Contractor from TxDOT in an x, y, z only coordinate format, or z only coordinate format, DB Contractor shall provide TxDOT with data in an x, y, z only coordinate format or z only coordinate format.

17.5 Submittals

DB Contractor shall submit all submittals described in this Item 17 to TxDOT in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 17-4. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 17-4: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
ROE documentation	Upon request	For information	17.2.2
Survey records as listed in Section 17.2.3	Upon request	For information	17.2.3
Verification of owner provided survey control	After NTP2	For information	17.3.1
All topographic mapping created by DB Contractor	Prior to signing maps	Review and comment	17.3.3
A horizontal and vertical control report	Upon request	For information	17.3.4
Survey records and reports	Upon request	For information	17.3.4
Copies of all field notebooks	Upon request	For information	17.3.4
Survey records as listed in Section 17.4.1	Prior to Final Acceptance	Review and acceptance	17.4.1
ROW Surveying and Mapping documents	Upon completion but prior to Final Acceptance	Approval	17.4.4
Updated mapping with any ROW monument information	Upon completion of the ROW acquisition and all Construction Work	For information	17.4.4
Record Documents	As a condition of Final Acceptance	For information	17.4.5

Item 18
Grading

18.1 **General Requirements**

DB Contractor shall conduct all Work necessary to meet the requirements for grading, including clearing and grubbing, excavation and embankment, removal of existing buildings, concrete slabs, pavement and miscellaneous structures, subgrade preparation and stabilization, dust control, aggregate surfacing, and earth shouldering in accordance with the requirements of this Item 18.

DB Contractor shall demolish or abandon in place, all existing structures within the Project ROW no longer required for service, including, but not limited to: pavements, bridges, and headwalls. Any features that are abandoned in place shall be removed to an elevation at least the lower of 2 feet below the final finished grade or 1 foot below the pavement subgrade and drainage structures. DB Contractor shall ensure that abandoned structures are structurally sound after abandonment.

DB Contractor is prohibited from the use of blasting techniques.

18.2 **Preparation within Project Limits**

DB Contractor shall develop, implement, and maintain, for the Term, a Demolition and Abandonment Plan that considers types and sizes of Utilities and structures that will be abandoned during the Term. The plan shall ensure that said structures are structurally sound after the abandonment procedure. The plan shall be submitted to TxDOT for approval prior to NTP2.

TxDOT reserves the right to require DB Contractor, at any time to salvage and deliver to a location designated by TxDOT within the TxDOT District, in which the portion of the Project is located, any TxDOT-owned equipment and materials in an undamaged condition. TxDOT reserves the right to require DB Contractor to salvage and deliver to a reasonable location designated by TxDOT any ITS equipment and materials in an undamaged condition.

Unless otherwise specified by TxDOT, the material from structures designated for demolition shall be DB Contractor's property. All material removed shall be properly disposed of by DB Contractor outside the limits of the Project.

18.3 **Slopes and Topsoil**

DB Contractor shall follow TxDOT *Roadway Design Manual* and exercise Good Industry Practice regarding design limitations and roadside safety guidelines associated with the design of slopes along roadways.

DB Contractor shall perform finished grading and place topsoil to an adequate depth in all areas suitable for vegetative slope stabilization (and areas outside the limits of grading that are disturbed in the course of the Work) that are not paved. DB Contractor shall use only materials and soils next to pavement layers that do not cause water or moisture to accumulate in any layer of the pavement structure. DB Contractor shall provide stable slopes.

For designated construction easements and other approved PSLs outside DB Contractor's limits of maintenance, DB Contractor shall provide stable slopes.

For slopes steeper than 4:1, DB Contractor shall submit to TxDOT a slope stability analysis that demonstrates the adequacy of DB Contractor's design. DB Contractor shall submit the slope stability analysis to TxDOT for approval prior to submitting the Final Design. DB Contractor shall pave slopes steeper than or equal to 2:1 with concrete riprap.

Slopes that are to remain unpaved must accommodate mower access from the frontage road. Where access for mowing and maintenance operations cannot be provided from the frontage road, slopes must be paved with concrete riprap unless DB Contractor receives prior approval from TxDOT for an alternative access point. DB Contractor shall pave areas less than 2-foot in width and areas below structures with less than 10-foot vertical clearance with concrete rip rap.

DB Contractor shall sequence grading operations with construction phase erosion and sedimentation controls as described in Item 12, "Environmental."

18.4 **Sodding and Seeding**

In accordance with TxDOT *Standard Specification Item 162*, DB Contractor shall place Bermudagrass sod at all open disturbed areas outside the frontage roads and within the Project ROW prior to completion of the Project, except if St. Augustine grass is adjacent to the area, in which case DB Contractor shall place St. Augustine grass sod. DB Contractor shall seed all open disturbed areas inside the frontage roads within the Project ROW prior to completion of the Project using the wildflower seeding mix set forth in Table 18-1 in addition to the seeding requirements in TxDOT *Standard Specification Item 164*. DB Contractor shall use a no-till or pasture type drill that is capable of release of small seeds, large seeds, and fluffy seeds uniformly. Grain seeding drills are not permitted. DB Contractor shall establish and maintain all erosion and sediment controls in accordance with the approved SW3P, and the condition of the erosion and sediment controls shall be in good working order throughout construction of the Project. DB Contractor shall stabilize disturbed areas on which construction activities have ceased temporarily or permanently, within 14 days unless they are scheduled to resume construction within 21 days. DB Contractor shall not remove construction phase erosion and sediment controls until their removal has been approved by TXDOT. The areas adjacent to creeks and drainage ways have priority followed by devices protecting storm sewer inlets.

Table 18-1: Wildflower Seeding

Common Name	Scientific Name	lb. PLS/acre
Illinois Bundleflower	*Desmanthus Illinoensis*	6.0
Indian Blanket	*Gaillardia Pulchella*	6.0
Lemon Mint	*Mondarda Citriodora*	1.0
Bluebonnet	*Lupinus Texensis*	12.0
Pink Evening Primrose	*Oenothera Speciosa*	1.0
Black-eyed Susan	*Rudbecia Hirta*	1.0
Indian Paintbrush	*Castilleja Miniata*	1.0
Partridge Pea	*Cassia (Chamaecrista) Fasiculata*	8.0
Plains Coreopsis	*Coreopsis Tinctoria*	1.0

18.5 **Construction Requirements**

DB Contractor shall conduct all Work necessary to meet the requirements for grading in accordance with the requirements of this Item 18 and the TxDOT Standard Specifications.

18.6 **Submittals**

All Submittals described in this Item 18 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 18-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 18-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Demolition and Abandonment Plan	Prior to NTP2	Approval	18.2

Table 18-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Slope stability analysis	Prior to final submittal	Approval	18.3

Item 19
Roadways

19.1 **General Requirements**

DB Contractor shall coordinate roadway design, construction, and maintenance with other elements of the Project to achieve the Project objectives.

Where changes to the roadway geometrics result in revisions to the Project ROW, DB Contractor is responsible for demonstrating the proposed change is an equally safe alternative, as well as the initiation and progression of all environmental and public involvement processes in coordination with TxDOT. DB Contractor shall perform all ROW acquisition services that are necessitated by proposed changes in accordance with the Contract Documents.

DB Contractor shall not place temporary or permanent roadways in the Tree Preservation Areas.

19.1.1 **Lead Roadway Design Engineer**

DB Contractor shall employ a Lead Roadway Design Engineer responsible for ensuring the design of the roadway is completed and design criteria requirements are met. The Lead Roadway Design Engineer shall be a PE and be responsible for coordinating interdisciplinary design reviews in cooperation with leaders of other disciplines. The Lead Roadway Design Engineer or a PE reporting directly to the Lead Roadway Design Engineer shall be the engineer of record for the design of the roadway elements.

19.2 **Design Requirements**

DB Contractor shall complete the design of the Project roadways in accordance with the Schematic Design. Deviations from the Schematic Design shall be requested in accordance with General Conditions Section 5.2.2.2.1.

DB Contractor shall design roadways to be consistent with the design of all other elements of the Project, including aesthetics. The Project roadways shall be designed to integrate with streets and roadways that are adjacent or connecting to the Project. All design transitions to existing facilities shall be in accordance with the TxDOT *Roadway Design Manual*.

DB Contractor shall design all elements in accordance with the TxDOT *Roadway Design Manual,* TxDOT Engineering Standard Sheets, applicable design criteria, and Good Industry Practice based on the Design Speeds as shown in the Contract Documents.

DB Contractor shall design the Project roadways to promote safety and to mitigate visual and noise impacts on neighboring properties.

All roadside safety hardware used on the Project shall meet Manual for Assessing Safety Hardware (MASH) current crash test criteria and other safety requirements and conform to TxDOT Engineering Standard Sheets. DB Contractor shall replace all roadside safety hardware within the Project limits that is East of US 290 and Old Fredericksburg Road with hardware meeting MASH current crash test criteria and other safety requirements in accordance with TxDOT Engineering Standard Sheets. Within the Project limits and west of Old Fredericksburg Road, DB Contractor shall replace all roadside safety hardware as necessary to meet MASH requirements.

19.2.1 **Control of Access**

Unless identified in and shown to be denied in the Schematic Design, DB Contractor shall maintain all existing property accesses, including those not shown on the Schematic Design, and shall not revise control of access without TxDOT review and the written agreement of the affected property owner. DB Contractor shall design new and revised exit and entrance ramps to meet the desirable spacing requirements between ramps and driveways, side streets, or cross streets listed in TxDOT *Roadway Design Manual* and TxDOT *Access Management Manual*. In locations where the desirable spacing cannot be achieved, DB Contractor shall submit to TxDOT for approval a demonstration why the spacing cannot be achieved and a request for

permission to design and implement channelization methods per TxDOT *Roadway Design Manual* and TxDOT *Access Management Manual*.

DB Contractor shall coordinate with TxDOT and the landowner when tying-in to private property; shall replace necessary signs, mailboxes, fences, and landscape features; and shall coordinate all access.

19.2.2 **Design Criteria**

19.2.2.1 **Reserved.**

19.2.2.2 **Geometric Design Criteria**

DB Contractor shall design the elements of the Project to meet or exceed the geometric design criteria shown in Table 19-1 (Geometric Design Criteria). DB Contractor shall utilize the geometric design criteria shown in Table 19-1 for the corresponding roadway types and approximate limits shown in the "Oak Hill Parkway Pavement Designations" document included in the RIDs. DB Contractor shall utilize the geometric design criteria shown in Table 19-1 for both existing and proposed roadways within the limits of widening and rehabilitation shown in the "Oak Hill Parkway Pavement Designations" document included in the RIDs.

Table 19-1: Geometric Design Criteria

	Mainlanes	Frontage Roads	Ramps
Functional Classification	Freeway	High Speed Arterial***	Ramp
Design Speed	60 mph (55 mph for US 290 station 194+29.36 to station 219+00)	45 mph	45 mph
Stopping Sight Distance	570 ft	360 ft	360 ft
Horizontal Alignment Criteria:			
Maximum Curvature (Min Radius)	1550 ft	810 ft	810 ft
Superelevation – e(max)	6 %	6 %	6 %
Maximum Curvature (Min Radius) w/o Superelevation	11,100 ft	6,480 ft**	6,480 ft
Vertical Alignment Criteria:			
Maximum Gradient	4 % (5% for US 290 station 194+29.36 to station 219+00)	6 %	6 % (7% for 290EBEN1, 290WBEX1, and 290WBEX2)
Minimum Gradient	0.5 %	0.5 %	0.5 %
Crest (min K-Value)	151	61	61
Sag (min K-Value)	136	79	79
Maximum Algebraic Difference w/o Vertical Curve	0.5 %	0.5 %	0.5 %
Min Vertical Clearance – Roadway	16.75 ft	16.75 ft	16.75 ft
Cross Section Criteria:			
Lane Widths	12 ft	12 ft	14 ft (12 ft for 2+ lanes)
U-turn Lane Width	NA	20 ft	NA
Inside Shoulder Widths	10 ft	1.5 ft Curb offset (curbed) 4 ft (uncurbed)	4 ft
Outside Shoulder Widths	10 ft	1.5 ft Curb offset (curbed) 8 ft (uncurbed)	8 ft
Pavement Cross Slope	2.5% (existing and proposed pavement to match existing in widening areas)	2.5% (existing and proposed pavement to match existing in widening areas)	2%
Side Slope Within Clear Zone	6:1	6:1	6:1
Side Slope Outside Clear Zone	4:1*	4:1*	4:1*
Curb Offset	NA	1.5 ft	1.5 ft
Clear Zone Width	30 ft	4 ft (curbed) 10 ft (uncurbed) (6 ft for bridge abutments and columns)	16 ft
Intersection & U-turn Horizontal and Vertical Criteria:			
Corner Radii	NA	40 ft	NA
Design Vehicle	WB-62 (WB-50 at local access road to EB US 290 at approximate station 214+00)	WB-62 (WB-50 at SH 71 north-south turnaround at approximate station 1070+00)	WB-62
Preferred Corner Geometry	NA	40 ft	NA
Minimum Gradient	NA	0.35 %	NA

*For side slopes steeper than 4:1, DB Contractor must follow the requirements listed in Section 18.3
** 290WBFR-EB_1 from station 1238+00 to the end of alignment, minimum radius = 35 ft
*** Through limits of signalized intersections and 300 ft before and 300 ft after signalized intersections, Functional Classification = Low Speed Arterial for superelevation requirements (no superelevation required)

Table 19-1: Geometric Design Criteria (continued)

	Direct Connectors	Collector Distributors	Single Point Urban Interchange (SPUI)
Functional Classification	Direct Connector	Collector	Collector
Design Speed	45 mph	45 mph	35 mph
Stopping Sight Distance	360 ft	425 ft	250 ft
Horizontal Alignment Criteria:			
Maximum Curvature (Min Radius)	810 ft	833 ft	371 ft
Superelevation – e(max)	6 %	6%	4 %
Maximum Curvature (Min Radius) w/o Superelevation	6,480 ft	7,870 ft	510 ft
Vertical Alignment Criteria:			
Maximum Gradient	6 %	7 %	6 %
Minimum Gradient	0.5 %	0.5 %	0.50 %
Crest (min K-Value)	61	61	29
Sag (min K-Value)	79	79	49
Maximum Algebraic Difference w/o Vertical Curve	0.5 %	0.5 %	1.0 %
Min Vertical Clearance – Roadway	16.75 ft	16.75 ft	16.75 ft
Cross Section Criteria:			
Lane Widths	14 ft	14 ft (1-lane) 12 ft (2-lane)	12 ft
U-turn Lane Width	NA	NA	20 ft
Inside Shoulder Widths	4 ft	4 ft	4 ft
Outside Shoulder Widths	8 ft	8 ft	8 ft
Pavement Cross Slope	2%	2%	2%
Side Slope Within Clear Zone	6:1	6:1	6:1
Side Slope Outside Clear Zone	4:1*	4:1*	4:1*
Curb Offset	1.5 ft	1.5 ft	1.5 ft
Clear Zone Width	16 ft	Depends on ADT, Curbed or uncurbed - 10 ft	4 ft (6 ft for bridge abutments and columns)
Intersection Horizontal and Vertical Criteria:			
Corner Radii	NA	NA	40 ft
Design Vehicle (Intersection)	WB-62	NA	WB-62
Preferred Corner Geometry	NA	NA	30 ft
Minimum Gradient	NA	NA	0.50%

*For side slopes steeper than 4:1, DB Contractor must follow the requirements listed in Section 18.3.

Table 19-1: Geometric Design Criteria (continued)

	Cross Streets: William Cannon Drive	Cross Streets: RM 1826	Cross Streets: Other
Functional Classification	Low Speed Arterial	Low Speed Arterial	Low Speed Arterial
Design Speed	35 mph	40 mph	30 mph
Stopping Sight Distance	305 ft	305 ft	200 ft
Horizontal Alignment Criteria:			
Maximum Curvature (Min Radius)	371 ft	533 ft	250 ft
Superelevation – e(max)	4 %	4 %	4 %
Maximum Curvature (Min Radius) w/o Superelevation	510 ft	762 ft	333 ft
Vertical Alignment Criteria:			
Maximum Gradient	5.5 %	4 %	5 % (8% for Scenic Brook and Convict Hill)
Minimum Gradient	0.35 %	0.35 %	0.35 %
Crest (min K-Value)	44	44	19
Sag (min K-Value)	64	64	37
Maximum Algebraic Difference w/o Vertical Curve	1.0 %	1.0 %	1.0 %
Min Vertical Clearance – Roadway	16.75 ft	16.75 ft	16.75 ft
Cross Section Criteria:			
Lane Widths	11 ft	12 ft	12 ft
U-turn Lane Width	20 ft	20 ft	20 ft
Inside Shoulder Widths	NA	NA	NA
Outside Shoulder Widths	NA	NA	NA
Pavement Cross Slope	2%	2%	2%
Side Slope Within Clear Zone	6:1	6:1	6:1
Side Slope Outside Clear Zone	4:1*	4:1*	4:1*
Curb Offset	1.5 ft	1.5 ft	1.5 ft
Clear Zone Width	4 ft	4 ft	4 ft
Intersection Horizontal and Vertical Criteria:			
Corner Radii	40 ft	40 ft	40 ft
Design Vehicle (Intersection)	WB-62	WB-62	WB-62
Preferred Corner Geometry	30 ft	30 ft	30 ft
Minimum Gradient	0.35 %	0.35 %	0.35 %

*For side slopes steeper than 4:1, DB Contractor must follow the requirements listed in Section 18.3.

19.2.2.3 Mainlanes

Along US 290 from approximately station 245+00 to the eastern Project limits, DB Contractor shall design the Project maintaining a 28-foot reserved median from the inside edge of pavement only allowing a four-foot encumbrance in the center (two feet on each side) for traffic barrier, column and lighting placement.

Along US 290 from approximate station 210+00 to station 245+00, DB Contractor shall design the Project to incorporate a 114-foot mainlane reserved space. DB Contractor shall ensure that the entire 114-foot mainlane reserved space shall be clear of all bridge bents, retaining walls, and other structures other than a four-foot encumbrance in the center (two feet on each side) for traffic barrier, column and lighting placement.

DB Contractor shall ensure the vertical clearance requirements in Section 19.2.2.2 will be achieved from the projected cross slope of the final pavement to the roadway centerline throughout the 28-foot reserved median and the 114-foot mainlane reserved space.

Along US 290 from approximately station 285+00 to approximately station 305+00, DB Contractor shall design and construct retaining walls adjacent to the mainlanes with an offset of 13.5-feet from the edge of

pavement. The bottom of wall elevation shall be a minimum of 3-feet below the projected cross slope of the final mainlane pavement at the retaining wall alignment.

Along westbound US 290 from the Scenic Brook exit ramp (Ramp 290WBEX1) to the SH 71 entrance ramp (Ramp 290WBEN3), DB Contractor shall design and construct an additional 12-ft of roadway at the outside of the westbound mainlanes, similar to the Schematic Design.

Along eastbound US 290 from the Scenic Brook entrance ramp (Ramp 290EBEN1) beginning of mainlane physical gore to mainlane tip of painted gore, DB Contractor shall design and construct an additional 12-ft of roadway at the outside of the mainlanes, similar to the Schematic Design. From the Scenic Brook entrance ramp (Ramp 290EBEN1) mainlane tip of painted gore, the DB Contractor shall construct an 800-foot transition from 12-ft to 0-ft of roadway width at the outside of the mainlanes, similar to the Schematic Design.

Along the SH 71 mainlanes, for their entire length, DB Contractor shall design and construct the mainlanes with a clear width (on bridge) and pavement width (on roadway) of 36-feet (for each direction of traffic).

19.2.2.4 Frontage Roads, Cross Streets and Ramps

DB Contractor shall design and construct frontage roads and cross street minimum approach right and left turn storage bay lengths per “Oak Hill Parkway Cross Street Matrix” included in the RIDs.

DB Contractor shall accommodate and provide a reserved space as described in “Oak Hill Parkway Cross Street Matrix” as shown in the RIDs. DB Contractor shall ensure that the required reserved areas are clear of any bridges or other structures. DB Contractor shall ensure that the vertical clearance requirements in Section 19.2.2.2 is achieved throughout the reserved area.

DB Contractor shall design and construct inside and outside shoulders along all one-lane frontage roads and transitions to/from one-lane frontage roads.

DB Contractor shall design and construct shoulders along frontage roads where curb and gutter is not used.

The eastbound frontage road from approximately station 3353+00 to approximately station 3358+00 shall be designed and constructed with a 12-foot inside shoulder and no outside shoulder.

The westbound SH 71 frontage road from approximately station 2081+50 to approximately station 2097+00 shall be designed and constructed with a 16-foot inside shoulder.

The eastbound SH 71 frontage road from approximately station 4084+00 to approximately station 4094+00 shall be designed and constructed with a 16-foot inside shoulder.

Ramp 71WBEX1 and Ramp 71EBEN1 shall be constructed with 16’ outside shoulders and 8’ inside shoulders.

19.2.2.5 Superelevation

In areas where proposed roadways and ramps are to connect to existing pavement, DB Contractor’s design may retain existing superelevation if appropriate. Superelevation transitions shall be designed and constructed such that zero percent cross-slopes will not occur on longitudinal grades flatter than 0.10%.

19.2.2.6 Direct Connectors

DB Contractor shall design and construct the maximum elevation of the direct connectors measured from the profile grade line to be 885.5 feet on the Schematic Design and shall not be increased without written approval by TxDOT.

Along the direct connectors, for their entire length, DB Contractor shall design and construct the direct connectors with a clear width (on bridge) and pavement width (on roadway) of 36-feet (for each direction of traffic).

19.2.2.7 Roadway Design Deviations

[A brief description of which design deviations are permitted will be provided at a later date]

19.2.2.7.1 Design Exceptions

Reserved.

19.2.2.7.2 **Design Exception Documentation for Existing Conditions within Project limits**

Reserved.

19.2.3 **Miscellaneous Design Requirements**

19.2.3.1 **Driveways**

DB Contractor shall design and construct driveways, including existing driveways and those not shown on the Schematic Design, to be functionally adequate for existing land use of adjoining property and permits approved prior to the Effective Date. This shall be in accordance with the guidelines, which TxDOT will consider requirements for the purpose of this Project, specified in TxDOT Roadway Design Manual – Appendix C, "Driveways Design Guidelines." DB Contractor shall design and construct driveways in accordance with Austin District Standards. Existing concrete driveways shall be reconstructed with concrete pavement, and existing asphalt and unpaved driveways shall be reconstructed with asphalt pavement. DB Contractor shall design driveways with a flare in lieu of a radius in accordance with "DW-19(AUS)" as shown in the Austin District Standards.

19.2.3.2 **Cable Barrier**

DB Contractor shall install a MASH compliant cable barrier system in the center median of US 290. The system shall include a mow strip as shown in the Austin District Standards. DB Contractor shall not use fiber reinforcement in mow strips for safety hardware.

19.2.3.3 **Metal Beam Guard Fence**

DB Contractor shall design all metal beam guard fence to include a mow strip as shown in the TxDOT Engineering Standard Sheets. Traffic barrier, other than the MASH compliant cable barrier system in the center median of US 290, greater than 250 feet in length shall be concrete barrier or bridge rail in its entirety in accordance with the TxDOT Engineering Standard Sheets and not metal beam guardrail.

19.2.3.4 **Bus Stops**

Bus stops with turnouts shall be designed and constructed in accordance with "Bus Turnout Detail Example" and "CapMetro Turnout Pavement" included in the Austin District Standards. For bus stops without turnouts, DB Contractor shall design and construct the shelter pads in accordance with "Bus Turnout Detail Example". Final locations for bus stops shall be approved by both TxDOT and CapMetro. Preliminary locations are shown in "Capital Metro Bus Stop Inventory" included in the RIDs.

19.3 **Construction Requirements**

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 19 in accordance with the requirements of this Item 19 and TxDOT Standard Specifications.

Item 20
Drainage

20.1 General Requirements

In the design of the drainage facilities, DB Contractor shall account for all sources of runoff that may reach the Project, whether originating within or outside the Project ROW.

The drainage features including inlet, pipes, outfall, culverts, bridge waterway openings, channel overbank mitigation areas, water quality and detention pond location shown in the Schematic Design and the preliminary drainage report are planning level only in nature and shall not be assumed to be representative of preliminary or final design locations and configurations. DB Contractor shall determine the detention and water quality mitigation strategies, location, appropriate size for all drainage features needed to address the requirements of the Contract Documents.

DB Contractor shall design the Project, including all drainage facilities, such that the revised or newly constructed drainage system will not increase flooding to properties outside the Project ROW. If existing drainage patterns or flows are revised during the Project design, DB Contractor shall design and construct a solution that does not have adverse impacts to property owners outside the Project ROW with the exception of Gaines Tributary and Williamson Creek. For Gaines Tributary and Williamson Creek, there is to be no increase in discharge or water surface elevation from the project outside of the Project ROW. Adverse impacts for the purposes of this Item 20 are defined as impacts that have the potential to increase risk to health and human safety, cause or exacerbate flooding of developed structures, or cause any increase water surface elevations on undeveloped properties.

DB Contractor's drainage design shall include assessments of pre- and post-construction conditions, as well as assessments of conditions during construction staging. DB Contractor shall ensure and demonstrate that its drainage design does not cause any material impact to off-Site property owners in terms of developability or marketability of their property. DB Contractor shall obtain the appropriate drainage easement at its own cost if easement is deemed necessary and has not previously been obtained by TxDOT. Grading activities and drainage structures needed outside of the Project ROW require a construction or perpetual easement as appropriate.

DB Contractor shall meet the requirements specified in this Item 20 along with the requirements of the TxDOT *Hydraulic Design Manual*.

20.2 Administrative Requirements

20.2.1 Data Collection

To establish a drainage system that complies with the requirements and accommodates the historical hydrologic flows in the Project limits, DB Contractor is responsible for collecting all necessary data, including those elements outlined in this Section 20.2.1.

DB Contractor shall collect all applicable data identifying all water resource issues, including water quality requirements as imposed by State and federal government regulations; national wetland inventory and other wetland/protected waters inventories; in FEMA mapped floodplains; and official documents concerning the Project, such as the EA or other drainage and environmental studies. Water resource issues include areas with historically inadequate drainage (flooding or citizen complaints), environmentally sensitive areas, localized flooding, maintenance problems associated with drainage, and areas known to contain Hazardous Materials. DB Contractor shall also identify watershed boundaries, protected waters, county ditches, floodplains, and boundaries between regulatory agencies (e.g., watershed districts and watershed management organizations).

DB Contractor shall acquire all applicable municipal drainage plans and watershed management plans. DB Contractor shall acquire all pertinent existing storm drain plans and existing survey data, including data for all culverts, drainage systems, and storm drain systems within the Project limits. DB Contractor shall also identify existing drainage areas that contribute to the highway drainage system and the estimated runoff used for design of the existing system.

DB Contractor shall obtain photogrammetric and GIS data within the Project limits that depicts the "Outstanding National Resource Waters" (ONRW) and impaired waters as listed by the TCEQ. DB Contractor shall conduct surveys for information not available from other sources.

DB Contractor shall create an inventory of all existing drainage facilities including structures, culverts, ditches, and storm drains within the Project corridor. The inventory must include the condition, size, material, location, status, videotape or photographs, and other pertinent information. DB Contractor shall verify that all existing drainage components that are to remain have adequate capacity and design life as defined in this Item 20 and Item 21, "Structures." If any elements of the existing system do not comply with the requirements of this Item 20 or Item 21, "Structures," DB Contractor shall improve those elements to meet requirements of this Item 20 and Item 21, "Structures."

The data collected shall be used in the design of the drainage facilities.

20.2.2 Coordination with Other Agencies

DB Contractor shall coordinate all water resource issues with affected stakeholders and regulatory agencies. DB Contractor shall document the resolution of water resource issues.

While coordinating design with TxDOT, DB Contractor shall make every effort to design the Project in a manner to avoid CLOMR and LOMR. DB Contractor will not be responsible for the CLOMR or LOMR. DB Contractor shall prepare the required documentation, perform the necessary calculations and design, and provide to the local floodplain administrators (FPA) all information and technical data needed for the FPA to file a CLOMR/LOMR with FEMA.

Drainage areas and structures that fall under the jurisdiction of the USACE shall comply with all USACE requirements. DB Contractor shall coordinate review and approval of the design and construction, if necessary, with the USACE. DB Contractor shall be responsible for obtaining applicable USACE permits.

DB Contractor shall coordinate with TCEQ for meeting water quality requirements. DB Contractor shall be responsible for acquiring all permits including submitting a WPAP and obtaining TCEQ approval.

DB Contractor shall coordinate with TxDOT in order to have a TxDOT representative present at all meetings with affected stakeholders and regulatory agencies.

20.3 Design Requirements

DB Contractor shall design all elements of the drainage facilities in accordance with this Item 20, the applicable design criteria, Good Industry Practice and the TxDOT *Hydraulic Design Manual*.

The design of temporary and proposed drainage systems shall meet the performance requirements as defined in this Item 20. DB Contractor may make use of existing drainage facilities, provided overall drainage requirements for the Project are achieved and the combined drainage system functions as required. Should a temporary or proposed drainage system tie to an existing drainage system, the connected existing system shall also be designed and reconfigured, as necessary, to ensure the temporary or proposed system meets the performance requirements as defined in this Item 20 or Item 21, "Structures," while maintaining or improving the performance of the connected existing drainage system.

Modifications to existing drainage patterns should be minimized. DB Contractor bears full responsibility for the Final Design and its effects on property owners outside the Project ROW.

DB Contractor shall base its design on design computations and risk assessments for all aspects of Project drainage.

DB Contractor shall design roadside open channels such that the profiles have adequate grade to minimize sedimentation.

DB Contractor shall design all ponds solely used for storm water control, with the exception of the offsite detention pond, to include an impermeable geomembrane liner in accordance with TxDOT Special Specification 5056.

DB Contractor shall provide a drainage system that maintains or improves the existing drainage.

DB Contractor shall utilize the TxDOT statewide precast drainage standard sheets for inlets, manholes, outfalls, and additional details as shown in the TxDOT Engineering Standard Sheets.

DB Contractor will be responsible for preparing details for special non-standard inlets, manholes, outfalls, junction boxes, splitter boxes, etc.

DB Contractor shall utilize the National Weather Services' Atlas 14 rainfall depths for all drainage analysis and design, including hydrologic and hydraulic calculations.

DB Contractor shall make available to TxDOT, as part of the Submittals, all native design files including but not limited to proprietary software used in the hydrologic and hydraulic analyses to prepare computations and plans. Such native files include input and output data from HEC-HMS, SWMM, HEC-RAS, or HY-8 Models, culvert hydraulic computations, drainage area reports, drainage maps, parameter and coefficient estimation details, and methods/equations used such as the rational method, the NRCS method, or regional regression equations. The native files for the models and analyses should represent the record set submitted.

20.3.1 Permanent Water Quality

DB Contractor shall base the project's required water quality design and TSS load removal on the following:

- TCEQ requirements for water quality found in 30 TAC Chapter 213 and associated TCEQ Edwards Aquifer Protection Program guidance (TCEQ EAPP guidance).
- Comply with USFW commitment of 0 lbs/yr TSS net increase leaving the project from existing conditions to proposed based on TCEQ calculation methodology.

In addition to TCEQ requirements, at a minimum each pond shall be designed to meet the following:

- Water quality capture volume of the first one-half (0.5) inch of runoff plus an additional one-tenth (0.1) inch for each ten (10) percent increase of impervious cover over twenty (20) percent within the drainage area.
- Have an equivalent effluent removal rate to that of Sedimentation/Filtration to the extent possible.

DB Contractor shall select BMPs that are currently allowed per TCEQ EAPP guidance and must be one or more of the following types: vegetative filter strip (VFS) adjacent to pavement, bioretention basins, or sand filter basins. The use of VFS should not take the place of or reduce the number of ponds shown in the schematic. Additionally, the use and placement of PFC, batch detention or proprietary BMPs from TCEQ EAPP guidance is prohibited without prior written approval from TxDOT. Additional area of PFC beyond what is shown in the "Oak Hill Parkway Pavement Designations" located in the RIDs will not be allowed to count as a water quality BMP. Prior to requesting the use of batch detention, DB Contractor shall provide design variances approved by TCEQ to TxDOT for sand filtration ponds such as flatter underdrains, shallower sand filter media depth, etc.

VFS shall be designed in accordance with TCEQ program guidance. VFS along sidewalks and SUP's shall utilize the sizing in Table 20-1.

Table 20-1: Filter Strip Sizing for Shared Use Paths

Shared Path Width (ft)	Engineered VFS Width (ft)
4	2.10
6	3.10
8	4.20
10	5.20
12	6.30
14	7.30

If the use of PFC is approved by TxDOT, placement of PFC shall meet the following criteria:

- PFC shall be placed on the main lanes before being placed on frontage roads. As part of TxDOT approval, DB must show that PFC on main lanes does not achieve required removal before placing on frontage roads as a last resort.
- PFC shall be placed on west end of US 290 heading east first to meet TSS removal requirements. Placement of PFC on SH 71 shall be a last resort.
- PFC shall be placed with minimum section lengths of 1500'.
- Minimum spacing between PFC sections shall be 2000'. If this can't be achieved make PFC continuous.
- PFC shall not be placed within 500' of a signalized intersection or stop signs.
- PFC shall not be placed in areas with multiple driveways.
- PFC shall not be placed on bridges or approach slabs.
- PFC shall be placed the full width of pavement, including shoulders but is not required across entire main lanes separated by barrier or medians. A turn lane is not considered a median. If the full width of pavement is greater than 48' (approximately 4 lanes), only the upgradient 48' of PFC shall be counted for TSS removal.
- PFC shall only be counted for treatment on roadway sections with a cross slope less than or equal to 2.7%.

Design requirements in addition to and superseding TCEQ EAPP guidance are as follows:

- The use of underground water quality facilities is prohibited.
- DB Contractor shall design and construct water quality pond inlets to be above the vertical limits of the dead sediment storage volume.
- All ponds shall have shutoff valves on the downstream end of the ponds that are accessible in all weather conditions and require no tools to open or close. Valves shall be enclosed in a ground box with apron. All surfaces of the valve assembly shall be accessible.
- Earthen pond side slopes shall be 4:1 (H:V) or flatter with a minimum embankment top width of six (6) feet.
- Vertical pond side slopes are allowed as long as access to basins is maintained and side slopes meet retaining wall design standards.
- The use of Schedule 40 PVC will be allowed within water quality ponds and to outfall water quality ponds. The minimum PVC pipe size inside ponds shall be 4 inch perforated and 6 inch unperforated for pond outfalls. The use of PVC under pavement is prohibited. The PVC shall transition to 24-inch RCP no further than 100 feet from the entrance to the pond outlet.
- DB Contractor shall design and construct a permanent access concrete drive to each pond. General requirements for maintenance access must meet TCEQ EAPP guidance. Access drives must have a minimum width of 12 feet and slopes not exceeding 4:1. Access drive turning radii shall be at least 50 feet. Access drives or ramps shall be designed into each pond chamber. All ponds must have an access maintenance staging area measuring 40 feet by 40 feet.
- DB contractor shall design security fencing and gates as shown in the Aesthetics and Landscaping Plan. At least one gate opening must be provided in each travel direction. Gate openings must be at least 12 feet wide. Security fencing and gates are limited to ponds that need fall protection.
- DB Contractor shall design water quality ponds to function as temporary sediment basins during construction with a means to detain stormwater and control the discharge if dewatering becomes necessary. DB Contractor may provide a dewatering mechanism that is accessible from outside the ponded area.
- DB Contractor shall design berms for water quality ponds permitted with TCEQ to be higher than the 100-yr WSE of Williamson Creek or the 100-yr WSE of the adjacent outfall location if the water quality pond outfall location is different than Williamson Creek. DB Contractor shall design berms for water quality ponds not permitted with TCEQ to be higher than the 5-yr WSE of Williamson Creek or the 5-yr WSE of the adjacent outfall location if the water quality pond outfall location is different than Williamson Creek and armor the berms to protect against the

100-yr flood event. DB Contractor shall design the water quality ponds to prevent the back flow of water from Williamson Creek to the water quality ponds, and will obtain prior approval from TxDOT of the method of preventing backflow.

- DB Contractor shall confirm elevations of underdrain pipe after installation and prior to covering with filter media. DB Contractor shall provide an electronic pdf of Record Drawings within 60 calendar days of a water quality pond becoming active. Record Drawings of the water quality ponds shall include GPS coordinates and elevations of all flowlines for inlets, flowlines for outlets, elevations of underdrain pipes, top of the pond, and bottom of the pond. DB Contractor shall schedule and conduct a walk thru inspection with a TxDOT registered professional engineer prior to providing the Record Drawings of the water quality ponds. DB Contractor shall clean the pond to be free of sediment and debris prior to Final Acceptance.

If it is not feasible to meet the design requirements in addition to and superseding TCEQ EAPP guidance and the pond still meets the TCEQ and USFW criteria, the DB Contractor shall obtain prior approval from TxDOT and a detailed engineering explanation as to why it is infeasible.

DB Contractor shall set up a meeting with TCEQ and TxDOT to coordinate construction activities, and schedule and WPAP approval(s) within 30 days of NTP1.

DB Contractor shall provide Water Quality plan sets that contain the following with the Preliminary Design and Final Design:

Site Plan Sheets including:

- All TCEQ Site Plan requirements from TCEQ-0584 form
- Contributing areas identified and quantified
- Location and type of BMP shown
  - Begin and End stations and lengths of VFS
- Project areas including:
  - Total Project area boundary
  - BMP contributing drainage area boundaries
  - Existing and Proposed impervious cover area boundaries
- Drainage flow direction arrows
- FEMA floodplains shown with floodplains labeled
- ROW and drainage easements shown and labeled

Water Quality Data sheets with tables including:

- Project ID/TxDOT maintenance number
- Total Project Area
- Total Project Existing and Proposed Impervious areas
- Total Project TSS removal required
- BMP ID and type
- Runoff depth captured for ponds
- BMP efficiency
- Load removed (Project Total and per BMP)
- Pond volume required
- Pond volume provided
- Existing load leaving project, proposed load leaving project and difference

TCEQ General Notes Sheet as shown in the Austin District Standards

Water Quality Pond Layout Sheets including:

- All design elements required by TCEQ for the specific BMP type
- BMP ID
- Area and Storage Table with

    - Area and volume for each foot of elevation
    - Cumulative Volume for each foot of elevation
    - Discharge Table: 25-yr and 100-yr weir with flow, weir length, weir coefficient, weir depth and freeboard
  - Pond Locations Table
    - Point number, Station/Offset, XY Coordinates (decimal degrees), Elevation and Description
    - Points for top and bottom of berm/wall, top of weir, flowlines, toe of slope, access drive location, riser pipe, splitter box, inlet and outlet structure(s), and valves
  - Label berm width and side slopes
  - Pond basin dimensions
  - Label shutoff valves and cleanouts
  - At least one cross section through pond oriented from inlet to outlet
  - Label access drive and staging area

Water Quality Pond Detail Sheet(s) including:

- Impermeable liner type, placement, installation attachment details
- Filtration bed section
- Underdrain pipe
- Filtration bed clean-out
- Vertical sediment depth marker
- Outfall structure details
- Valve installation
- Splitter Box

Access Drive and Maintenance Staging Area Layout and Details Sheet including:

- Access from the roadway
- Drive and staging area dimensions: width, cross slope, radii
- Drive material
- Fence and gate details and dimensioned layout

20.3.2 Surface Hydrology

20.3.2.1 Design Frequencies

DB Contractor shall use the design frequencies listed in Table 20-2 below. Additional design frequency requirements are described in Section 20.3.6.5.1.

20.3.2.2 Hydrologic Analysis

DB Contractor shall ensure that no adverse drainage impacts will result from the construction of the Project. DB Contractor shall evaluate and document the analysis confirming that the temporary drainage system and proposed drainage improvements do not result in any adverse impacts. Flood damage potential for the Project, while under construction and when completed, shall not exceed pre-Project conditions.

DB Contractor shall use the following criteria in developing runoff calculations:

- Run-off Coefficients:
  - Pavement (Asphalt) = 0.9
  - Pavement (Concrete) = 0.9
  - Unpaved areas within the Project ROW = 0.35
  - For areas outside the Project ROW, use the methods in Chapter 4 of the TxDOT *Hydraulic Design Manual* for calculating the Run-off Coefficients
- Minimum Time of Concentration, Tc = 10 minutes

- Minimum sheet flow slope is 0.005 ft/ft.
- Use of underground storage facilities for mitigation of adverse impacts is prohibited.
- DB Contractor's base hydraulic model shall reflect the most current as-built conditions.

Hydrologic calculations for off-site runoff shall include the assumption that any undeveloped area adjacent to the Project ROW will be developed as commercial use for the first 150 feet adjacent to the Project ROW. DB Contractor shall design drainage structures that intercept and convey flow from off-site through the Project (e.g., cross-culverts), with sufficient capacity to accommodate existing off-site conditions and the 150-foot strip of land adjacent to the Project ROW modeled as commercial-use development.

Table 20-2: Drainage Design Summary Table

	Design AEP (Design ARI)				
Functional classification and structure type	50% (2-yr)	20% (5-yr)	10% (10-yr)	4% (25-yr)	2% (50-yr)
Freeways (main lanes):					
Culverts					X
Bridges+					X
Principal arterials:					
Culverts				X	
Bridges+				X	
Minor arterials and collectors (including frontage roads):					
Culverts			X		
Bridges+				X	
Local roads and streets:					
Culverts			X		
Bridges+			X		
Storm drain systems on interstates and controlled access highways (main lanes):					
Inlets, drain pipe, and roadside ditches			X		
Inlets, drain pipe for depressed roadways*					X
Storm drain systems on other highways and frontage roads:					
Inlets, drain pipe, and roadside ditches		X			
Inlets, drain pipe for depressed roadways*				X	

Table 20-1 notes:
All facilities, including storm drain systems, must be evaluated to the check flood/1% AEP (100-yr) flood event. The purpose of the check flood evaluation is to ensure the safety of the drainage structure and downstream development by identifying significant risk to life, property, or the environment in the event of capacity exceedance.
All features of the roadway facility shall be assessed under the 2-, 5-, 10-, 25-, and 50-year storm events to ensure no significant adverse impacts.
For structures extending underneath both mainlanes and frontage roads the structure shall be designed to the mainlane design AEP.
* A depressed roadway provides nowhere for water to drain even when the curb height is exceeded.
+ It may be necessary to calculate the 4% (25-yr), 2% (50-yr), 0.5% (200-yr), or 0.2% (500-yr) AEP for scour computations. See the TxDOT *Geotechnical Manual*: *Chapter 5.*

20.3.3 Storm Drain Systems

Where precluded from handling runoff with open channels by physical site constraints, or as directed in this Item 20, DB Contractor shall design enclosed storm drain systems to collect and convey runoff to appropriate discharge points.

DB Contractor shall prepare a storm drain drainage report encompassing all storm drain systems that contains, at a minimum, the following items:

- Detailed table of contents and narrative of design methodology;
- Drainage area maps for each storm drain inlet with pertinent data, such as boundaries of the drainage area, best available topographic contours, runoff coefficients, time of concentration, and land use with design curve number and/or design runoff coefficients, discharges, velocities, ponding, and hydraulic grade line data;
- Location and tabulation of all existing and proposed pipe and drainage structures. These include size, class and gauge, detailed structure designs, and all special designs;
- Specifications for the pipe bedding material and structural pipe backfill on all proposed pipes and pipe alternates;
- Complete pipe profiles, including pipe size, type, and gradient; station offsets from the centerline of the roadway; length of pipe; class/gauge of pipe; and numbered drainage structures with coordinate location and elevations;
- Complete documentation of DB Contractor's assessment of the potential for the Project to cause adverse impacts, including how adverse impacts are mitigated (if needed), and reasonable substantiation that the Project will not cause any significant adverse impacts; and
- Demonstrate that the drainage design does not cause any adverse impact to offsite properties or that DB Contractor has obtained appropriate drainage easements.

This report shall be a component of the Drainage Design Report.

DB Contractor shall design all storm drain systems such that the hydraulic grade line for the design frequency event is no higher than 1 foot below:

- Gutter depression for curb inlet;
- The top of grate inlet; and
- The top of manhole cover, whichever is lower as applicable.

All existing and proposed ditches and permeable storm drain systems, not including Williamson Creek, that are east of Old Bee Cave Road shall be supplemented with an impermeable geomembrane liner in accordance with TxDOT Special Specification 5056. The liner shall be installed to the extent that it shall encompass the entire limits of the water for the storm design frequency required for the storm drain system.

Runoff within the jurisdiction of the USACE shall be conveyed in accordance with applicable Laws and permits.

The gutter depression used for curb and grate combination inlets shall not encroach into the travel lane if the gutter depression exceeds the normal cross slope.

The use of slotted drains or trench drains will not be allowed.

The use of pump stations, or forced flow drainage systems will not be allowed.

The use of slotted barriers that allow storm waters runoff to flow into adjacent travel lanes will not be allowed for permanent barriers, except as described in Section 21.2.6. Slotted barriers may be used only for temporary conditions during construction.

DB Contractor shall not be permitted to mitigate impacts by using restrictor plates or restrictor pipes for in-line detention facilities.

DB Contractor shall place manholes or combination manholes and inlets wherever necessary or required for clean-out and inspection purposes. See Chapter 10, Section 7 of the TxDOT *Hydraulic Design Manual* for the manhole spacing criteria.

The use of "T" connections and "Y" connections in storm sewer systems is not permitted unless approved in writing by TxDOT.

DB Contractor shall not be permitted to mitigate impacts by using vaulted or underground detention or water quality facilities.

DB Contractor shall design and construct an enclosed storm drain system to collect and convey runoff between the westbound frontage road and the Project ROW from westbound frontage road station 1300+00 to station 1315+50. Runoff cannot be handled with an open channel at this location.

20.3.3.1 Pipes

DB Contractor shall meet the requirements set forth in Chapter 10 of the TxDOT *Hydraulic Design Manual.*

Storm drain pipes shall be designed to maintain a minimum trunkline velocity of three feet per second whenever feasible. If design flow velocities less than three feet per second are unavoidable, pipes shall be designed for full flow at 80% of the internal diameter to account for sedimentation in the pipe. Pipes shall be designed to achieve a maximum velocity of 12 feet per second in the pipe. All storm drains shall be designed and constructed to sustain all external loads with zero deflection and shall have positive seals at the pipe joints.

All pipes shall be thermoplastic in accordance with TxDOT Special Specification 4122 as shown in the RIDs or RCP with a minimum pipe size inside diameter of 24 inches. Thermoplastic pipe shall only be used in accordance with "Phase I Restrictions" in the TxDOT Pipe Selection Memo as shown in the RIDs. The minimum pipe size inside diameter of a discrete drainage system may be less than 24 inches if the drainage system is tying to an existing system that is in good condition and is adequate size to properly convey the flow. Trunklines are defined as any pipe receiving flow from three inlets or more. The existing system must meet the performance requirements in this Item 20 and Item 21, "Structures." The minimum box culvert height, inside dimension, shall be three feet. The minimum pipe size for pipe drains shall be 18 inches in accordance with Chapter 10, Section 7 of the TxDOT *Hydraulic Design Manual.* The only exception to minimum pipe sizes and material is for water quality. PVC may be used outside of the roadway for water quality pond outfalls.

Storm drain design will be non-pressure flow unless otherwise approved by TxDOT.

DB Contractor shall not place trunk lines within the structural fill of MSE walls.

Trunk lines may be designed through the inlets.

- Pipe depth of cover: 1 foot desirable; 6 inches minimum (top of pipe to bottom of treated subgrade)
- Pipe slope: ≥0.50% desirable; 0.30% minimum
- Pipe flow velocities: 3 fps minimum; 12 fps maximum
- Outfall velocity criteria: 6 fps desirable; > 8 fps provide outfall protection

20.3.3.2 Ponding

DB Contractor shall design drainage systems to limit ponding to the widths defined in Table 20-3 below for the design frequency event:

Table 20-3: Allowable Ponding Widths by Roadway Classification

Roadway Classification	Design Storm Allowable Ponding Width
Interstate, Controlled Access Highways	Shoulder width
Barrier-Separated Managed Express Lanes: Single Lane Multiple Lanes	 Shoulder width One travel lane width
Ramps	Shoulder width
Direct Connectors	4 feet (along narrow shoulder) 8 feet (along wide shoulder)
Frontage Roads	One travel lane width
Minor Cross Streets	One travel lane width

DB Contractor to design drainage systems to have no carryover at intersections, and will be allowed to use a maximum of 1.0 cfs of carryover for locations other than intersections.

20.3.4 Miscellaneous Drainage Design Requirements

DB Contractor shall design mainlane cross structures (culverts and bridge openings) in accordance with the TxDOT *Hydraulic Design Manual.*

- Examine water surface elevations to assure that the Project will not cause any adverse impacts to adjacent properties. A rise in water surface elevation can be considered as having no impact if the rise is contained within the Project ROW and drainage easements.

DB Contractor shall design a pavement underdrain system if either geotechnical borings show groundwater or seasonal high water elevations at an elevation greater than the base elevation of the roadway subgrade; or water is encountered during the placement of the roadway subgrade.

DB Contractor shall install safety end treatments for all pipes less than 54-inches in diameter and culverts less than 4-feet in height.

20.3.4.1 Inlet Design Criteria

DB Contractor shall place inlets in accordance with the criteria shown below and the TxDOT *Hydraulic Design Manual.*

DB Contractor shall place inlets in accordance with the criteria listed in Table 20-3A below:

Table 20-3A: Inlet Design Criteria

Storm Drain Inlets

Inlet Locations	1. On-grade: Place inlets to keep gutter ponding less than or equal to ponding widths in Section 20.3.3.2 of the Design-Build Specifications. Carryover is acceptable. 2. Low points: Inlets shall be located at low point of vertical curve, not at P.I. Place flanking inlets both sides of low point at a maximum spacing of 100 feet from low point. 3. Redundant inlets: Inlets shall be located at ends of curb returns at intersections. 4. 100% flow interception: On pavement at end of retaining wall, at ramp gores, at intersections. 5. Inlets shall be placed outside the main lane travel way. In addition, the inlets along the direct connectors shall be placed within 4 feet of the pavement/bridge rail along the narrow shoulder and within 8 feet of the pavement/bridge rail along the wide shoulder.

Design drop inlets for the following criteria:

- Area Reduction Factor = 0.5
- Perimeter Reduction Factor = 0.5

20.3.5 **Reserved**

20.3.6 **Hydraulic Structures**

20.3.6.1 **Culverts**

DB Contractor shall analyze existing and proposed culverts and drainage-system impacted, replaced, or created by the Project, for any localized flooding problems.

DB Contractor shall use the following design criteria:

- The headwater elevation for design flood will be no higher than then the lowest top of crown of the treated subgrade within headwater pool limits.

As feasible, culverts shall be designed to achieve a minimum tailwater velocity of 2 feet per second, or a maximum tailwater velocity of eight feet per second. In the event the maximum desirable tailwater velocities are exceeded, velocity-reducing devices and outfall channel erosion protection shall be included in the design in order to reduce erosion at the culvert outlets. DB Contractor shall obtain TxDOT's approval prior to the installation and use of velocity-reducing devices.

Culverts are classified as major or minor, as follows:

- Major Culvert: A culvert that provides an opening of more than 35 SF in single or multiple installations. A major culvert may consist of a single round pipe, pipe arch, open or closed-bottom box, bottomless arch, or multiple installations of these structures placed adjacent or contiguous as a unit. Culverts are classified as bridges when they provide an opening measured along the center of the roadway of more than 20 feet between spring lines of arches, or extreme ends of the openings for multiple box culverts; such culverts shall be included in the bridge inventory. Bridge class culverts shall have a minimum rise of 4 feet and design shall include drop-off protection. Major culverts shall be analyzed using HEC-RAS.
- Minor Culvert: Any culvert not classified as a major culvert.

The minimum box inside culvert height dimension for all proposed box culverts shall be 3 feet. Existing box culverts that have inside height dimensions of less than 3 feet but that meet all other hydraulic requirements may be extended at their existing height.

20.3.6.2 **Bridges**

All bridge hydraulic computations, designs, and recommendations shall be consistent with past studies and projects in the area by the USACE and other State or federal agency studies and projects.

Where bridge design is influenced by upstream storage, the analysis of the storage shall be considered in the design of the bridge.

DB Contractor shall design bridges so that at the design frequencies referenced in Section 20.3.6.5.1, water surface elevation (WSE) shall be below the bridge low chord.

20.3.6.3 Regional Detention Pond

DB Contractor shall provide final hydrology and hydraulics design for the preliminary schematic regional detention pond at the Old Bee Cave location. The following are minimum design requirements for this pond facility:

- Pond limits must be contained within proposed ROW on the schematic, unless alternate limits are approved by TxDOT.
- DB Contractor shall design and construct the detention pond in accordance with the requirements listed in the TCEQ *Hydrologic and Hydraulic Guidelines for Dams in Texas,* the TCEQ *Design and Construction Guidelines for Dams in Texas*, the *City of Austin Erosion Control Manual,* and the *City of Austin Drainage Criteria Manual.* Where there are conflicts in the requirements of these manuals, the most stringent requirement will apply.
- DB Contractor shall size and design the pond to yield a minimum 4% reduction in peak flow below pre-project conditions in Williamson Creek from downstream of the Old Bee Cave Pond's tributary confluence (just downstream of SH 71) to just downstream of Joe Tanner Road, unless approved by TxDOT. This reduction in peak flows shall be achieved for the 1% AEP (100-year ARI) event. Also, pond design shall result in no peak flow increase for 50%, 20%, 10%, 4%, or 2% AEP (2-yr, 5-yr, 10-yr, 25-yr, or 50-yr ARI).
- Pre-project conditions as defined herein shall include updated HEC-HMS and HEC-RAS models to reflect existing conditions within Williamson Creek watershed within and upstream of the Project limits, including updated hydrology using Atlas 14 rainfall, for a condition immediately preceding the anticipated construction.

20.3.6.4 Ditches

DB Contractor shall use the following drainage ditch design criteria:

Ditches between roadways:

- Design ARI = 10-year
- Flat-Bottom Ditch = Minimum 6-foot bottom width, 4:1 or flatter side slopes
- V-Ditch = 6:1 or flatter side slopes
- Minimum ditch slope = 0.5%

Ditches next to ROW Line:

- Design ARI = 5-year
- Flat Bottom Ditch = Minimum 6-foot bottom width, 4:1 or flatter side slopes
- V-Ditch = 6:1 or flatter side slopes
- Minimum Ditch Slope = 0.5%

All ditch lining types will be determined by the shear stress calculations for the design discharge procedure as contained in the TxDOT *Hydraulic Design Manual*.

Minimum 0.5 feet of freeboard shall be provided to the bottom of treated subgrade or to top of ditch, whichever is lower.

DB Contractor shall be responsible for the design of both normal and special ditch sections, as needed. When necessary, ditch linings shall be designed by DB Contractor according to HEC-15. Open channels shall be designed to minimize sedimentation.

20.3.6.5 Methods Used to Estimate Flows and Analyze Hydraulics

DB Contractor shall use methods outlined in the TxDOT *Hydraulic Design Manual* for flow determination.

20.3.6.5.1 **Design Frequency**

Major waterway crossings, bridges, culverts, and storm drain systems shall be designed for the frequency corresponding to the roadway classification shown in Section 20.3.2.1, with the exception of the Old Bee Cave Road crossing of Williamson Creek which shall be designed for the 100-year storm event. The functional classification for each roadway is shown in Item 19, "Roadways."

DB Contractor shall evaluate bridges for contraction scour and pier scour concerns and incorporate protection in accordance with Good Industry Practice. DB Contractor shall provide a scour analysis in accordance with TxDOT *Geotechnical Manual*, Chapter 5, Section 6 for all bridges. If necessary, DB Contractor shall provide countermeasures for any instability and scour problems in accordance with FHWA HEC-23 – *Bridge and Scour and Stream Instability Countermeasures Experience Selection and Design Guidance*.

DB Contractor shall calculate the peak discharge for both existing and proposed conditions. Water surface profiles for design and check flood conditions shall be determined.

20.3.6.5.2 **Hydraulic Analysis**

DB Contractor shall use the most comprehensive available and reliable hydrologic and hydraulic models as design base models. For waterways mapped as FEMA SFHA, DB Contractor must comply with TxDOT *Hydraulic Design Manual* procedures, including coordination with the local floodplain administrator(s) and use of the current FEMA effective models to create the revised effective and the proposed effective models. The revised FEMA effective model shall incorporate the Atlas 14 rainfall data, any corrections for identified errors in the effective model if applicable, any more accurate surveyed data to be used, any major developments that are not incorporated in the existing FEMA models but having a significant impact to the effective model, among others. The proposed effective models shall be based on the revised effective model as the baseline model by adding the proposed designs or changes to the baseline model. DB Contractor must also coordinate with major adjacent developments that are pursuing a LOMR during the initial development period.

DB Contractor shall design riprap at abutments in accordance with the procedures outlined in HEC-23. For bridge abutments in urban areas, DB Contractor shall install protection in accordance with the Project's aesthetic plan.

20.3.6.5.3 **Bridge/Culvert Waterway Design**

For existing crossings, DB Contractor shall analyze the existing structure using the proposed flows to ensure the headwater does not exceed allowable headwater elevations, as defined in this Item 20. If the proposed drainage produces headwater elevations greater than those allowed by this Item 20, DB Contractor shall design and construct a replacement structure with sufficient capacity to pass the required design-frequency flows and ensure the maximum headwater for the required frequency event does not exceed that of the corresponding event for the current condition. Culvert extensions may increase the headwater elevation, but not above the maximum allowable headwater.

When designing a bridge over waterways, DB Contractor design shall minimize changes to the existing channel. Bridge waterway design shall maintain the existing channel morphology through the structure. An existing bridge spanning a waterway shall not be replaced with a structure of a lesser total span than the original structure. New bridges spanning a waterway shall not result in a narrowing of the existing channel.

20.3.6.5.4 **Bridge Deck Drainage**

Storm water flowing toward the bridge shall be intercepted upstream from the approach slab. Runoff from bridge deck drainage shall be treated as required by TCEQ and other applicable regulation prior to discharge to the natural waters of the State.

Open deck drains and slotted rail are not permissible for new bridges passing over waterways or other roadways, except as described in Section 21.2.6. If ponding width limits are exceeded on the new bridges, then the runoff must be conveyed in a closed system through the bridge columns to the roadway drainage system below. The bridge deck drainage system shall outlet at the bottom of the substructure either into a storm drain system or into an open channel. In no case shall storm water be discharged against any part of the structure.

20.4 Drainage Design Report

A preliminary Drainage Design Report shall be submitted with Preliminary Design Submittal. The preliminary Drainage Design Report shall include at a minimum everything included in the Drainage Design Report as described in this Item 20. Prior to construction of any drainage element, DB Contractor shall submit a preliminary Drainage Design Report for each drainage element to TxDOT.

DB Contractor shall submit to TxDOT, as part of the Record Documents, a revision to the final Drainage Design Report, which shall be a complete documentation of all components of the Project's drainage system. The revision to the final Drainage Report shall document all changes to the drainage design made during construction. At a minimum, the Drainage Design Report shall include:

- Record set of all drainage computations, both hydrologic and hydraulic, and all support data including all geospatial data. If computations are in electronic format, the original format in which the computations were executed shall be submitted, such as XLSX for Microsoft Excel or XMCD for Mathcad.
- Hydrology/Hydraulic notes, models, and tabulations. Models are to be submitted in the original electronic format (e.g., GEOPAK drainage file – GDF, HEC-RAS – PRJ, Hydrologic, Engineering Center's Hydrologic Modeling System (HEC-HMS) – HMS). Please note some programs such as HEC-HMS generate multiple files which are essential to the overall model. All files shall be included with the Submittal to ensure the results match those in the record set. All models shall be well annotated and cleaned. A read me file shall be provided to define all modeling plans, frequency, files names, abbreviations, etc.
- Storm drain drainage reports.
- Bridge and culvert designs and reports for major stream crossings.
- Open channel design data.
- Regional detention pond designs, including graphic display of dam, flood storage areas and maintenance guidelines for operation.
- Complete documentation of DB Contractor's assessment of the potential for the Project to cause adverse impacts, including how adverse impacts are mitigated (if needed), and reasonable substantiation that the Project will not cause or increase to damage to properties outside the Project ROW.
- Demonstration that DB Contractor has obtained appropriate drainage easements.
- Correspondence files that include:
  - Meeting minutes pertaining to drainage
  - Email and letter correspondence with all Governmental Entities pertaining to drainage and drainage studies, including any issued floodplain permits
  - Letters to all Governmental Entities pertaining to drainage
- Drainage system data (location, type, material, size, and other pertinent information) in a GIS data format for the existing system to remain in place and the proposed system constructed in conjunction with this Project.
- Exhibits demonstrating the compatibility of the drainage design with the 114-foot mainlane reserved space described in Section 19.2.2.3.

20.4.1 Drainage Report for Major Stream Crossings

DB Contractor shall prepare a drainage report for each major stream crossing. Major stream crossings are defined as waterways listed as a FEMA SFHA or requiring a bridge class structure, as defined in Section 20.3.6.1. Any other waterway will be a minor stream crossing. The report shall include the detailed calculations, electronic and printed copies of the computer software input and output files, a discussion about hydrologic and hydraulic analysis assumptions and data used, project impact and mitigation used, and final design recommendations for meeting all design requirements. The report shall follow the Hydraulic Report Guidelines referenced and outlined in the TxDOT *Hydraulic Design Manual,* Chapter 3. At a minimum, for each crossing the report shall include:

- FEMA SFHA
  - FIRMette;

- Discussion of SFHA and implications; and
- Flood Plain Permit, if required by City or County.

- Hydrology
  - Data sources, quality and quantity description;
  - Software sources and versions;
  - Drainage area maps with watershed characteristics/parameterization including topography, both hardcopy and GIS format;
  - Hydrologic calculations (including modeling methods, parameter and coefficient estimation equations, special assumptions, decisions made, both hardcopy and electronic input and output files);
  - Historical or Site data used to review computed flows;
  - Pre-project and post-project peak flow comparative evaluation table and discussion for both the design and the check flood conditions at key points of interest; and
  - Pre-project and post-project peak flow with mitigation comparative evaluation table and discussion for both the design and the check flood conditions at key points of interest.
- Hydraulics and Recommended Waterway Opening and/or Structure
  - Data sources, quality and quantity description;
  - Software sources and versions;
  - Photographs of the Site (pre- and post-construction);
  - General plan, profile, and elevation of recommended waterway opening and/or structure;
  - Calculations – including modeling methods, parameter estimation equations, and special assumptions, decisions made, hardcopy of output, as well as electronic input and output files for all computer models used for final analysis or for permit request, as well as summary of the basis of the models;
  - Cross-sections of waterway (DB Contractor shall provide a hard copy plot, plus any electronic data used);
  - Channel profiles;
  - Pre-project and post-project WSE comparative evaluation table and discussion for both the design and the check flood conditions at major cross-sections; and
  - Pre-project and post-project WSE comparative evaluation table with mitigation and discussion for both the design and the check flood conditions at major cross-sections.
- Scour Analysis
  - Channel cross-sections at bridge showing predicted scour;
  - Calculations and summary of calculations, clearly showing predicted scour and assumptions regarding bridge opening and piers used to calculate predicted scour;
  - Discussion of review of long-term degradation/aggradation and effects; and
  - Recommendation for abutment protection.

This report shall be a component of the Drainage Design Report.

DB Contractor shall provide bridge hydraulic summary sheets and bridge scour envelope sheets with projected scour calculation summaries for every bridge crossing a waterway in the Record Documents.

20.5 Construction Requirements

DB Contractor shall design drainage to accommodate construction staging. The design shall include temporary erosion control measures and other BMPs needed to satisfy the NPDES and other regulatory requirements. DB Contractor shall conduct all Work necessary to meet the requirements for this Item 20 in accordance with the requirements of this Item 20 and the TxDOT Standard Specifications.

The water resources notes in the plans shall include a description of the drainage design for each stage of construction, including temporary drainage elements.

20.6 Water Pollution Abatement Plan (WPAP)

DB Contractor will be responsible for preparing and obtaining approval of a Water Pollution Abatement Plan (WPAP) from TCEQ and designing stormwater facilities in accordance with the Edwards Aquifer Protection Program.

20.7 Submittals

All Submittals described in this Item 20 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 20-3. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 20-4: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Preliminary Drainage Design Report	Prior to construction of any drainage element	Review and comment	20.2.1, 20.4
Final Drainage Design Report	As part of the Final Design Submittal	Review and comment	20.2.1, 20.4
All native design files used in the hydrologic and hydraulic analyses to prepare computations and plans	Upon request	Review and comment	20.3
Hydraulic summary sheets and bridge scour envelope sheets with projected scour calculation summaries for every bridge crossing a waterway	As part of the Record Documents	Review and comment	20.4.1

Item 21
Structures

21.1 General Requirements

The structural elements of the Project, including bridges, culverts, drainage structures, signage supports, illumination assemblies, traffic signals, retaining walls, and sound walls, shall be designed and constructed in conformance with the requirements of the Contract Documents, TxDOT Engineering Standard Sheets, AASHTO *LRFD Bridge Design Specifications* except where directed otherwise by TxDOT *Bridge Design Manual – LRFD,* TxDOT *Geotechnical Manual*, TxDOT *Bridge Detailing Guide*, and TxDOT bridge design policy and information listed at https://www.txdot.gov/inside-txdot/division/bridge.html. FHWA manuals shall be used for geotechnical design in conjunction with AASHTO *LRFD Bridge Design Specifications*.

DB Contractor shall design bridges, retaining walls, sound walls, and sign structures in conformance with the approved aesthetic schemes, guidelines, and standards as identified in Item 23, "Aesthetics and Landscaping."

Throughout the Term, DB Contractor shall allow access to TxDOT bridge inspectors performing National Bridge Inspection Standards (NBIS) inspections. DB Contractor shall coordinate with TxDOT 90 days prior to opening any portion of the new bridge to traffic to allow for the initial NBIS inspection by TxDOT.

21.1.1 Lead Structural Engineer

DB Contractor shall employ a Lead Structural Engineer responsible for overseeing the design and construction of all structural elements of the Project such that each element is complete and design requirements are met. The Lead Structural Engineer shall be a PE responsible for coordination of interdisciplinary design reviews in cooperation with leaders of other disciplines. The Lead Structural Engineer or a PE reporting directly to the Lead Structural Engineer shall be the engineer of record for the design of all structural elements on the Project.

21.2 Design Requirements

For bridges, walls, bridge class culverts, sign structures and other miscellaneous structures, a Corridor Structure Type Study and Report shall be submitted to TxDOT for review and comment prior to design of these Elements. At a minimum, structural concepts, details and solutions, soil parameters, hydraulics, environmental requirements, wetland impacts, safety, highway alignment criteria, constructability, aesthetics requirements and continuity for the Project shall be evaluated in the Corridor Structure Type Study and Report. The Corridor Structure Type Study and Report shall clearly define DB Contractor's action to achieve a durable structure compatible with the AASHTO *LRFD Bridge Design Specifications* (or extended life if otherwise called for in Contract Documents) for new Project bridges, walls, culverts and miscellaneous structures. Evaluation of existing structures within the Project limits that will be retained shall be included in the Corridor Structure Type Study and Report.

All bridges shall be designed without a design exception to not preclude the construction of all of the infrastructure described in the "Oak Hill Parkway Cross Street Matrix" included in the RIDs.

21.2.1 NBI Reporting Procedures

Upon completion of the bridge layout during the design phase, DB Contractor shall coordinate with the appropriate TxDOT District Bridge Engineer or Bridge Inventory Inspection and Appraisal Program (BRINSAP) Coordinator to obtain permanent structure numbers for all bridges and bridge class culverts. This will require an approved bridge layout and completion of the permanent structure number request form. The permanent structure numbers shall be shown on the applicable bridge layout sheets of the Final Design Submittal.

DB Contractor shall stencil permanent structure numbers on all bridge structures. DB Contractor shall stencil bent numbers on all bridges with four or more spans. The permanent structure numbers and bent numbers shall be placed at locations directed by TxDOT.

21.2.2 Design Parameters

Unless otherwise noted, design for all roadway structural elements shall be based on the LRFD methodology included in the TxDOT *Bridge Design Manual – LRFD*, TxDOT bridge design policy and information listed at http://www.txdot.gov/inside-txdot/division/bridge/specifications.html and the AASHTO *LRFD Bridge Design Specifications*.

Design of project structures, foundations, embankments, walls, excavations, retained structures, slopes, bridges, and other related design features as well as soil exploration frequencies and boring requirements shall be in compliance with provisions of the TxDOT *Geotechnical Manual* and in accordance with the provisions of Item 16. Where design requirements are not specific in the TxDOT *Geotechnical Manual*, FHWA manuals including guidance regarding geotechnical design shall be used in their entirety.

DB Contractor shall provide a sufficient testing frequency and testing methods that account for karstic subsurface conditions to facilitate the design and construction of foundations and retaining walls. In accounting for karstic subsurface conditions, DB Contractor shall incorporate testing and design that includes geophysical investigation, conformance to environmental requirements, consideration of both lateral and vertical load carrying capacity, impact to construction methods, and a mitigation plan for foundation in karstic subsurface condition.

DB Contractor shall rehabilitate or modify existing structures not originally designed to LRFD provisions to be governed by their original design requirements as defined in the AASHTO *Standard Specifications for Highway Bridges,* but never less than HS-20 design loading. Design of widening of existing structures shall be based on the LRFD methodology included in the TxDOT *Bridge Design Manual - LRFD*, HL-93 loading and the AASHTO *LRFD Bridge Design Specifications*. For widening of structures, the existing service, operating, and inventory load rating of all existing bridge components shall not be reduced in the process of widening.

Steel bridge design shall comply with TxDOT *Preferred Practices for Steel Bridge Design, Fabrication, and Erection*.

Corrosion protection measures shall be in accordance with TxDOT Bridge Division and the respective District's practices. Specific corrosion protection measures can be found at https://www.txdot.gov/inside-txdot/division/bridge/specifications/super-corrosion.html and District-specific requirements can be found at http://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/district-corrosion.pdf.

Segmental bridges shall conform to the requirements of the AASHTO *Guide Specifications for Design and Construction of Segmental Concrete Bridges*.

Hydraulic design shall be in accordance with the provisions of Item 20, "Drainage."

Structural design of signs, luminaires, and traffic signals shall be in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Falsework, shoring, and other temporary supports shall be designed in accordance with the AASHTO *Guide Design Specifications for Bridge Temporary Works* and shall be compliant with OSHA and local jurisdictional standards and requirements.

Load ratings shall be in accordance with the AASHTO *Manual for Bridge Evaluation* and the TxDOT *Bridge Inspection Manual*.

DB Contractor shall design bridge units without uplift at supports under all load conditions.

DB Contractor shall ensure that bridges withstand a 100-year frequency event with no loss of structural integrity. DB Contractor shall ensure all applicable requirements of *FHWA HECs* are met for bridge structures.

Unless otherwise directed, DB Contractor shall ensure at least 1 foot of freeboard clearance between the design-year frequencies water surface elevation described in Item 20, "Drainage" and the low chord of bridges crossing over waterways.

At TxDOT's request during design and construction, all electronic and hard copies of files and design calculations shall be made available no later than the start of construction of Elements related to the request. All files and calculations (bridge design notes) shall be submitted with the Record Documents in accordance

with Bridge Division's Procedure for Archiving Bridge Design Notes in Chapter 6 of the TxDOT *Quality Control and Quality Assurance Guide* and other requirements of the DBA. DB Contractor shall submit load rating calculation including input and output files for all new or widened bridges and all new or widened bridge class culverts.

Sidewalks and bicycle lanes shall be provided on bridge structures as shown on the Schematic Design and in accordance with the provisions of Item 19, "Roadways" and Item 28, "Bicycle and Pedestrian Facilities." DB Contractor shall design sidewalks to meet the criteria of the AASHTO *A Policy on Geometric Design of Highways and Streets* and the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. Pedestrian bridges shall additionally conform to the requirements of AASHTO *LRFD Guide Specifications for the Design of Pedestrian Bridges*.

21.2.3 Bridge Design Loads and Load Ratings

All roadway bridges and bridge class culverts shall be designed to accommodate the following live loads:

- New Construction: A vehicular design load designated HL-93 consisting of the design truck or the design tandem, and the design lane load as defined in the AASHTO *LRFD Bridge Design Specifications* shall be utilized for bridges. Sidewalks of vehicular bridges shall be loaded in accordance with requirements in the AASHTO *LRFD Bridge Design Specifications*.
- Existing Bridge Structures: Load rating with a rating factor of 1.0 for all Texas legal loads at the operating level. Structures failing to meet this standard shall be rehabilitated to a load rating of rating factor of 1.0 for all Texas legal loads at the operating level or replaced using LRFD design and HL-93 loading.
- Existing Bridge Class Culverts: Load rating with a rating factor of 1.0 for all Texas legal loads at the operating level. Structures failing to meet this standard shall be rehabilitated to a load rating of rating factor of 1.0 for all Texas legal loads at the operating level or replaced using LRFD design and HL-93 loading.
- Existing Bridge Widenings: HL-93 for widening and a rating factor of 1.0 for all Texas legal loads at the operating level minimum for existing portion (designate both existing and widening loading on bridge layouts). Existing structures with load rating exceeding rating factor of 1.0 for all Texas legal loads at the operating level shall not have their existing capacity reduced in the process of widening. Nor shall the service and inventory load rating of all existing bridge components be reduced in the process of widening.

Pedestrian bridges and sidewalks of vehicular bridges shall be loaded in accordance with requirements in the AASHTO *LRFD Bridge Design Specifications* and the AASHTO *Guide Specifications for the Design of Pedestrian Bridges*. In addition, all pedestrian bridges shall also be designed for an AASHTO H-10 truck live load as defined in the AASHTO *Standard Specifications for Highway Bridges*, to account for maintenance and emergency vehicles.

21.2.4 Bridge Decks and Superstructures

Fracture critical members shall not be used for bridges.

Multi-beam bridges shall include a minimum of four beam lines. The type of bridge substructure and superstructure shall be restricted to those identified within the TxDOT *Bridge Design Manual – LRFD*.

Modular joints shall not be used.

DB Contractor shall minimize the number of bridge deck joints. DB Contractor shall locate joints to provide for maintenance accessibility and future replacement. Joints on bridge decks shall be sealed.

DB Contractor shall provide reinforcing steel in accordance with TxDOT provisions for corrosion protection measures.

For bridge widenings in Districts requiring corrosion resistant reinforcing (or equivalent measures), existing uncoated reinforcing in the bridge deck exposed during bridge deck removal shall receive an abrasive blast cleaning followed closely by an application of BASF Emaco P25, Sika Armatec 110 EpoCem, or Euclid Duralprep A.C. Perform all work in accordance with manufacturer's specifications. Cleaning and coating operations must be performed no more than 7 days prior to placement of the concrete. In the event more than seven days is required between initial coating and bridge deck placement, DB Contractor shall apply a

second coat of the same material used initially to the bars approximately one day prior to placement of the concrete.

In addition, DB contractor shall not waive the air entrainment requirement for all bridge deck, approach slabs, and rails except as permitted by TxDOT in accordance with the District's corrosion protection measures.

DB Contractor shall make bridge superstructures, joints, and bearings accessible for long-term inspection and maintenance. DB Contractor shall make open-framed superstructures accessible with walkways or by use of ladders or an under-bridge inspection truck.

DB Contractor shall embed all conduits within structure, with the exception that conduits shall not be embedded in bridge beams unless specifically approved by TxDOT. No exposed conduit will be allowed on bents, columns, outer face of exterior bridge beams, bridge slab overhangs, retaining walls, or any other visible surface unless specifically approved by TxDOT. TxDOT conduit is permitted to run on the underside of the slab in between bridge beams.

Box girders and caps (substructure) shall be accessible without impacting traffic below; DB Contractor shall make concrete box girders and caps (substructure) with a minimum inside depth of six feet to facilitate interior inspection. DB Contractor shall include a minimum access opening of 3-foot diameter into all cells and between cells of the girders to allow free flow of air during inspections. The outside access opening cover shall hinge to the inside of the box girder and caps (substructure). Steel tub girders shall meet the guidelines in the TxDOT *Preferred Practices for Steel Bridge Design, Fabrication, and Erection*.

Segmental bridges shall additionally conform to the following:

- Segmental bridge decks shall use deck protection systems to prevent infiltration of corrosive agents into reinforcing in the superstructure. The deck protection system used shall minimize cracking and develop adequate bond strength is developed with the superstructure.
- If monolithically cast overlay is used as part of the deck protection system, DB Contractor shall develop fully engineered design guidelines for the thickness of the monolithic concrete removed and replaced in a manner that keeps distress and changes in surface profile at the time of concrete removal to levels that do not reduce the structural integrity of the structure.
- All expansion joints shall be sealed or drained.
- External tendons, if used, shall be protected with welded high-density polyethylene joints.
- The design, detail and construction of segmental bridges shall provide additional ducts or other means to allow for future post-tensioning. Flexible fillers are not permitted.

21.2.5 Bridge Substructure

Integral abutments, where the superstructure is structurally framed (either completely or partially) into the abutment, shall not be used unless approved by TxDOT. MSE walls shall not serve as structural foundations for bridges on the Project, and shall not be subjected to vertical loads from the bridges. Bridge approach slabs or other settlement mitigation measures, if approved by TxDOT, shall be designed and constructed to mitigate settlement immediately behind abutment backwalls.

DB Contractor shall design abutment caps that are accessible by pedestrian foot traffic with a 4:1 sloped cap surface between bridge beams that starts at the backwall and slopes downward towards the cap edge, as shown in the Aesthetics and Landscaping Plan.

21.2.6 Bridge Railing and Barriers

All barrier systems used on the Project shall meet current crash test criteria as specified in the AASHTO *Manual for Assessing Safety Hardware* (MASH), TxDOT *Bridge Railing Manual,* and other safety requirements as determined by TxDOT. All testing and associated costs for non-standard railings shall be the sole responsibility of DB Contractor and shall be accomplished through a third party acceptable to TxDOT. A current list of standard railing is provided in the TxDOT *Bridge Railing Manual*. DB Contractor shall use SSTR on bridge structures, except for structures identified in the Aesthetics and Landscaping Plan. DB Contractor shall protect sidewalks on high speed bridges from vehicular impact by using TxDOT-approved bridge railings.

DB Contractor shall not utilize traffic rails with steel elements unless required for compliance with Item 28, "Bicycle and Pedestrian Facilities."

21.2.7 Retaining Walls

The type of retaining wall shall be restricted to those pre-approved by TxDOT, unless DB Contractor requests and is granted approval of an alternative system by TxDOT.

The design of wall structures shall take into account live load surcharges. DB Contractor shall apply the appropriate live loading condition (vehicular, heavy rail, transit, etc.) to which each wall is subjected. These live load surcharges shall be based on AASHTO *LRFD Bridge Design Specifications*, AREMA *Manual for Railway Engineering*, or the requirements of the specific railroad and transit owner/operator.

The retaining wall layout shall address slope maintenance above and below the wall.

DB Contractor shall design and construct components of the Project to provide embankments without the use of retaining walls. Where earthen embankments are not feasible, DB Contractor may use retaining walls.

If pipe culverts are to extend through the retaining walls, the pipe shall be installed so that no joints in the pipe are located within 2 feet of face of wall. Slip joints shall be placed on either side of the pipe and a headwall shall be placed over the portion of the pipe exiting the wall when any portion of the pipe exits the wall above finished ground.

Pipe for storm drain systems shall not run longitudinally within the MSE retaining wall earth reinforcement zone unless approved by TxDOT.

No weep holes through the face of the retaining walls will be permitted, except at the base of the walls.

Underdrains are required and shall be a minimum of 6 inches in diameter with cleanouts at a maximum of 300-foot spacing unless an alternative is approved by TxDOT. Underdrains shall be sloped to drain to permanent outfalls. Outfalls, minimum slope, and flowlines shall be shown on the retaining wall layouts. During placement DB Contractor to confirm minimum slope maintained end to end of pipe.

The top of the retaining wall leveling pad shall be located a minimum of two feet below existing natural ground or one foot below a proposed cut when material is removed, unless approved by TxDOT.

Earth reinforcement length is measured perpendicular to the wall. Adjust skewed earth reinforcements as necessary to obtain required length in accordance with the requirements of this Item 21 and Item 16, Section 16.2.2, “Geotechnical Investigation for Other Elements.” Wall height is the distance from the top of the leveling pad to the finished grade at the top of the wall.

Retaining walls shall end as close as practical to proposed grade within limits of fabrication heights of wall panels. Riprap shall be used to channel water from flume behind wall to outlets and to avoid soil erosions at ends of walls.

MSE retaining walls shall contain the appropriate select backfill as specified in the TxDOT Standard Specifications.

Retaining walls shall be analyzed for overall stability (both internal and external) including, but not limited to, bearing capacity, overturning, sliding, global stability and settlement. A geotechnical sampling program shall be used to obtain adequate samples for laboratory testing. Laboratory testing results shall be used for accurate determination of properties of in situ materials for use in design as well as use of accurate water levels, both groundwater and maximum high-water levels. Retaining walls shall have an underdrainage system depicted on plans, show location, slope, outfall, and drain typical section. Retained fill parameters should be based on testing results from borings or borrow site testing results. Design shall clearly describe results and application of sampling program, design parameters used, factors of safety, settlement, global stability, overturning, sliding, and bearing capacity. For retaining walls placed near slopes, appropriate application of reductions in bearing capacity shall be applied. All work shall be in accordance with requirements of AASHTO, FHWA, and TxDOT specifications, standard plans, and geotechnical design standard practices. FHWA documents including guidance manuals are considered design manuals to be followed in their entirety.

Hybrid walls shall only be used where DB Contractor can demonstrate an individual (non-hybrid) wall type cannot be constructed. Where hybrid walls are selected to be used in a particular case, walls shall be analyzed for overall stability (both internal and external) of the individual and combined walls and include all loads to each wall and combined walls. The design should demonstrate by calculation that the upper or adjacent wall will not cause excessive settlement or lateral movement of the lower wall due to the loading of

the upper wall. If a fill wall on top of a soil nail hybrid wall is selected, DB Contractor shall place a minimum of 2 feet of horizontal offset between the face of the fill wall and soil nail wall at the bottom of the fill wall. Plans for hybrid walls shall include details for construction of the walls including any temporary or permanent shoring for the walls and a detailed plan for the construction sequence. Plans shall include joints in the walls where necessary.

DB Contractor shall not utilize perched walls (i.e., retaining walls founded in non-in situ soil, embankment fill, or manmade subgrade).

Natural, exposed rock cut in place of retaining walls are permitted along the US 290 Eastbound frontage road ROW from approximately station 3363+00 to station 3380+00. Natural, exposed rock cut shall have a maximum height of 20 feet. If a natural, exposed rock cut is selected, DB Contractor shall meet the following requirements:

- Prevent 100% of rockfall from impacting roadway and shoulder;
- Prevent 100% of rockfall from impacting shared use path; and
- Prevent 100% of rockfall from resting on the roadway and shoulder;

DB Contractor is permitted to use a combination of rockfall mitigation measures, but the rock face must be a natural-exposed face without catchment coverings.

In producing rockfall analysis, DB Contractor shall conform to the most stringent requirements of TRB *Rockfall Characterization and Control* or *Rock Slope Engineering: Civil Applications*. DB Contractor may request to use other industry standard methods with TxDOT approval.

Cast-in-place concrete cantilever walls in accordance with TxDOT standards shall be permitted.

DB Contractor shall install a concrete traffic barrier (designed to resist rail impact loading) at the top of the retaining walls along frontage roads, collector-distributors, ramps, the SPUI, and cross streets in the following conditions:

- Top of retaining wall is within 20-feet of the roadway travel way and wall height is greater than 5-feet.
- Top of retaining wall is within 30-feet of the roadway travel way and wall height is greater than10-feet.

DB Contractor shall install pedestrian barrier at the top of retaining walls located between the frontage roads and ROW when the top of the wall is adjacent to facilities such as parking lots, commercial or multifamily properties that have the potential for pedestrian activities.

21.2.8 Sound Walls

DB Contractor shall design and construct all sound walls to achieve the decibel reduction requirements in the NEPA Approvals and meet the aesthetic requirements in Item 23, “Aesthetics and Landscaping.”

Sound walls shall conform to AASHTO *LRFD Bridge Design Specifications,* including installation of traffic railing in accordance with the Contract Documents.

If any portion of the existing sound wall needs to be temporarily disassembled for any reasons during construction, the sound wall shall be reassembled and restored to its existing condition. DB Contractor shall repair all existing sound walls that are damaged during construction within the Project limits.

If pipe culverts are to extend through the sound walls, the pipe shall be installed so that no joints in the pipe are located within two feet of face of wall.

21.2.9 Drainage Structures

In developing the design of drainage structures, DB Contractor shall account for maximum anticipated loadings for the Project.

Energy dissipaters, if used, shall be considered as structural Elements.

DB Contractor shall analyze existing drainage structures for capacity and condition. As necessary, retrofit or replace elements to accommodate required hydraulic capacity, and any additional loads, settlements, and/or other structural impacts associated with the Project.

21.2.10 Sign, Illumination, and Traffic Signal Supports

DB Contractor shall design overhead and cantilever sign supports to accommodate the Project. Cantilever and overhead sign bridge supports shall be placed outside the clear zone or shall be otherwise protected by appropriate safety measures. Sign supports shall be provided at locations necessary to meet the signing requirements of the Project. Supports for bridge mounted illumination poles shall not be located more than 10 feet away from centerline bearing of a bridge bent or abutment unless approved by TxDOT.

Small roadway clearance signs shall follow the TxDOT BCMS standard requiring attachment to the corresponding bridge rail.

Large signs as defined by the TxDOT Standard Specifications shall not be mounted on bridges unless approved by TxDOT. For overhead sign supports on bridges, DB Contractor shall indicate on bridge layouts a cantilever-type overhead sign support (COSS) founded on a bent cap or on an isolated concrete column on drilled shaft, or an overhead sign bridge (OSB) attached directly to the bridge superstructure. The location of any overhead sign support on bridges requires special design to be reviewed and approved by TxDOT.

21.2.11 Rehabilitation of Structures to be Widened, Extended, or Reused

Rehabilitation of existing bridges and bridge class culverts and widening of existing bridges and bridge class culverts is permitted in accordance with DBA Exhibit 1.

A Bridge Condition Rating Summary and Bridge Condition Surveys are located in the RIDs. Any component with a condition rating less than 7 as determined in the condition survey and any other defects discovered by DB Contractor shall be rehabilitated. DB Contractor shall perform inspections using inspectors, pre-approved by TxDOT, with previous experience inspecting TxDOT bridge inventory. The inspectors shall confirm rehabilitation has achieved a minimum condition rating of 7 for each structural component at Substantial Completion. Crashwalls shall be added to existing two-column bents for structures to be reused. Any substandard or obsolete rail shall be upgraded for structures to be reused.

DB Contractor shall clean and repair existing expansion joints and provide new full width seals for existing and widened structures including all existing open joints.

DB Contractor shall inspect all existing bridge bearings. As necessary, DB Contractor shall rehabilitate, repair, or replace existing bridge bearings to accommodate design loads and expansion.

DB Contractor shall patch and repair concrete spallings, and concrete delaminations, clean and repair exposed reinforcing, seal cracks and repair or replace structurally damaged elements of existing structures.

DB contractor shall perform concrete repair work in accordance with TxDOT *Concrete Repair Manual*.

DB Contractor shall remove rust, clean, and paint all existing steel bridge superstructures and associated steel bridge bearings to remain. DB Contractor shall perform a paint condition assessment for all painted structures prior to any rehabilitation activities. Recommendations to leave any existing coatings intact shall be submitted to TxDOT for approval.

Full bridge deck replacements shall consist of a minimum of 8.5-inch-thick Class S concrete bridge deck. Bridge beams/girders and substructures shall be rehabilitated or replaced as required to support the new bridge deck load in combination with live load specified in this Section 21.2.3. Bridge widenings shall utilize 8.5-inch-thick deck regardless of the deck thickness of existing bridge. Existing decks less than 8.5-inch-thick may only remain in place when meeting bridge design load and rating criteria from Section 21.2.3.

21.3 Construction Requirements

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 21 in accordance with the requirements of this Item 21 and TxDOT Standard Specifications.

DB Contractor shall create a digital video of all drilled shaft excavations east of US 290 station 330+00 and east of SH 71 station 1110+00. Each digital video shall document the inside of the excavated hole prior to installation of reinforcing steel and will be used to document the presence of karstic features or lack of karstic features. Each digital video shall include visual confirmation of the structure being constructed, location, and drilled shaft number. DB Contractor shall submit each digital video to TxDOT within 10 Business Days of completion of the drilled shaft.

21.4 Submittals

All Submittals described in this Item 21 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 21-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 21-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Corridor Structure Type Study and Report	Prior to the design of bridges, walls, bridge class culverts, sign structures and other miscellaneous structures	Review and comment	21.2
All electronic and paper copies of files and design calculations	Upon request and no later than the start of construction of Elements related to the request	For information	21.2.2
Recommendations to leave any existing coatings intact	Prior to any rehabilitation activities	Approval	21.2.11
Digital videos of drilled shaft excavations	Within 10 Business Days of completion of the drilled shaft	For information	21.3

Item 22
Rail

Item 22 is omitted.

Item 23
Aesthetics and Landscaping

23.1 **General Requirements**

This Item 23 defines requirements with which DB Contractor shall design and construct aesthetic treatments for the roadway, structures, shared use paths, drainage, and landscaping elements of the Project. Aesthetic treatments shall be designed to harmonize with the local landscape and architecture, as well as the developed themes of the local settings.

This Item 23 presents minimum aesthetics and landscape design requirements for Project designs. For purposes of this Item 23, the following list of items will be considered the aesthetics elements of the Project design:

- Material, finish, color, shape, and texture of bridge elements;
- Materials, finish, and color of barriers and railings;
- Paved slope treatments;
- Finish, color, and texture of retaining and noise/sound walls;
- Contour grading, slope rounding, channel treatments, and drainage;
- Sculptural and artistic features of other structures;
- Sidewalks, medians, or pedestrian specialty paving, including material, finish, and color;
- Hardscape at interchanges and intersections;
- Landscape features;
- Wayfinding markers;
- Fencing;
- Signage – overhead, attached, and ground-mounted;
- Any permanent building construction within the Project, including ancillary and operational support;
- Light fixture, ambient light colors, and general layout conditions; and
- Landscape plant materials.

DB Contractor shall provide to TxDOT landscaping and irrigation plans for review and approval as part of the Preliminary Design Submittal and Final Design Submittal.

23.1.1 **Aesthetics Concepts**

Aesthetic elements shall be designed as corridor-wide enhancements. To the extent practicable, the aesthetic elements shall remain consistent in form, materials, and design throughout the length of the Project where applied.

It shall be understood that with TxDOT approval, the concepts for components of the Project corridor may need to be adapted to the Site-specific conditions of the Project.

23.1.2 **Aesthetics and Landscaping Plan**

DB Contractor shall adhere to the Aesthetics and Landscaping Plan for the aesthetics design of the Project.

23.1.2.1 **Aesthetics**

The Aesthetics and Landscaping Plan shall serve as the primary standard guidance necessary to produce the intended aesthetic form, function, and appearance of this Project.

DB Contractor shall apply the Aesthetics and Landscaping Plan from US 290 station 453+00 to the western Project limits and on SH 71 from US 290 to Silvermine Drive.

23.1.2.2 **Landscaping**

Soil preparation plans, landscape staking, mulching, and other aspects of plant installation and maintenance of the Project shall comply with the TxDOT Standard Specifications and Good Industry Practice.

23.1.3 **Personnel**

DB Contractor shall provide a landscape architect, registered in the State of Texas, to remain involved through construction and shall ensure continuity and compliance with the Aesthetics and Landscaping Plan and applicable TxDOT and TxDOT District office standards and these Design-Build Specifications.

23.2 **Design Requirements**

23.2.1 **Aesthetics Principles and Strategies**

DB Contractor shall follow the guidelines and requirements of the Aesthetics and Landscaping Plan, as well as the aesthetics principles, requirements, and strategies established by TxDOT for the Project design, including the following:

- Aesthetics shall not interfere with safety, constructability, or maintenance requirements;
- The Project design shall minimize impact on the existing natural environment to the extent possible;
- The Project design shall emphasize and enhance the existing natural context and landscape to the fullest extent possible;
- Simple geometric shapes for structures shall be used to the extent possible for continuity along the entire length of the Project;
- All bridges and other structures shall be simplified in their design, and to the greatest extent possible, kept small in size, bulk, and mass;
- All structures shall be carefully detailed so as to achieve the greatest level of aesthetic quality and conform to the Aesthetics and Landscaping Plan;
- Color, texture, and form shall be used appropriately for all structures;
- Graphics, signage, and lighting shall be consistent along the entire length of the Project;
- Existing native Trees and established naturalized Trees and natural features shall be preserved to the greatest extent possible, and TxDOT consent will be required in order to use a natural feature for erosion control;
- Aesthetic elements shall be fully integrated with the overall structure and landscape design;
- Visual quality of the landscape shall be consistent along the entire length of the Project;
- Mass plantings shall be utilized to the greatest extent;
- Native-area and/or naturalized plant materials that exhibit good drought tolerance shall be used to the extent possible;
- Aesthetic elements shall be easy to maintain and resistant to vandalism and graffiti; and
- Aesthetic elements shall conform to the Aesthetics and Landscaping Plan.

23.2.2 **Walls and Sign Columns**

DB Contractor shall design noise/sound walls to be similar in color, texture, style, and aesthetic treatment to retaining walls consistent with the Aesthetics and Landscaping Plan. DB Contractor shall apply aesthetic treatments to the vertical surfaces of retaining and noise/sound walls where the surface is visible from the roadway or adjacent residential dwelling units. Consistent treatments shall be used for retaining and noise/sound walls and exposed concrete column sign support structures that articulate the design themes established. DB Contractor shall clearly detail and identify how wall patterns shall be incorporated into the chosen design solution.

The roadside face of noise/sound walls shall have a consistent appearance throughout their length. The side of the noise/sound walls facing away from the roadway may vary based upon TxDOT-approved conceptual and Final Design and, if so directed by TxDOT, community input gathered by DB Contractor.

23.2.3 Bridges and Other Structures

All aesthetic treatments for structural Elements shall be coordinated with DB Contractor's structural design team to facilitate constructability and maintain safety requirements. All substructure columns, abutments, bridge rails, and other structures shall be consistent in form and texture with similar shapes and details used for all bridges, in accordance with the Aesthetics and Landscaping Plan.

A maximum of 3 concrete beam/girder depths is permitted within an individual structure. DB Contractor shall maintain the same structure depth for a minimum of 4 consecutive concrete spans at all locations, except that beam/girder depth may change if a demonstration to TxDOT is provided that horizonal or vertical clearance constraints from particular roadway geometric arrangements or hydraulic requirements necessitate a specific depth change for particular span(s). In all cases these constraints shall be kept to minimum required.

23.2.4 Trees, Shrubs, and Other Plant Materials

All trees, shrubs, deciduous vines, and perennials shall comply with the applicable requirements of *American Standard for Nursery Stock* (ANSI Z60.1-1990). DB Contractor shall utilize plant species native to or naturalized in the Project region.

Vegetation provided, other than grassing, and erosion control measures, shall be placed in accordance with TxDOT minimum clearance zones.

DB Contractor shall comply with the requirements of Item 10,001, Tree Protection" for preconstruction and construction activities. Where permissible under Item 10,001, "Tree Protection," DB Contractor shall perform tree and shrub trimming or removal for areas within 30 feet of edge of pavement under construction. Where permissible under Item 10,001, "Tree Protection," DB Contractor shall trim or remove to provide minimum of 5 feet of horizontal clearance and 7 feet of vertical clearance for the following: pedestrian facilities, bicycle facilities, metal beam guard fence, rails, signs, object markers, and structures. Where permissible under Item 10,001, "Tree Protection," DB Contractor shall trim to provide a minimum of 15 feet vertical clearance for vehicles under trees.

23.2.5 Mass Plantings

DB Contractor shall identify and provide 150,000 SF of mass plantings in the "Mass Planting Areas" within the Project ROW in accordance with the Aesthetics and Landscaping Plan. Mass Planting Areas are permitted to be constructed along SH 71 and US 290 west of Joe Tanner Lane. DB Contractor shall use a minimum of 12 different beds separated by a minimum of 300 feet upstation and downstation from the start of the next Mass Planting Area. Plant beds shall be located outside of the clear zone and have a minimum width of 15 feet. DB Contractor shall not construct mass plantings over buried utilities, under bridges, in areas of concentrated flows, or in areas receiving shade for more than 6 hours per day during the growing season. DB Contractor shall not construct mass plantings in a detention pond or within the 25-year flood plain. DB Contractor shall install trees a minimum of 15 feet from back of curb. Trees installed in Mass Planting Areas are not permitted where back of curb to ROW distance is less than 15 feet. DB Contractor shall install shrubs and grasses in Mass Planting Areas a minimum of 10 feet from back of curb.

The total distribution of plants across all Mass Planting Areas combined shall be comprised of 50% shrubs, 35% perennials and grasses, and 15% trees by volume, Each Mass Planting Area shall be comprised of 50% shrubs, 35% perennials and grasses, and 15% trees by volume, unless bed size does not accommodate this distribution.

For the Mass Planting Areas, DB Contractor may select from the following types of shrubs ranging from 5 to 15 gallons each:

- Anacacho Orchid Tree;
- Mexican Buckeye;
- Carolina Buckthorn;
- Crape Myrtle;
- Desert Willow;
- Eve's Necklace;
- Goldenball Leadtree;

- Yaupon Holly;
- Kidneywood;
- Mountain Laurel;
- Texas Persimmon;
- Mexican Plum;
- Mexican Redbud;
- Retama;
- Mexican Silktassel;
- Evergreen Sumac;
- Flameleaf Sumac;
- Agarita;
- Apache Plume;
- Flame Acanthus;
- Fragrant Mimosa;
- Dwarf Yaupon;
- Globe Mallow;
- Texas Sage; and
- Turks Cap

For the Mass Planting Areas, DB Contractor may select from the following types of perennials and grasses ranging from 1 to 5 gallons each:

- Bird of Paradise;
- Butterfly weed;
- Calyophus;
- Chile Pequin;
- Coralbean;
- Blackfoot Daisy;
- Copper Canyon Daisy;
- Damianita;
- Esperanza;
- Fall Aster;
- Gayfeather;
- Gregg Mistflower;
- Hymenoxys;
- Lantana;
- Hill Country Penstemon;
- Cedar Sage;
- Majestic Sage;
- Mealy Blue Sage;
- Big Red Sage;
- Skeletonleaf Goldeneye;
- Heartleaf Skullcap;
- Wrights Purple Skullcap;
- Agave;
- Basketgrass;
- Prickly Pear;

- Nolina;
- Sotol;
- False Red Yucca;
- Twist Leaf Yucca;
- Little Bluestem;
- Big Muhly;
- Gulf Muhly; and
- Sideoats Grama

For the Mass Planting Areas, DB Contractor shall select 50% of trees at 30 gallons and 50% of trees between 15 and 30 gallons. For the Mass Plantings Areas, DB Contractor may select from the following types of trees:

- Eastern Red Cedar;
- Arizona Cypress;
- Cedar Elm;
- Honey Mesquite;
- Chinquapin Oak;
- Lacey Oak;
- Monterrey Oak;
- White Oak;
- Live Oak;
- Red Oak; and
- Pecan

23.2.6 Tree Protection

DB Contractor shall comply with the requirements of Item 10,001, “Tree Protection.”

23.2.7 Plant Maintenance and Establishment Period

DB Contractor shall be responsible for the care of all plants installed on the Project, in accordance with the requirements of the TxDOT Standard Specifications for a period of two years, “the Establishment Period,” after the date of Final Acceptance.

During the Establishment Period, DB Contractor shall replace the plant materials when they are no longer in a healthy condition as determined by TxDOT, and make adjustments to the irrigation systems as directed by TxDOT. DB Contractor shall make replacement plantings in the planting season, except as otherwise approved in writing by TxDOT. DB Contractor shall remove dead plants within ten Business Days of discovery, and DB Contractor shall replace such plants during the next planting season. Replacements shall be of the same species and variety of the originally specified material, unless otherwise approved in writing by TxDOT, and shall be installed as specified by herein. If a replaced plant requires another replacement during the maintenance and Establishment Period, the new replacement shall also be covered for the maintenance and Establishment Period.

After Final Acceptance, TxDOT will review the completed landscape installation and irrigation systems with DB Contractor on a quarterly basis during the roadside planting and Establishment Period. Plant material health, mulching, erosion controls and other maintenance concerns will be specifically noted. Replacement needs will be noted and directed to DB Contractor during the roadside planting and Establishment Period.

If grassed areas develop major weed or erosion problems, DB Contractor will correct the problems. DB Contractor shall monitor and control weeds where necessary. Acceptance of vegetative establishment of all seeded areas will be required before Final Acceptance of Project. Acceptance will occur when grass has grown at least 2 inches high with 95% coverage provided no bare spots larger than one square foot exists. Watering shall continue until Final Acceptance.

23.2.8 Irrigation System

DB Contractor shall prepare an irrigation plan for a drip irrigation system, designed by a licensed irrigator and following TCEQ requirements. DB Contractor shall design the system to sufficiently distribute water to all plant material in accordance with the rules and regulations of TCEQ and the local water authority. DB Contractor shall install the irrigation design, as approved by TxDOT.

DB Contractor shall provide irrigation lines and meters to the mass planting beds and provide for their upkeep through the Establishment Period.

DB Contractor shall locate all underground utilities and conduit locations prior to digging or trenching. Irrigation pipes shall be placed to avoid conflicts with utilities and other appurtenances. Valves shall be placed in accessible locations.

Substitutions or alternate equipment shall not be installed without prior TxDOT approval. Equipment shall be installed according to manufacturer's directions, unless otherwise directed.

DB Contractor shall provide one-inch temporary hydrant water meters from the City of Austin Water Services for irrigation purposes.

DB Contractor shall provide backflow prevention devices that are approved by the city water authority and shall ensure that temporary hydrant meters are secured to hydrants.

DB Contractor shall establish the water service account under DB Contractor's name and pay for all fees, deposits, and costs related to equipment, installation, inspections, and water service through the Establishment Period.

DB Contractor shall provide a minimum of 18 inches clearance below the bottom of roadway pavement structures for bores, with a minimum depth of no less than 30 inches to pavement surface.

DB Contractor shall use SCHD 80 PVC pipe for all exposed, above ground irrigation pipe. DB Contractor shall use SCHD 40 PVC for all below ground irrigation pipe and bore casings, unless otherwise directed. DB Contractor shall bury main lines and lateral pipe a minimum of 12 inches below grade.

DB Contractor provide 0.5-inch drip tubing with punch-in emitters and shall staple and bury drip tubing two inches below soil line.

DB Contractor shall provide Record Drawings on 11" x 17" sheets that show the exact location of valves, backflow preventer, quick couplers, and location changes of irrigation mainlines, if different from original layout. DB Contractor shall show the dimensional distances of valve and device locations from two permanent objects such as curbs, walls, light poles, etc. Record Drawings must be sealed by a licensed irrigation contractor, must include all information required by TCEQ, and must be submitted for approval before the Establishment Period begins.

DB Contractor shall monitor water distribution, check for leaks or over-saturation, and repair and adjust irrigation to prevent wasted water.

DB Contractor shall repair and replace parts as required to keep irrigation systems operating and functioning properly throughout the Term.

DB Contractor shall ensure proper distribution of water for proper plant growth and keep irrigation system fully operational.

Upon completion of the Establishment Period and as directed, DB Contractor shall contact the local water authority to disconnect temporary hydrant meters. DB Contractor shall remove temporary hydrant meters and cap irrigation lines and close the water account, as directed. DB Contractor shall remove all stakes and gator bags or equivalent water delivery devices.

23.2.9 Riprap, Paving, and Pavers

Concrete paving or landscape pavers shall be used in hard-to-reach mowing areas such as, but not limited to, areas between, near, or next to guard fence posts, retaining walls, freeway ramp gores, paved ditches, flumes, and ditch inlets to improve roadway appearance.

Concrete riprap, cobblestone riprap and landscape pavers shall be applied per the Aesthetics and Landscaping Plan. Where sound walls and buildings within the public right-of-way are less than 10 feet apart,

DB Contractor shall place concrete riprap between the two structures. Where riprap is to be placed under structures, DB Contractor shall use cobblestone riprap under all structures.

Sidewalks and shared use paths shall not receive a patterned finish.

23.3 Construction Requirements

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 23 in accordance with the requirements of this Item 23, TxDOT Standard Specifications, Item 10,001, "Tree Protection," and Aesthetics and Landscaping Plan.

DB Contractor shall provide TxDOT sample panels 30 days in advance of starting construction of textured concrete surfaces and landscape pavers. DB Contractor shall construct sample panels in accordance with TxDOT Standard Specifications Item 427 and Item 528 that comply with the principles, requirements, and strategies established by TxDOT, the Aesthetics and Landscaping Plan and TxDOT district standards. TxDOT must review and approve the sample panels before any construction form liners, paint, or landscape pavers may be ordered, obtained, or used. DB Contractor shall provide sample equivalent to the size of the panels that will be installed when constructed with a representative un-textured surrounding surface. The approved sample panel shall be the standard of comparison for the production concrete surface texture.

For textured panels or concrete surfaces finished with a coating of paint or stain, DB Contractor shall prepare a corresponding coated panel or surface area of an in-place element for TxDOT approval prior to the coating operation.

All sample panels shall be representative of the actual panel that will be placed. Primary, secondary, and accent colors shall be displayed.

DB Contractor shall construct the irrigation system in accordance with TxDOT Standard Specification Item 170 (Irrigation System) that comply with the principles, requirements, and strategies established by TxDOT and the Aesthetics and Landscaping Plan and TxDOT Austin District Standards.

23.4 Aesthetic and Landscaping Enhancements

DB Contractor shall coordinate with the Utility Owner(s) and ensure power service is initiated and provided/maintained for all irrigation controllers and aesthetic lighting within the Project during the Term. DB Contractor shall place power services in the name of TxDOT and pay the applicable initial startup and permit fees. TxDOT will pay for permanent power services.

23.5 Submittals

All Submittals described in this Item 23 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 23-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 23-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Landscape and Irrigation Plans	As part of the Preliminary and Final Design Submittals	Approval	23.1, 23.2.8
Aesthetic and landscape concepts	As needed	Review and comment	23.1.1
Panel samples	Prior to starting construction of textured concrete surfaces and landscape pavers	Approval	23.3

Item 24
Signing, Delineation, Pavement Marking, Signalization, and Lighting

24.1 **General Requirements**

This Item 24 includes requirements with which DB Contractor shall design, construct, and maintain, all signs, delineation, pavement markings, signals, and lighting for the Project.

24.2 **Administrative Requirements**

24.2.1 **Meetings**

DB Contractor shall arrange and coordinate all meetings with local Governmental Entities that will assume responsibility for maintaining and operating traffic signals and roadway lighting. DB Contractor shall provide TxDOT with notification of such meetings a minimum of 48 hours prior to the start of the meeting. TxDOT, in its discretion, may attend such meetings.

DB Contractor shall arrange and coordinate all meetings with Governmental Entities or other Persons requesting special signs.

24.3 **Design Requirements**

DB Contractor shall design all signing, delineation, pavement marking, and signalization in accordance with the TMUTCD and TxDOT SHSD, TxDOT *Freeway Signing Handbook,* TxDOT *Sign Crew Field Book,* TxDOT *Traffic Signals Manual,* TxDOT Engineering Standard Sheets, TxDOT Standard Specifications, and Good Industry Practice. DB Contractor shall design all illumination (lighting) in accordance with the TxDOT *Highway Illumination Manual*, NEC, AASHTO *Roadway Lighting Design Guide*, TxDOT Engineering Standard Sheets, TxDOT Standard Specifications, and Good Industry Practice.

24.3.1 **Final Design**

DB Contractor shall submit, for TxDOT's approval, a preliminary operational signing schematic. Design of the signing, delineation, pavement marking, signalization, and lighting shall be based on the approved preliminary operational signing schematic. Before placing any signs, delineation, non-standard sign structures, pavement markings, traffic signals, and lighting, DB Contractor shall provide TxDOT a layout indicating the proposed location of such items. DB Contractor shall provide TxDOT advance notice of changes or revisions to sign locations included in the preliminary operational signing schematic.

24.3.2 **Signing and Delineation**

DB Contractor shall design and install all signs as shown on the Release for Construction Documents. Signs include new signs, as well as modifications to existing sign panels and structures. The use of existing sign structures by DB Contractor shall be subject to TxDOT approval. DB Contractor shall confirm the suitability of existing sign structures considered for use and shall be responsible for necessary modifications and structural evaluation to determine if the existing structure is acceptable to use.

DB Contractor's design shall include the locations of ground-mounted and overhead signs, graphic representation of all signs, proposed striping, delineation placement, guide sign and special sign details, and structural and foundation requirements. Signs shall be located in a manner that avoids conflicts with other signs, vegetation, DMS, lighting, and structures.

DB Contractor shall ensure that signs are clearly visible, provide clear direction and information for users, and comply with all applicable TMUTCD requirements.

Subject to Section 24.3.4, DB Contractor shall review with TxDOT all requests for new signs, including traffic generators, or modifications of existing sign text. Such requests are subject to TxDOT's approval.

DB Contractor's design of delineators and object markers shall comply with TMUTCD requirements.

DB Contractor shall install type GF2 barrier reflectors as shown in TxDOT Engineering Standard Sheets on metal beam guard fences.

Signs shall meet the requirements of TxDOT SHSD.

DB Contractor shall replace all signs (overhead, large, small, etc.) within the limits of full depth reconstruction with new signs.

DB Contractor shall replace all mainlane signs along US 290 and SH 71 within the Project limits with new signs.

DB Contractor shall replace all wooden signs within the Project limits with new signs in accordance with this Item 24.

DB Contractor shall replace all signs, including school signs and flashers, affected by any local street improvements.

DB Contractor shall ensure all existing street name signs for cross streets are replaced or relocated and proposed street name signs are installed according to TMUTCD requirements.

24.3.3 Project Signs – Outside the Project ROW

For signs located outside the Project ROW but within a public ROW, DB Contractor shall install the signs in existing ROW controlled by local Governmental Entities or other State Governmental Entities. DB Contractor shall coordinate with appropriate Governmental Entities for DB Contractor's design and installation of such signs.

24.3.4 Third-Party Signs

In addition to the warning, regulatory, and guide signs within the Project ROW, TxDOT or Governmental Entities may request that third-party signs, including logo signs, be installed by a third party. DB Contractor shall coordinate and cooperate with any third party performing such work. TxDOT may solicit input from DB Contractor in reviewing applications for new third-party signs, but will retain sole authority for approving installation of these signs. If approved by TxDOT, TxDOT may require DB Contractor to fabricate and/or install these signs as a TxDOT-Directed Change.

DB Contractor shall maintain existing third-party signs and shall not remove, adjust, or relocate third party signs without approval of the third party and TxDOT.

24.3.5 Sign Support Structures

DB Contractor shall determine foundation types and design sign foundations based upon geotechnical surveys/tests using Good Industry Practice. Designs for sign supports shall also comply with requirements in Item 21, "Structures," and Item 23, "Aesthetics and Landscaping."

24.3.6 Pavement Markings

DB Contractor shall ensure that the design and installation of all pavement markings comply with applicable TMUTCD requirements, Austin District Standards, and TxDOT Engineering Standard Sheets.

DB Contractor shall design and install 6 in pavement markings as shown in the Austin District Standards and TxDOT Engineering Standard Sheets for the pavement markings on the mainlanes of US 290 and SH 71, and any direct connectors.

DB Contractor shall design and install raised profile pavement markings as shown in the Austin District Standards and TxDOT Engineering Standard Sheets for all roadways with a design speed of 45 miles per hour or greater.

DB Contractor shall design and install contrast lane line pavement markings as shown in the Austin District Standards on all concrete pavement surfaces. The contrast lane lines shall comply with the requirements of *TxDOT Special Specification Item 6019* provided in the RIDs.

DB Contractor shall design and install edgeline pavement markings as shown in the TxDOT Engineering Standard Sheets on the mainlanes of US 290 and SH 71.

DB Contractor shall retrace all existing pavement markings that will remain within the project.

24.3.7 Signalization

Traffic signal designs and modifications to existing traffic signals shall be completed in accordance with TxDOT Standard Specifications, the TMUTCD, and the requirements of the City of Austin

24.3.7.1 Traffic Signal Requirements

DB Contractor shall design and install new or modified existing fully-actuated temporary and permanent traffic signals at all TxDOT-authorized intersections identified within "Oak Hill Parkway Cross Street Matrix" included in the RIDs or that are impacted by the Traffic Control Plan and/or Final Design. DB Contractor shall maintain all signals modified by DB Contractor from the time at which it is modified through Final Acceptance. DB Contractor shall coordinate with TxDOT and the City of Austin to define appropriate traffic signal design requirements, local agency oversight of DB Contractor's Work, and final acceptance of traffic signals. DB Contractor shall coordinate with the City of Austin for synchronization of traffic signal networks. DB Contractor shall provide connectivity from the temporary and permanent traffic signals to the Combined Transportation, Emergency and Communication Center and the City of Austin Mobility Management Center in accordance with City of Austin design requirements.

DB Contractor shall comply with TxDOT *Traffic Signals Manual*.

DB Contractor's design shall also incorporate the following requirements:

- Design mast arms, poles, heads and foundations in accordance with TxDOT Engineering Standard Sheets and TxDOT Specifications;
- Comply with the UAR for proper cover of conduit;
- Comply with Electrical Detail (ED) sheets of the TxDOT Engineering Standard Sheets, however, all pull boxes tied to the immediate signal infrastructure shall be designed to City of Austin Standard 834S for Traffic Signal Pull Boxes;
- Any Cat5e Cable proposed on the project to service devices/equipment shall be armored;
- Include a 352 Stretch Advanced Traffic Controller (ATC) Cabinet with 2070 Controller loaded with D4 software;
- Detection shall be radar capable of stopbar and set-back detection, with the ability to set and distinguish lane lines;
- Each intersection shall include a CCTV camera capable of pan-tilt-zoom;
- All signal heads shall be aluminum, polycarbonate heads shall not be permitted;
- Where right turn overlaps are provided in proposed signal phasing, include a 4-section head including a flashing yellow arrow for right turns;
- All crosswalks shall incorporate Audible Pedestrian Signal Heads consistent with current installations within the City of Austin; and
- All signals shall include a Battery Back-up unit consistent with TxDOT Standards and Specifications.

24.3.7.2 Traffic Signal Timing Plans

DB Contractor shall design signal timing plans for all new and modified traffic signals. DB Contractor shall coordinate with the City of Austin for any diamond interchange phasing to be developed; TTI 4-phase diamond interchange phasing shall not be implemented. DB Contractor shall coordinate and implement signal timing plans that optimize traffic flows and provide signal coordination with adjacent intersections and arterials for all new and modified signals. DB Contractor shall be responsible for updating signal timing as necessary to maintain optimized flows.

DB Contractor shall provide copies of all final implemented signal timing plans to the appropriate Governmental Entity.

24.3.7.3 Traffic Signal Warrants

As part of the Final Design process, DB Contractor shall collect traffic data and prepare traffic warrant studies for all proposed signalized intersections and shall submit these signal warrant studies to TxDOT for

review. The warrant studies shall address all signal warrant criteria in the TMUTCD. DB Contractor shall make recommendations for new signal installations based on these warrant studies in consultation with TxDOT and the City of Austin. TxDOT will reasonably determine if a signal or modification is required, based upon the warrant study.

All requests for signals within the Project ROW throughout the Term shall be subject to TxDOT approval. Requests for signals shall include supporting traffic warrant studies and traffic signal plans prepared in accordance with the TMUTCD, TxDOT Engineering Standard Sheets and TxDOT Specifications.

Signal warrant studies shall be based on actual traffic and/or opening year traffic projections. From TMUTCD Chapter 4C: *"At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed".* At TxDOT's request, DB Contractor shall conduct additional traffic signal warrant studies for all intersections located in the Project ROW, prior to Final Acceptance. If additional signals or modifications to existing signals are warranted, based on the traffic volumes obtained through these studies, DB Contractor shall be responsible for installation of additional traffic signals or modification of previously-installed traffic signals. If, based on the above traffic counts, the need for a signal or signal modification is unclear, TxDOT will reasonably determine if the new signal or signal modification is required.

DB Contractor shall design permanent traffic signal support structures in accordance with Section 24.3.7.4, traffic signal systems in accordance with Section 24.3.7.5, and permanent signalization in accordance with Section 24.4.3 for all proposed signalized intersections at the time of NTP1.

For signals that do not meet signal warrant requirements at the time of analysis, DB Contractor shall provide the mast arms, signal heads, and all infrastructure to be mounted on the mast arm to TxDOT but shall construct and install all of the other infrastructure required by the permanent traffic signal design.

DB Contractor shall design and construct safety lighting using the infrastructure installed for all proposed signalized intersections that do not meet traffic warrants as directed by TxDOT.

As part of the Final Design process, DB Contractor shall collect traffic data and prepare traffic warrant studies for all existing signalized intersections that are not proposed to be signalized and shall submit these signal warrant studies to TxDOT for review.

24.3.7.4 Traffic Signal Support Structures

DB Contractor shall coordinate with TxDOT and the City of Austin to determine the type of traffic signal support structures. DB Contractor shall obtain the City of Austin's and TxDOT's approval of traffic signal support structures to be used on new and modified signal installations. DB Contractor shall provide mast arms for permanent signals.

Designs for traffic signal support structures shall also comply with requirements in Item 21, "Structures."

24.3.7.5 Traffic Signal Systems

DB Contractor shall provide to TxDOT an ATP for all traffic signals. This ATP shall also be submitted to the City of Austin. DB Contractor shall conduct testing in accordance with the ATP and document those results to show conformance.

24.3.8 Lighting

All third-party requests for lighting within the Site shall be subject to TxDOT approval.

DB Contractor shall design lighting systems, including safety lighting where warranted, in accordance with the TxDOT *Highway Illumination Manual*. DB Contractor shall design continuous lighting within the Project limits for the mainlanes of US 290, SH 71, and William Cannon Drive. All design and construction shall comply with the latest TxDOT Engineering Standard Sheets and TxDOT Standard Specifications. As part of the lighting design a lighting schematic layout will be required and will be subject to TxDOT review and approval. At all times during the Term, DB Contractor shall maintain safe lighting conditions along the Project roadway and shall provide safety lighting at all intersections.

Conventional luminaire poles and breakaway bases shall be designed in accordance with AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. For all poles located within the clear zone of the roadways, DB Contractor's design shall incorporate breakaway devices that are pre-qualified by TxDOT. Any high mast lighting poles shall meet the requirements of TxDOT Engineering Standard Sheets and TxDOT Standard Specifications.

DB Contractor shall replace all existing luminaire fixtures (housing and bulbs) within the Project limits, including existing luminaire fixtures in high-mast illumination. Replacements shall include repair of conduit, wiring and upgrades to current electrical standards. DB Contractor shall utilize LED luminaires that conform to TxDOT DMS 11011 at all applicable proposed lighting locations. All high-mast illumination fixtures shall be LED with shields.

DB Contractor shall not install additional high-mast illumination within the Project limits but may relocate existing high mast within the same illuminated area to accommodate roadway construction and meet illumination requirements.

DB Contractor shall place all understructure lighting in a configuration that minimizes the need for Lane Closures during maintenance.

DB Contractor shall install understructure lighting between Old Bee Cave Road and William Cannon Drive along the westbound frontage road and eastbound frontage road when the mainlane bridges are above the frontage road pavement.

DB Contractor shall determine and design appropriate foundation types and lengths for permanent lighting structures.

For each assembly, DB Contractor shall paint the service, circuit, run and assembly number and letter using 3 inch tall characters with black paint. The markings shall be stacked vertically, in the order provided, with the service on top and the assembly number and letter on the bottom. Markings shall be placed 6 ft. above the roadway surface, on the side of the pole that contains the handhole or access door, or adjacent to the assembly, if mounted to a structure.

DB Contractor shall ensure that lighting structures comply with Federal Aviation Administration (FAA) height restrictions near airport facilities. In the event that proposed or existing luminaires, mast arms, or poles infringe into an airport's or heliport's base surface, DB Contractor shall coordinate with the FAA and TxDOT to permit or relocate such structures. If FAA restrictions prohibit lighting structures from being placed in certain areas near an airport facility, DB Contractor shall find alternative ways of providing the required level of lighting.

DB Contractor shall provide to TxDOT an ATP for all illumination. This ATP shall also be submitted to the City of Austin. DB Contractor shall conduct testing in accordance with the ATP and document those results to show conformance.

DB Contractor shall install cut-off or neighborhood friendly fixtures to eliminate spillover lighting outside the Project ROW. Light spill over levels shall be less than 2.5% of the average illumination level at the edge of the ROW line.

Daytime roadway illumination will not be required.

24.3.8.1 Shared Use Path Lighting

DB Contractor shall design continuous lighting for the entire shared use path in accordance with the TxDOT *Highway Illumination Manual*. Aesthetic requirements of the illumination fixtures shall conform to the Aesthetics and Landscaping Plan. Lighting shall be installed on one side of the shared use path, where permitted, and spaced at 120 feet on center. Lighting fixtures shall be located 2.5 feet behind edge of shared use path to center of pole.

DB Contractor shall design the shared use path illumination independent of the illumination provided for the roadway or adjacent illumination.

DB Contractor shall design underpass lighting at all locations where the shared use path is located. Shared use path illumination under bridges shall be designed per TxDOT Standards for underpass light fixtures.

DB Contractor shall design shared use path illumination located within the 25-year floodplain to be on separate circuits from those poles located outside the 25-year floodplain.

24.3.9 Visual Quality

Notwithstanding the requirements of Section 24.3.9, DB Contractor shall provide luminaires of equal height along the roadway.

DB Contractor shall not use timber poles for permanent installation.

DB Contractor shall re-sod or re-seed areas of construction disturbed by the installation of signs, traffic signal systems, or lighting systems after final installation.

24.4 Construction Requirements

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 24 in accordance with the requirements of this Item 24 and the TxDOT Standard Specifications.

24.4.1 Permanent Signing and Delineation

DB Contractor shall use established industry and utility safety practices to erect and remove signs located near any overhead or underground Utilities, and shall consult with the appropriate Utility Owner(s) prior to beginning such Work.

DB Contractor shall leave all applicable advance guide signs and/or exit direction signs in place at all times and shall not obstruct the view of the signs to the motorist. DB Contractor shall replace any other removed signs before the end of the work day.

DB Contractor shall affix a sign identification decal to the back of all signs for inventory purposes and shall submit inventory information to TxDOT in a TxDOT-compatible format for inclusion into the MMS.

All installed signs are required to meet the minimum retroreflectivity values specified in TMUTCD Table 2A-3 (Minimum Maintained Retroreflectivity Levels).

24.4.2 Permanent Pavement Marking

DB Contractor shall meet the following minimum retroreflectivity values for edge line markings, centerline/no passing barrier line markings, and lane line markings when measured any time after three days, but not later than 10 days after application:

- Type I, thermoplastic pavement markings
  - White markings: 250 millicandelas per square meter per lux (mcd/m2/lx)
  - Yellow markings: 175 mcd/m2/lx
- Type II, paint and beads
  - White markings: 175 mcd/m2/lx
  - Yellow markings: 125 mcd/m2/lx

24.4.3 Permanent Signalization

DB Contractor shall place permanent traffic signals at the approximate locations shown on the Schematic Design and in the document “Oak Hill Parkway Cross Street Matrix” included in the RIDs.

DB Contractor shall coordinate with the Utility Owner(s) and ensure necessary power service is initiated and maintained for permanent signal systems until Final Acceptance by TxDOT. DB Contractor shall ensure power is provided to all DB Contractor-installed signals. DB Contractor shall place power services for permanent signal systems in the name of TxDOT and pay the applicable initial startup and permit fees. TxDOT will pay for permanent power services.

DB Contractor shall provide TxDOT with copies of all signal warrant studies as required in this Item 24. DB Contractor shall also provide copies of all final signal timing.

Before placing any permanent traffic signals, DB Contractor shall provide TxDOT a layout indicating the proposed location of such items.

24.4.4 Permanent Lighting

DB Contractor shall coordinate with the Utility Owner(s) and ensure power service is initiated and maintained for permanent lighting systems until Final Acceptance by TxDOT. DB Contractor shall place power service for permanent lighting systems in the name of TxDOT and pay the applicable initial startup and permit fees. TxDOT will pay for permanent power services. Where the Work impacts existing lighting, DB Contractor shall maintain existing lighting as temporary lighting during construction and restore or replace prior to Substantial Completion. At all times during the Term, safe lighting conditions shall be maintained along the Project roadway.

DB Contractor shall remove all old illumination-related cable and conduit that does not have existing pavement or riprap above it; any existing illumination-related conduit that is under the existing pavement or riprap may be abandoned.

DB Contractor shall place all bore pits safely away from traffic, provide positive barrier protection, and provide necessary signs to warn of the construction area.

DB Contractor shall contact Utility Owners regarding their specific required working clearance requirements.

DB Contractor shall affix an identification decal on each electrical service indicating service address as well as all required information shown on the Electrical Detail (ED) sheets of the TxDOT Engineering Standard Sheets.

24.4.5 Reference Markers

DB Contractor shall place reference markers and/or mile markers at approximately one mile apart in accordance with the TRM system. DB Contractor shall set reference markers and/or mile markers according to the TMUTCD. Once placed, DB Contractor shall inventory and record reference markers with GPS. DB Contractor shall provide this information to TxDOT in Microsoft Excel format.

24.5 Submittals

All Submittals described in Item 24 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 24-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 24-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Notification of meetings with local Governmental Entities	Prior to the start of the meeting	For information	24.2.1
A preliminary operational signing schematic	Prior to commencing Final Design	Review and approval	24.3.1
Copies of all final implemented signal timing plans	With Record Drawings	For information	24.3.7.2, 24.4.3
Signal warrant studies	As part of the Final Design Submittal	Review and comment	24.3.7.3, 24.4.3
ATP for all traffic signals	As part of the Final Design Submittal	Review and comment	24.3.7.5
ATP for all illumination	As part of the Final Design Submittal	Review and Comment	24.3.8
Reference marker record	After placement of all markers	For Information	24.4.5

Item 25
Intelligent Transportation Systems

25.1 **General Requirements**

An ITS is necessary for monitoring the Project's traffic flow and performance both temporarily during construction and as a permanent installation after roadway opening to traffic. The Project ITS must accurately detect traffic and traffic operational conditions throughout the Project limits, on US 290 from Convict Hill to Old Fredericksburg Road and on SH 71 from US 290 to Silvermine Drive, and clearly communicate relevant and useful travel information to the Users. "Smart Work Zone" elements required as a part of Section 26 shall be integrated into the existing ITS for the duration of the Term.

DB Contractor shall connect the Project ITS that it provides to the existing ITS network while fulfilling all requirements herein. DB Contractor shall be responsible for connecting the ITS as a part of this Project to the ITS network along SH 71 between Silvermine Drive and RM 620 currently under construction. DB Contractor shall access a Type 2 ITS ground box at the northeast corner of SH 71 at Silvermine Drive (approximately 30.247078°,-97.888141°) and splice onto the SH 71 ITS trunk line for this connection. TxDOT shall provide DB Contractor with plans and as-builts to facilitate this scope of the work. The Project ITS must be compatible with such in-place system(s) that TxDOT and other entities (government or private) are currently operating. DB Contractor shall coordinate the ITS planning and implementation with TxDOT and other Governmental Entities that have roadways within or intersecting the Project.

DB Contractor shall maintain and protect any existing ITS functionality to include communications networks within the Project until Final Acceptance, except during Force Majeure Events, periods of system maintenance or system crossovers, or other periods approved by TxDOT.

The functionality of the ITS shall be such that command and control of appropriate field devices is shared and exchanged with appropriate Governmental Entities.

DB Contractor shall be responsible for the planning, design, installation, testing, and operations support of safe and functional ITS for the Project using Good Industry Practice. All components of the ITS shall conform to the provisions of the NTCIP and the statewide Transportation Systems Management and Operations Strategic Plan.

The Project ITS shall operate under the Regional ITS Architecture and be consistent with the TxDOT Austin ITS Masterplan. Communication and interoperability shall be achieved with other TMCs in the region, such that with appropriate privileges, access to data, command, control, and information sharing can occur among centers. All communication and access of information shall occur in near real-time (within logistical restraints).

25.2 **Design Requirements**

DB Contractor shall provide a complete and operational ITS network throughout the Project that is expandable as capacity is increased along the Project roadways, utilizes hardware and software components consistent and compatible with the systems of TxDOT in the manner described in this Section 25.2 and the other affected Governmental Entities, resistant to weather encountered in the Project area, and places components in locations that are not hazardous to Users.

Prior to beginning ITS efforts, DB Contractor shall conduct an ITS workshop with TxDOT, and affected Governmental Entities (per TxDOT's direction) to:

- Confirm TxDOT's operational requirements;
- Review DB Contractor's survey of existing ITS infrastructure and condition assessment;
- Discuss concepts, identify potential resolutions for Site-specific issues (as identified by DB Contractor);
- Determine communication requirements;
- Determine requirements for design;

- Determine requirements for construction including security considerations (burying of ground boxes, welding ground boxes shut, etc.);
- Determine requirements for construction and coordination of activities with adjacent roadways;
- Confirm requirements of other affected parties and Governmental Entities; and
- Address other topics as needed to ensure the design meets all requirements herein.

DB Contractor shall prepare a preliminary ITS layout for review and concurrence by TxDOT to ensure adequate planning of the ITS implementation. Subject to the specific requirements of this Item 25, DB Contractor shall determine the number and specific locations of all ITS components. The ITS shall consist of all equipment necessary to implement the ITS described in this Section 25.2.

DB Contractor shall provide safe ingress/egress areas and structures to accommodate authorized personnel access to ITS components for maintenance and operation activities. Unless approved by TxDOT, ITS components shall be placed in locations that allow maintenance without a Lane Closure.

All components of the ITS shall conform to the provisions of the NTCIP and be compatible with the latest version of TxDOT's software.

DB Contractor shall design ITS infrastructure in accordance with TxDOT Engineering Standard Sheets. DB Contractor shall not make any modifications to the standards or specifications without TxDOT's approval.

DB Contractor is responsible for designing and constructing lightning protection, grounding, and surge suppression for each ITS structure and equipment cabinet.

DB Contractor shall be responsible for the design, installation, and provision of power required to operate the ITS devices until Final Acceptance by TxDOT. DB Contractor shall place permanent power services in the name of TxDOT and pay the applicable initial startup and permit fees. TxDOT will pay for permanent power services.

25.2.1 DB Contractor ITS Communications Requirements

DB Contractor shall provide a communications network that has redundant routing capabilities. The communications network shall serve the highway ITS components along the highway Elements of the Project. Where necessary, as determined by TxDOT, DB Contractor shall provide communication node buildings and cabinets to support the communications network.

DB Contractor shall submit proposed fiber termination charts to TxDOT for approval.

DB Contractor shall install a 144-strand single mode fiber optic cable in the duct bank. All fiber drops to field devices shall consist of 12-strand single mode fiber optic cable. The trunk line fiber may only be spliced at the communication hubs/ITS cabinets unless approved by TxDOT. Pull boxes shall be placed at each ITS device location, cabinet, satellite building and a maximum of every 500 feet along the Project corridor. DB Contractor is responsible for confirming that 144 strands of fiber can support the proposed ITS deployment and providing additional fiber at no cost to TxDOT, as needed, to ensure that no more than 50% of the throughput capacity of a sub-network path is exceeded. Type 1 ground boxes with aprons shall be utilized unless otherwise approved by TxDOT.

DB Contractor shall integrate all proposed communications with the existing communications infrastructure.

DB Contractor shall provide terminal servers, video encoders, media converters, and modems to establish communications as required. Video encoding shall meet MPEG-4 standards and be compatible with TxDOT's traffic management system software requirements for TxDOT CCTV.

ITS shall be interconnected with traffic signal infrastructure, including those operated and maintained by local Governmental Entities.

25.2.2 Conduit

DB Contractor shall submit, for TxDOT's concurrence, the type, quantity, and design of the conduit above and below ground, ground boxes, all communication cables, and electrical conductors to support the ITS network and operations. DB Contractor shall meet the following minimum requirements for conduit size and type for ITS elements on the project:

- 2" Schedule 80 PVC for Electrical Service to ITS field devices

- 3" Schedule 80 PVC for ITS communications
  - DB Contractor shall provide one spare conduit along trunkline

DB Contractor shall design the ITS duct bank conduit system in accordance with Austin District Standards, including TxDOT Engineering Standard Sheets ITS (27)-16 and ITS (28)-16.

No exposed conduit sections will be permitted. All sections shall have a minimum of 42 inches of cover over all ITS conduit except:

- Where boring is required to cross under intersections; and
- In the case of large bridge crossings, built into the bridge structure.

DB Contractor shall install bored conduit below the base layer of pavement structure. TxDOT approval will be required for any placement on existing structures.

DB Contractor shall repair each existing communication cable or electrical conductor that is severed or otherwise rendered not usable within:

- 4 hours if a major/backbone/trunk line
- 8 hours if a minor/drop fiber line

DB Contractor shall provide materials and use construction methodology that, at a minimum, meets the most current or applicable TxDOT statewide standards and specifications.

No electrical conductor beyond that provided for tracer wire shall be located in the ITS duct bank. All electrical service conduit shall be separated from the duct bank.

25.2.3 CCTV Cameras

DB Contractor shall provide CCTV cameras for Incident or Emergency verification and traffic management. The system of cameras shall accurately identify all vehicle(s) involved in an Incident or Emergency, the extent of vehicle(s) damage, and if applicable, the likelihood of personal injury. Operation of the cameras shall result in no visual delay in response of the camera pan/tilt/zoom by a user.

25.2.3.1 Equipment

DB Contractor shall provide all necessary CCTV equipment, including cameras, camera controls, cables, and connections. DB Contractor shall provide all the equipment necessary for TxDOT control of all CCTV cameras. The method of control shall be in accordance with TxDOT Engineering Standard Sheets and TxDOT Standard Specifications.

DB Contractor shall provide a digital video format and communications protocol at all connections with TxDOT systems.

25.2.3.2 Placement

DB Contractor shall provide overlapping roadway coverage by CCTV cameras for all highway lanes and intersecting cross streets within the Project limits to provide redundant camera field of view. CCTV cameras shall be placed to enable TxDOT to monitor traffic conditions on highway lanes, access roads, connecting facilities, entrance and exit ramps, and messages displayed on any remotely-controlled DMS in the Project area. To provide a stable video image, DB Contractor shall mount cameras on dedicated structures unless otherwise approved by TxDOT.

DB Contractor shall provide CCTV cameras at the approximate locations outlined below.

Oak Hill Parkway CCTV Locations		
Device	Latitude	Longitude
CCTV 1	30.245943°	-97.885969°
CCTV 2	30.239706°	-97.880339°
CCTV 3	30.233615°	-97.874549°
CCTV 4	30.234288°	-97.865009°

CCTV 5	30.235454°	-97.858351°

DB Contractor is responsible for placing cameras to ensure 100% coverage. 100% coverage shall be defined as no blind spots for any reason, including, but not limited to: trees, bridge structures, horizontal or vertical alignment, overhead or side mounted sign structures. Additionally, each CCTV camera shall be able to view the CCTV camera immediately upstream and downstream from itself unless otherwise approved by TxDOT.

25.2.3.3 **Video Requirements**

DB Contractor shall provide state-of-the-art CCTV cameras that meet the requirements of the applicable TxDOT Engineering Standard Sheets and TxDOT Standard Specifications. If at any time prior to Final Acceptance, should any CCTV cameras fail to meet the latest TxDOT Engineering Standard Sheets and TxDOT Standard Specifications in effect at the time of design, DB Contractor shall replace such cameras within 48 hours of discovery of lack of compliance.

25.2.3.4 **Operating Requirements**

DB Contractor shall provide cameras with built-in heaters, mounting structure, and related equipment capable of operating within the following weather conditions:

- Ambient temperature range of -35 degrees Fahrenheit to +140 degrees Fahrenheit;
- Relative humidity range not to exceed 95% within the temperature range of +40 degrees Fahrenheit to +110 degrees Fahrenheit; and
- Humidity range of 0 to 100% condensing.

25.2.3.5 **Control Requirements**

DB Contractor shall allow a minimum of 30 days for testing by TxDOT ITS personnel. The equipment submitted for testing must be fully assembled, installed, and in a fully operational condition. DB Contractor shall configure all equipment submitted for testing as is intended for use on the Project. Prototype equipment is not permitted. The equipment will be interconnected to the existing CCTV control system and must be fully operational using that system. No modifications to the existing CCTV control system will be made to accommodate the submitted CCTV equipment. To be considered fully operational, the equipment must, at a minimum, correctly respond to the following commands:

- Pan left
- Focus far
- Pan right
- Iris override
- Tilt up
- Iris open
- Tilt down
- Iris close
- Zoom in
- Camera power (latching)
- Zoom out
- Pan tilt position preset
- Focus near

Upon completion of installation, DB Contractor shall test the communications link installed between the satellite building and the CCTV field equipment locations. DB Contractor shall perform the test at all CCTV locations on the Project.

DB Contractor shall use a test signal generator and a video monitor to demonstrate the ability of the video signal link to transmit a National Television System Committee compliant video signal from the CCTV cabinet to the satellite building. After completion of testing with the signal generator, connect the CCTV camera to the link and use a video monitor at the satellite building to verify the presence of a National Television

System Committee compliant video signal. No degradation of the video signal shall be discernible using the video monitor.

Connect a laptop computer containing TxDOT-supplied CCTV control software on the link and use to demonstrate the ability to control all CCTV functions outlined in the specifications.

DB Contractor shall supply all test equipment, cabling, and connectors necessary for performing the tests by DB Contractor.

DB Contractor shall be permitted one opportunity to retest equipment which does not pass the initial test. The retest must occur within 30 days after the initial test. All issues of non-compliance and all discrepancies shall be resolved prior to commencing the second test. Equipment which is not able to be retested within 30 days, or which does not pass the second test, shall not be used on the Project. DB Contractor shall not be entitled to additional time or compensation on account of the testing of the CCTV equipment.

25.2.4 Vehicle Detection

DB Contractor shall provide permanent, high definition microwave radar detection in each highway lane of the Project that measures vehicle classification, vehicular volume, lane occupancy, and vehicle speed information on the roadway. The detectors shall be non-intrusive to the roadway users. Spacing for the permanent vehicle detection shall be no greater than one-half mile in each highway lane in the Project, and, at a minimum, provide detection for all highway lanes at one location between interchanges, each entrance ramp lane, and each exit ramp lane. DB Contractor shall locate the devices on the side of the Project nearest the largest shoulder so as to limit the potential interference by the concrete traffic barrier on detecting vehicles and collecting information.

DB Contractor shall provide RVSDs at the following approximate locations:

Oak Hill Parkway RVSD Locations		
Device	Latitude	Longitude
RVSD 1	30.239706°	-97.880339°
RVSD 2	30.233068°	-97.874216°
RVSD 3	30.233760°	-97.873953°
RVSD 4	30.235192°	-97.858250°
RVSD 5	30.235192°	-97.858250°

DB Contractor shall be permitted to collocate RSVD4 and RSVD 5 on the same pole.

Vehicle detection sensors shall determine vehicle speed for each vehicle passing the sensor. The sensors shall provide raw speed data (volume, speed, lane occupancy, and vehicle classification counts) and direction of travel for all lanes. Additionally, the sensors (or the software controlling the sensors) shall be capable of determining vehicles traveling in the wrong direction. For sensors that collect data across multiple lanes of traffic, data shall be collected and provided by lane. In areas where a sensor would have to collect data on more than 12 lanes of traffic, including shoulders or over distances/widths greater than 250 feet, DB Contractor shall provide additional detectors as required. DB Contractor shall provide detectors that allow TxDOT to adjust the frequency rates that the data files are provided by device. Documentation of the performance of the vehicle detection devices shall be provided as a part of the end-to-end testing process for TxDOT approval.

DB Contractor shall install a mounting pole solely for the vehicle detector. Microwave radar detectors may be colocated on the same pole as a proposed CCTV. Any mounting poles placed specifically for ITS items shall conform to the TxDOT Standard Specifications and Good Industry Practice for CCTV mounting poles and must adhere to minimum vertical clearance requirements. DB Contractor shall provide all necessary support structures, equipment, including, but not limited to, vehicle detection system devices, controls, cables, and connections.

25.2.5 DMS

DB Contractor shall provide a comprehensive network of electronic DMS as needed to satisfy the operational requirements using only LED display technology. The DMS shall operate as part of an overall regional system. DB Contractor shall provide TxDOT with full control of DMS messaging prior to Final Acceptance.

DB Contractor shall position each DMS to allow motorists to safely view the messages being displayed. DB Contractor shall locate the DMS to comply with large guide sign spacing stated in the TMUTCD.

DB Contractor shall provide DMS and Cabinets at the following locations.

Oak Hill Parkway DMS Locations		
Device	Latitude	Longitude
DMS Cabinet 1	30.246295°	-97.887397°
DMS 1	30.246369°	-97.887380°
DMS Control Cabinet 2	30.235464°	-97.851043°
DMS 2	30.235476°	-97.850983°
DMS Control Cabinet 3	30.228806°	-97.881760°
DMS 3	30.229009°	-97.882246°

DMS shall be mounted using a T-mount and located so that main lane closures are not needed to maintain the sign. DMS site shall be accessible in all weather conditions. Access pads shall be provided if necessary to support maintenance. DB Contractor shall provide DMS that use LED display technology and support full matrix graphics and color. DMS used shall conform to the TxDOT special specification NTCIP for DMS and shall demonstrate compliance to TxDOT therewith prior to installation of DMS by DB Contractor.

DB Contractor shall ensure the selected DMS meets the following requirements:

- DMS shall include a matrix size of 27x125, with an 18” nominal character height. DMS matrix shall have a 1’ offset minimum from the left and right edges of the panel.
- DMS shall consist of a full protective masked face panel.
- DMS shall consist of all aluminum construction.
- DMS housing must be designed, fabricated, welded and inspected in accordance with the latest revision of ANSI/AWS D1.2 Structural Welding Code-Aluminum.
- DMS shall support and include two 12” amber beacons, to be located at the top of the sign 2’-6” from each edge of the panel.
- Display panels shall have hinges to allow for access, and include door stops such that face panels will remain open at a 90-degree angle.
- DMS shall allow for two 1 ½” conduit hubs in the rear panel; one shall be dedicated for communications and the other shall be dedicated to power.
- DMS shall include a positive pressure ventilation system with multiple filtered air intake units and an equal number of air exhaust units.
- DMS shall provide monitoring information, including front panel and rear panel light sensors, ambient temperature and light sensors.
- DMS shall include controller to be installed in the TxDOT ITS Cabinet and all necessary communications cables to operate DMS equipment. DMS shall also include an uninterrupted power supply (UPS) capable of maintaining sign operations for a minimum of two hours.
- DMS Manufacturer shall have in-house Quality Management System in place and be ISO 9001 certified.

DB Contractor shall provide all necessary DMS, support structures and equipment, including, but not limited to, DMS devices, controls, cables, and connections. DB Contractor shall not include sign walkways on DMS sign support structures. All DMS cabinets shall be ground mounted unless otherwise approved by TxDOT.

DB Contractor shall maintain any existing DMS functionality within the Project during construction and shall not impact the operation of any existing DMS within the Project during construction absent approval from TxDOT.

25.2.6 Communications Hub Enclosures, Communications Cabinets, Environmental Communications Buildings

DB Contractor shall coordinate with TxDOT the connection of all new ITS components to any existing ITS communication hub enclosures and communication cabinets covering the Project.

25.2.7 Road Weather Information System (RWIS)

DB Contractor shall furnish and install RWIS and associated cabinet mounted Remote Processing Unit (RPU) at the location identified below. The RWIS will include bridge deck pavement sensors, pavement sensors, pavement temperature probes, and complete weather station to monitor wind information, air temperature humidity, and other items defined herein. The system will be specifically designed for monitoring and displaying pavement surface conditions, pavement temperature, freeze point temperature, and subsurface temperature. Non-Intrusive sensors will be installed at the RWIS site(s) to monitor roadway surface status conditions including dry, wet, chemical wet, ice watch and ice warning.

DB Contractor shall provide RWIS at the following location:

Oak Hill Parkway RWIS Location		
Device	Latitude	Longitude
Weather Station 1	30.233005°	-97.874215°

Atmospheric/meteorological conditions monitored may include any of the following; air temperature, relative humidity, barometric pressure, accumulated precipitation, and wind or speed direction. The information from the RWIS sites will be transmitted back to the Combined Transportation Emergency and Communications Center (CTECC) Transportation Management Center (TMC) via TxDOT's intelligent transportation system (ITS) network, where the data will be presented to the operations staff via vendor supplied software. TxDOT Lonestar™ software will poll the RWIS to ask for data on a preset time interval specified by TxDOT to transfer and refresh with current conditions. Data from the RWIS shall comply with standard National Transportation Communications for Intelligent Transportation System Protocol (NTCIP).

The RWIS will include all hardware, software, and licenses to operate as follows:

- Non-Intrusive surface sensors will measure bridge deck and or roadway pavement surface temperature along with surface wetness and communicate the data to the RPU.
- Roadway atmospheric sensors will measure their respective weather parameters and communicate the data from each to the RPU.
- Atmospheric weather sensors will measure their respective weather parameters and communicate the data from each to the RPU.
- The RPU will acquire data from all connected sensors. The RPU will process and temporarily store the output from the pavement sensors and atmospheric sensors.
- The RWIS server will poll the RPU of each local RWIS system on a scheduled basis. The RPU will respond to the poll and transfer all of its data to the RWIS server.
- All data transfers between the RWIS server and local RWIS will be compliant with the most current federal standard NTCIP Environmental Sensor Station (ESS) protocols.
- The RWIS user displays will include all sensor and forecast data in a Windows based graphical user interface or browser-based data display format.

25.2.7.1 RPU

The RPU shall gather, process, and store data from all connected atmospheric sensors, pavement sensors and camera. The data shall be transmitted to Lonestar™ upon polled request via NTCIP ESS protocols. The RPU shall utilize a modular design consisting of a main data processing unit and secondary communication units that are used to power and connect sensors at the RWIS site. The main data processing unit shall utilize a Reduced Instruction Set Computing type processor and run a Linux based operating system capable

of multi-tasking operations to optimize data acquisition from all connected devices. The RPU shall include in-built GPS for real-time clock synchronization and location definition.

The RPU shall support standardized communication protocols for sensors from various manufactures.

The RPU shall include a minimum of two 10/100 Ethernet ports, six serial ports configurable for RS-232, RS-485 two wire, or RS-485 four wire, capable of operating at full or half duplex from 300 to 115,200 bits per second. All circuitry of the RPU, the voltage inputs, the sensor inputs, and the communications ports shall be designed and tested to provide transient voltage and surge protection.

DB Contractor will install 110 VAC service to the RPU power disconnects. Primary power shall be installed to the RPU and fused for 20 amps, with voltage surge protection. The RPU will operate in a range of 100-130 VAC at 50-60 Hz and will use not more than approximately 50 W of continuous power (excluding options). Battery backup shall be provided to power the RPU for a minimum of 1 hr. in the event of loss of AC service.

RPU shall have at least 512MB DDR3 and 2GB of NAND flash memory. The communication shall be internal based Ethernet to ensure more reliable and faster communication. The RPU hardware and software shall meet the following technical specifications:

The RPU will gather data from all connected sensors and remote pavement sensors, and process, store and transmit this data to the RWIS server upon polled request. The RPU will be capable of collecting data from the following sensors:

- 1 wired precipitation type sensor,
- 1 wired air temperature/relative humidity sensor,
- 4 wired road surface /subsurface sensors,
- 1 wired subsurface sensor,
- 2 non-intrusive pavement condition sensors
- 2 non-intrusive pavement temperature sensors
- 1 rain sensor,
- 1 wind speed/direction sensor,
- 1 tipping bucket rain gauge,
- 1 barometric pressure sensor, and
- 1 wired pan-tilt-zoom camera

The RPU shall include an IP66 rated lockable stainless steel AISI 316 powder coated enclosure that is resistant to weather, sunshine, de-icing chemicals, corrosion and damage from falling debris (ice, small rocks and tree branches) and vandalism. The enclosure shall be capable of being mounted on poles with an outer diameter range of 6 inches to 24 inches. The enclosure shall house all RPU electronics, power supplies, and communication equipment and not exceed dimensions of 24 inches height by 20 inches width by 8.25 inches depth.

RPU communication with the server will utilize the most current published federal standard NTCIP-ESS protocol, with some manufacturer-specific objects. The server will poll the RPU via one of the following communications modes; Ethernet, PMPP leased line, PMPP spread spectrum radio, or PMPP serial fiber optic. The RPU will incorporate “watch-dog” circuitry and monitor its own operation and reset itself if the RPU software enters an indeterminate state. The RPU will also have the capability to be reset by a “user administrator” from the server.

The RPU will have the capability of being modified to utilize solar power or other power sources in place of conventional commercial electric power. Solar powered RPU sites will operate a minimum of 72 hours without sunlight or solar charging of the batteries.

25.2.7.2 Precipitation Type Sensor

The precipitation sensor shall utilize optical, infrared technology to detect precipitation with beam interruptions by precipitation particles. The precipitation occurrence sensor shall sense the onset and cessation of precipitation in the form of rain, snow, sleet, and freezing rain and shall indicate when precipitation is occurring. The sensor shall provide all precipitation classification, measurements of intensity or water accumulation, as well as visibility. The sensor shall operate within a minimum temperature range of -

40°F to 140°F at 0 to 100% relative humidity and also meet an IP66 rating. The sensor shall operate to specifications at cable lengths up to 100 feet from the RPU.

The sensor shall operate within a power range of 12 to 30 VDC and use no more than 5 watts of power. The sensor shall include RS-232, RS-485 data communication, and 4 to 20 mA outputs; and be capable of operating to specifications at cable lengths up to 100 feet from the RPU.

Communication and power cable connecting the sensor to the RPU shall be shielded, with ultraviolet (UV) stable jacket rated for outdoor use. DB Contractor is responsible for providing the correct length cable based on the planned installation.

25.2.7.3 Air Temperature and Relative Humidity Sensor

The Air Temperature and Relative Humidity Sensor will have an air temperature-sensing element that measure temperatures within a minimum range of -40°F to 140°F with an accuracy within 1 degree of actual temperature. The relative humidity sensing element will be of the "capacitance type" and have a measuring range of 10 to 100% RH within 1% of actual humidity levels. The sensor shall be protected by UV stabilized white thermoplastic solar/wind-radiation shield and meet IP66 rating.

System dew point temperature will be calculated by the system from the air temperature and relative humidity. Both atmospheric sensing elements will be mounted on the RWIS tower at the standard meteorological height of approximately 6 ft. above ground level.

The sensor shall operate within a power range of 7 to 30 VDC and use no more than 5 watts of power. The sensor shall include RS-485 two-wire serial data communication, 0 to 10 voltage, and resistance level outputs; and be capable of operating to specifications on cable lengths up to 100 feet from the RPU.

Communication and power cable connecting the combined sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. DB Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

25.2.7.4 Pavement Sensor

DB Contractor shall furnish and install non-intrusive pavement sensor(s). The non-intrusive sensor supplied will be a single solid-state electronic device that is installed in the roadway or bridge deck pavement at the locations as shown on the plans. Exact sensor placement will be as determined by DB Contractor with guidance from the equipment supplier.

The sensor will be constructed of materials that have thermal characteristics similar to common pavement materials. The top of the sensor will be installed with epoxy sealer so the top is flush with the surrounding roadway surface. The sensor will be thermally non-intrusive, providing stable operation over a temperature range from -40°F to 140°F. Weather conditions, traffic, or ice control chemicals will not degrade its performance. The sensor will be supplied with 300 ft. of attached molded cable that is waterproofed and sealed as an integral part of the assembly. Each sensor will be capable of operating at extended cable lengths up to 5000 ft. from the RPU by splicing to direct burial sensor extension cable. The sensor will electronically sample the following pavement parameters:

- Surface temperature at the sensor head and
- Pavement surface conductivity.

In addition, the pavement sensors will supply data for the RWIS to determine the following pavement surface conditions when sufficient water is present on the pavement, and atmospheric data from precipitation and air temperature sensors is available:

- Dry - Absence of moisture on the surface sensor.
- Trace Moisture - Pavement Moisture above freezing (no precipitation).
- Wet - Precipitation has occurred and there is a continuous film of moisture on the pavement sensor.
- Chemically Wet - Continuous film of water and ice mixture at or below freezing (32°F) with enough chemical to keep the mixture from freezing, and precipitation is not occurring.

- Ice Warning - Continuous film of ice and water mixture at or below freezing (32°F) with insufficient chemical to keep the mixture from freezing (active precipitation).
- Ice Watch - Thin or spotty film of moisture at or below freezing (32°F), and precipitation is not occurring.

DB Contractor will supply actual field test documentation that substantiates pavement sensor performance.

25.2.7.5 **Surface Temperature Probe**

Furnish and install the subsurface temperature probe(s) in the roadway near a surface sensor at a depth of 18 in. The probe will measure the ground temperature below the roadway pavement surface. The temperature-sensing element of the probe will operate over a temperature range of -40°F to 140°F.

The probe will be supplied with 300 feet of attached cable, which is waterproofed and sealed as an integral part of the assembly. Each sensor will be capable of operating at extended cable lengths up to 5000 feet from the RPU.

The wired sub-surface sensor shall be installed per manufacturer's recommendations to detect temperature at a depth of 18 inches. Exact placement of the sensor shall be as determined by DB Contractor with guidance from the manufacturer. All cabling for the sensor, where it is not embedded in the road, shall be installed in conduit at a minimum depth of 36 inches. Installation shall be done in a manner to eliminate all cable splicing. The sensor shall be configured and calibrated to function as designed with the RPU.

25.2.7.6 **Non-Intrusive Pavement Condition Sensors**

The non-intrusive pavement condition sensor shall utilize Class 1 laser technology to accurately measure presence of water, ice, slush, snow, and frost on the road surface. The sensor shall also measure the level of grip or friction coefficient of the roadway. The sensor shall be capable of accurate measurements within a minimum range or 7 feet to 50 feet. The sensor shall operate in a minimum temperature range of -40°F to 140 °F at 0 to 100 percent relative humidity.

The sensor shall be powered from a 9 to 30 volt direct current (VDC) source and use no more than 4 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces and be capable of operating to specifications at cable lengths up to 300 feet from the RPU for RS-232 and 495 feet from the RPU for RS-485.

If the RWIS is greater than 25 feet from the white edge line of the roadway being measured, then the non-intrusive pavement condition sensor shall include a steel pole with breakaway assembly as per TxDOT Standard and underground conduit to install the sensor at an appropriate height to detect conditions of the closest lane of travel.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. DB Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

DB Contractor shall determine the quantity of non-intrusive pavement condition sensors and desired sensor detection locations.

25.2.7.7 **Non-Intrusive Pavement Temperature Sensors**

The non-intrusive pavement temperature sensor shall use infrared technology to accurately measure road surface temperature. The sensor shall be capable of accurate measurements within a minimum range of 7 feet to 50 feet. The sensor shall operate in a minimal temperature range of -40°F to 140°F at 0 to 100 percent relative humidity. The sensor shall operate within a power range of 9 to 30 VDC and use no more than 0.05 watts of power. The sensor shall provide RS-232 and RS-485 serial data communication interfaces and be capable of operating to specifications at cable lengths up to 300 feet from the RPU.

If the RWIS is greater than 25 feet from the white edge line of the roadway being measured, then the non-intrusive pavement condition sensor shall include a steel pole with breakaway assembly as per TxDOT Standard and underground conduit to install the sensor at an appropriate height to detect conditions of the closest lane of travel.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. DB Contractor is responsible for providing the correct length cable based on the planned installation.

DB Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

25.2.7.8 **Wind Speed Sensors**

The wind monitor sensor will be installed at the standard meteorological height of approximately 30 ft. above ground level. The sensor shall be mounted such that birds are not able to perch or nest on the sensor. The sensor may be a combination wind speed and direction sensor of lightweight corrosion-resistant construction. The sensor shall be based on three transducer ultrasonic technology and not have any moving parts.

The sensor will have an operating range of 0 to 200 ft/sec, with a survival operation limit of 279 ft/sec. Accuracy will be +1 ft/sec. Wind speed resolution shall be 1.0 ft/sec. Wind direction accuracy shall be + 2%. Wind direction resolution shall be 1°. The sensor shall operate within a minimum temperature range of -40°F to 140°F and the sensor shall meet IP66 and IP67 ratings.

The sensor shall operate within a power range of 9 to 40 VDC and use no more than 30 watts of power. The sensor shall include both 0 to 5000 mV analog and RS-232/RS-485 digital outputs; and be capable of operating to specifications on cable lengths up to 100 feet from the RPU.

Communication and power cable connecting the sensor to the RPU shall be shielded, with UV stable jacket rated for outdoor use. DB Contractor is responsible for providing the correct length cable based on the planned installation.

The sensor shall include all mounting hardware necessary to complete the installation.

25.2.7.9 **Tipping Bucket Rain Gauge**

A 12 in. heated tipping bucket rain gauge shall be provided to monitor accumulated rainfall. Diameter of the aperture shall be 8.85” and the area of aperture shall be 15”. Event resolution will be 0.01 in. Accuracy of the rain gauge shall be ±2%. Operating temperature range is from 0°F to 180°F.

The rain gauge shall accommodate standpipe installation.

This shall include all mounting hardware necessary to complete the installation.

25.2.7.10 **Pan-Tilt-Zoom Camera**

The pan-tilt-zoom camera shall be installed per manufacturer recommendations on the RWIS approximately 3 feet below the top of the structure and configured for a minimum of two preset positions as determined by DB Contractor.

DB Contractor is responsible for using the appropriate communication protocol based on RPU to sensor connection to maximize communications reliability.

All sensor and camera cables connecting to the RPU shall be secured to themselves and the structure every three feet. Cables shall enter through the bottom of the RPU enclosure, be labeled by sensor type and location where applicable, and connect to the appropriate port on the RPU. All cabling shall be installed in a neat and workmanlike manor.

25.2.8 **Bluetooth or Wifi Detection System**

DB Contractor shall furnish and install Bluetooth or wifi detection system at the locations identified below. Deviation from these locations shall require TxDOT approval.

Oak Hill Parkway Bluetooth/Wifi Detection Locations		
Device	Latitude	Longitude
Bluetooth/WiFi 1	30.239706°	-97.880339°
Bluetooth/WiFi 2	30.233615°	-97.874549°
Bluetooth/WiFi 3	30.234288°	-97.865009°

The Detection System will consist of a UV-protected, IP65 housed sensor, 2 external antennas, a CAT5e cable for Power over Ethernet, and a non-corrosive fixing bracket.

DB Contractor shall provide documentation on the auto-configuration and auto-calibration processes.

DB Contractor shall provide a detection system that does not cause interference or alter the performance of any known equipment.

DB Contractor shall furnish all new equipment and component parts in an operable condition at the time of delivery and installation.

DB Contractor shall provide design to prevent reversed assembly or improper installation of connectors, fasteners, etc. DB Contractor shall design each item of equipment to protect personnel from exposure to high voltage during equipment operation, adjustments, and maintenance.

DB Contractor shall include licenses for all equipment, where required, for any software or hardware in the Detection System.

DB Contractor shall provide all Detection Systems from the same manufacturer.

DB Contractor shall provide Detection System firmware that is upgradeable by external local or remote download.

DB Contractor shall ensure the Detection System maintains accurate performance in all weather conditions, including rain, freezing rain, snow, wind, dust, fog and changes in temperature and light.

DB Contractor shall provide a Detection System that does not require cleaning or adjustment to maintain performance. DB Contractor shall ensure it does not rely on battery backup to store configuration information. DB Contractor shall ensure the Detection System, once calibrated, does not need recalibration to maintain performance over entire operational temperature range unless the roadway configuration changes. DB Contractor shall provide remote connectivity to the Detection System to allow operators to change the unit's configuration, update the unit's firmware programming and recalibrate the unit automatically from a centralized facility. The sensor can be accessed remotely through both TCP/IP and GPRS (both dynamic and static).

The sensor must be configurable through a web browser and at CTECC through the centralized traffic management software system (Lonestar).

DB Contractor shall supply the detection system with a connector cable of the appropriate length for each installation site. DB Contractor shall ensure that the detection system provides communication options that include RS-232, RS-485 or TCP/IP. The antennas must be connected with the sensor through standard SMA-connectors.

The detection system sensor must operate with two directional antennas for optimized detection of traffic in multiple lanes. The antennas must be optimized for detection across multiple lanes; they have a narrow vertical angle of 30º, and a wide horizontal (azimuth) angle of 110º, and have a 90º difference in the polarization to avoid interference. Each of the receiving channels must have the ability to capture signals as weak as -102dBm or more. The antennas are attached to the body of the sensor with stainless steel brackets.

The sensor must have an internal GPS for automatic clock synchronization and positioning. If a GPS signal is not available the sensor will capture its clock synchronization signal via NTP (Network Time Protocol). Once the clock signal has been captured it must start detecting devices automatically. It must be possible to view real time scans to verify operations. The sensor must have diagnostics data recording reboots, GPS reception, data transfers and error messages related with GPRS and TCP/IP. The GPRS antenna must be inside the sensor housing.

For security purposes the sensor must have a configurable firewall; and thereby only admit connections from computers that have pre-selected IP-addresses or a subnet of pre-selected IP-addresses. The operator must be able to upload new firmware into non-volatile memory of the detection system over any supported communication channel including TCP/IP networks. DB Contractor shall provide any and all programming and software required to support the detection system. Install the programming and software in the appropriate equipment prior to testing. DB Contractor shall complete and pass testing using a stable release

of the programming and software provided. DB Contractor shall provide software update(s) free of charge during the warranty period.

DB Contractor shall furnish the detection system with bracket or band designed to mount directly to a CCTV pole or overhead mast-arm or signal/ITS cabinet. DB Contractor shall ensure the mounting assembly has all stainless steel, or aluminum construction, and supports the load of the detection system. DB Contractor shall incorporate for the mounting assembly a mechanism that can be tilted in three axes, and then locked into place, to provide the optimum area of coverage. DB Contractor shall ensure the mounting bracket is designed and installed to prevent sensor re-positioning during 80 mph wind conditions.

Proper placement, mounting height and orientation of the detection systems must conform to the manufacturer's published requirements for the system provided. Install the detection system units as shown on the plans. DB Contractor shall analyze each proposed pole location to assure that the detection system installation will comply with the manufacturer's published installation instructions. DB Contractor shall advise TxDOT, before any trenching or pole installation has taken place, of any need to move the pole from the location indicated in the plans in order to achieve the specified detector performance. DB Contractor shall confirm equipment placement with the manufacturer before installing any equipment.

DB Contractor shall ensure alignment, configuration and any calibration of the detection system takes less than 15 min. per lane once mounting hardware and other installation hardware are in place. DB Contractor shall install detection system units such that each unit operates independently and that detectors do not interfere with other detection system units or other equipment in the vicinity.

25.2.8.1 Manufacturing Requirements

DB Contractor shall provide a detection system capable of continuous operation over a temperature range of –22°F to +165°F and a humidity range of 5% to 95% (non-condensing).

DB Contractor shall ensure the assembly of the units adheres to industrial electronic assembly practices for handling and placement of components.

The detection system must undergo a rigorous sequence of operational testing to ensure product functionality and reliability. Include the following tests:

- functionality testing of all internal subassemblies,
- unit level burn-in testing of 24 hour duration or greater, and
- final unit functionality testing prior to shipment.

DB Contractor shall provide test results and all associated data for the above testing, for each purchased detection system by serial number. Additionally, DB Contractor shall maintain and make available manufacturing data for each purchased Bluetooth detection system by serial number.

Externally, the detection system must be modular in design to facilitate easy replacement in the field. DB Contractor shall ensure the total weight of the detection system does not exceed 5 lbs.

DB Contractor shall ensure all external parts are protected against corrosion, fungus growth and moisture deterioration.

25.2.8.2 Power and Wiring Requirements

DB Contractor shall provide the detection system that operates at 12 to 24 VDC from a separate power supply and ensure it does not draw more than 2W of power each.

DB Contractor shall provide the separate power supply or transformer that operates from 115 VAC ±10%, 60 Hz ±3 Hz.

DB Contractor shall provide equipment operations that are not affected by the transient voltages, surges and sags normally experienced on commercial power lines. DB Contractor shall check the local power service to determine if any special design is needed for the equipment.

DB Contractor shall provide wiring that meets the requirements of the National Electric Code. DB Contractor shall provide wires that are cut to proper length before assembly. DB Contractor shall provide cable slacks to facilitate removal and replacement of assemblies, panels, and modules. DB Contractor shall not double-back

wire to take up slack. DB Contractor shall lace wires neatly into cable with nylon lacing or plastic straps, secure cables with clamps, and provide service loops at connections.

DB Contractor shall provide DC relays, solenoids and holding coils that have diodes or other protective devices across the coils for transient suppression.

DB Contractor shall provide equipment that contains readily accessible, manually re-settable or replaceable circuit protection devices (such as circuit breakers or fuses) for equipment and power source protection.

DB Contractor shall provide and size circuit breakers or fuses such that no wire, component, connector, PC board or assembly must be subjected to sustained current in excess of their respective design limits upon the failure of any single circuit element or wiring.

DB Contractor shall enclose the detection system in a rugged, water-tight NEMA 4X & IP 67 polycarbonate enclosure.

DB Contractor shall not use silicone gels or any other material for enclosure sealing that will deteriorate under prolonged exposure to UV rays. DB Contractor shall ensure the overall dimensions of the box, including fittings, do not exceed 8 in. x 8 in. x 6 in. DB Contractor shall ensure the overall weight of the box, including fittings, does not exceed 6.5 lbs.

DB Contractor shall coat all printed circuit boards with a clear-coat moisture and fungus resistant material (conformal coating).

DB Contractor shall ensure external connection for telecommunications and power be made by means of a single military style multi-pin connector, keyed to preclude improper connection.

DB Contractor shall provide external connections made by means of connectors. DB Contractor shall provide connectors that are keyed to preclude improper hookups. DB Contractor shall color code and appropriately mark wires to and from the connectors.

DB Contractor shall provide connecting harnesses of appropriate length and terminated with matching connectors for interconnection with the communications system equipment.

DB Contractor shall provide pins and mating connectors that are plated to improve conductivity and resist corrosion. DB Contractor shall cover connectors utilizing solder type connections by a piece of heat shrink tubing securely shrunk to insure that it protects the connection.

25.3 Construction Requirements

25.3.1 General

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 25 in accordance with the requirements of this Item 25 and the TxDOT Standard Specifications.

DB Contractor shall notify TxDOT in advance of making connections to the existing TxDOT system.

DB Contractor shall maintain any existing ITS communications functionality during construction activities. Required functionality can be accomplished by phasing construction to establish new equipment locations prior to removal of existing location, allowing minimal service interruption of no more than four hours for any disruption associated with communications and 72 hours for the transfer of devices from existing to new locations, or by use of portable equivalents for ITS devices, such as trailer mounted DMS, sensors or CCTV, positioned to allow removal of devices while new locations are constructed. Temporary wireless radio connections are permitted during construction to maintain existing ITS communications functionality. DB Contractor shall ensure that any temporary connections during construction meets the same performance criteria with respect to limitation on service interruption specified in this Section 25.3.1 as well as Section 25.2.2, Conduit.

DB Contractor shall coordinate with Utility Owner(s) and ensure that power service is available for permanent ITS systems.

25.3.2 Existing ITS Relocation

DB Contractor shall relocate any existing ITS components, including hubs, satellite buildings, CCTV cameras, DMSs, detection devices, and fiber-links, including those that are operated and maintained by local Government Entities, as required to continue service from the existing components. DB Contractor shall

sequence construction and relocation of existing ITS components, facilities, and systems to prevent lapses in TxDOT's receipt of video or data within the Project area. The existing physical links and the proposed physical links shall be in separate physical conduits.

Before removing existing ITS items and before beginning construction of segments without existing ITS, DB Contractor shall perform all activities necessary to maintain system operations during construction, including installing new ITS items, relocating or replacing existing ITS items, and connecting such ITS items to the existing network.

25.3.3 ITS Implementation Plan

DB Contractor shall provide an ITS Implementation Plan for approval as part of the Final Design Submittal to demonstrate system interoperability with other TMCs in the region, as well as compatibility with the operational procedures for command and control of devices, sharing of data, and priority control that various parties will assume under different operating conditions of the corridor and surrounding roadway system. The ITS Implementation Plan shall include the following:

- Functional design plan;
- Communications analysis report;
- Operational and requirements report; and
- ATP.

The functional design plan shall show each device's relationship in the overall functional design of the ITS and proposed roadway system. This functional design plan shall include the location of devices, technology and functional specifications of devices, and any unique design elements that are necessary to achieve the desired functionality or space restrictions.

The communications analysis report shall document the communications design. This report shall show all ITS field devices, their flow through all communications mediums, and throughput within the ITS. This shall include communications between any involved Governmental Entities. The report shall contain a narrative describing the information to be transmitted, as well as a high-level plan for its use. Communications diagrams shall be provided showing the location of any communication hubs (existing or proposed), any planned fibers (source as well as identification tag), modem/transceiver equipment planned at field equipment cabinets, and other equipment deemed necessary to functionally operate the ITS.

The operational and requirements document for the ITS shall describe the functional capability of the system and the method and level of integration. The document shall describe in detail the design of the system, hardware and software to be utilized, functional capabilities, command and control, data sharing capabilities, and priority use of devices by multiple agencies. In developing the operational and requirements document, DB Contractor is required to hold scoping meetings with TxDOT, such that requirements are defined to achieve interoperability with other TMCs, and priority logic and information for command, control, and data sharing is created to enable effective management and Incident response along the corridor, as well as regionally.

For each component of the ITS, an ATP shall assure proper operation, control, and response of each device meeting the functional requirements. DB Contractor shall implement the ATPs and provide certified documentation that its requirements have been met prior to operational use of the ITS.

As part of the ATP, DB Contractor shall prepare a system acceptance procedure prior to start of construction to assure proper operation, control, and response of each device as part of the overall ITS, including the overall operating system and software. DB Contractor shall conduct the procedure and provide certification that the ITS effectively meets the required functional requirements. DB Contractor shall submit this certification to TxDOT prior to Substantial Completion.

DB Contractor shall submit the CCTV secondary control equipment and design to TxDOT for approval a minimum of six months prior to Substantial Completion.

25.3.4 End-to-End Testing

DB Contractor shall provide notice and coordinate with TxDOT to allow for end-to-end testing of the ITS. DB Contractor shall not commence end-to-end testing until the following conditions have been met: DB Contractor and TxDOT shall have successfully completed all their testing, DB Contractor has completed

training of all relevant TxDOT staff, and DB Contractor has met all acceptance requirements for DB Contractor installed ITS devices, satellite buildings, communication and electrical networks, and generators.

DB Contractor shall be responsible, at a minimum, for the following:

- Coordinating the end-to-end testing with TxDOT to ensure that there will be no conflicts between TxDOT, their affiliated contractors, and DB Contractor's staff;
- Providing temporary advance signing (if needed) stating that the facility is closed and testing is occurring;
- Providing MOT/traffic control at all necessary locations for a maximum of five full days, which could include evenings and weekends and are not required to be consecutive;
- Providing access to the facility for authorized TxDOT staff and contractors; and
- Repairing any issues found with DB Contractor's work within one day unless otherwise approved by TxDOT.

DB Contractor shall not expect to have access to, nor conduct work within, the Project during the end-to-end testing, with the exception of providing the services as described above. TxDOT may, at its own discretion, provide DB Contractor access to the Project to conduct work outside the services described above.

25.3.5 Record Documents

The Record Documents shall include the construction drawings, as well as catalog sheets for all equipment and components. DB Contractor shall maintain for the Term records of all updates and modifications to the system.

For each component of the ITS, all computer codes and software shall be available to TxDOT and included in the Record Documents.

25.4 Submittals

All Submittals described in this Item 25 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth on Table 25-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise required.

Table 25-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Termination charts	Prior to Implementation	Approval	25.2.1
CCTV equipment	After installation	Review and Comment	25.2.3.5
Documentation of vehicle detection devices performance	End-to-end testing process	Approval	25.2.4
ITS Implementation Plan	As part of the Final Design Submittal	Approval	25.3.3
CCTV secondary control equipment and design	Prior to Substantial Completion	Approval	25.3.3
Notice of end-to-end testing	Prior to Implementation	For Information	25.3.4

Item 26
Traffic Control

26.1 **General Requirements**

DB Contractor shall design, construct, and maintain the Project, in conformance with the requirements stated in this Item 26, to provide for the safe and efficient movement of people, goods, and services through and around the Project, while minimizing negative impacts to Users, residents, and businesses.

DB Contractor shall furnish, install, relocate, operate, service, and remove various components of a "Smart Work Zone" system as a part of the Traffic Control work. DB Contractor shall include "Smart Work Zone" elements meeting the requirements noted in *TxDOT Special Specifications 6302, 6303, 6307, and 6309* provided in the RID, providing the maintenance of the complete system for the duration of the Term or as directed by TxDOT.

DB Contractor is responsible for gaining approval from TxDOT, the appropriate Governmental Entity and property owner for each intersecting street or driveway closure.

During all phases, temporary, new and existing ITS equipment, street lights, and traffic signals shall be interconnected and interoperable per District and local governmental requirements and practices.

DB Contractor shall provide temporary illumination throughout the duration of construction for all roadways and intersections that have existing illumination. All temporary illumination shall meet or exceed existing illumination levels.

DB Contractor shall install permanent illumination during construction as soon as practicable to enhance safety and benefit the traveling public but in no event later than opening to traffic.

26.1.1 **Lead MOT Design Engineer**

DB Contractor shall employ a Lead MOT Design Engineer responsible for ensuring the MOT plans are completed and design criteria are met. The Lead MOT Design Engineer shall be a PE with relevant experience overseeing the development of MOT plans during the design and construction phase of highway projects similar in size and scope. Individual will work with the Lead MOT Implementation Manager to coordinate with TxDOT, DB Contractor, and appropriate Governmental Entities.

26.1.2 **Lead MOT Implementation Manager**

DB Contractor shall employ a Lead MOT Implementation Manager responsible for ensuring the MOT plans are implemented in the field and are adhered to during their implementation. The Lead MOT Implementation Manager shall have relevant experience overseeing the implementation of MOT plans during the construction phase of highway projects similar in size and scope as the Project. Individual will work with the Lead MOT Design Engineer and coordinate with TxDOT, DB Contractor, and appropriate Governmental Entities.

26.2 **Design Requirements**

26.2.1 **Traffic Control Plans**

DB Contractor shall use the procedures in the TMP, TxDOT Engineering Standard Sheets, and TMUTCD requirements to develop detailed TCPs that provide for all construction phasing, as well as all required switching procedures. TCPs are required for the Work during the Term and for the duration of the Warranty Term.

DB Contractor shall provide to TxDOT for approval a TCP concept presentation at or near the Preliminary Design Submittal but prior to TCP plan sheet development. DB Contractor shall utilize Microsoft PowerPoint and roll plots to convey this concept at a TCP concept presentation meeting. Approval of the concept does not indicate automatic approval of the subsequent plan sheets, nor does it authorize DB Contractor to implement the concept in the field.

DB Contractor shall produce a TCP for every phase of Work that impacts traffic and involves traffic control details and shall coordinate with TxDOT on the development of the plan. When the through lanes of US 290 or SH 71 are placed in a new location, or if the geometric alignment of these through lanes is revised, that shall constitute a new phase of Work. DB Contractor is responsible for obtaining all necessary permits required to implement the plans. TCPs shall be designed, signed, sealed, and dated by a PE.

For each phase of Work, DB Contractor shall submit a traffic model in accordance with the *FHWA Traffic Analysis Toolbox Work Zone Traffic Analysis – Applications and Decision Framework*, with a minimum level of analysis in accordance with the *Highway Capacity Manual*. The traffic model shall be developed by a Professional Engineer, using the "Existing Conditions Model" provided in the RIDs as the base condition, and shall show estimated travel times for all periods and movements defined within Table 26-1, that accounts for a 4% annual growth rate in traffic volumes, for TxDOT review and approval. In addition to other requirements within the Contract Documents, an acceptable TCP will demonstrate through the traffic model that travel times will not exceed those presented in Table 26-1.

Table 26-1: Oak Hill Parkway Travel Times

Roadway	Segment	Travel Direction	Peak Period	Distance (miles)	Travel Time NTP1 to Day 365 (minutes)	Travel Time Day 365 to Day 730 (minutes)	Travel Time Day 730 to Day 1095 (minutes)	Travel Time Day 1095 to Substantial Completion (minutes)
US 290	LedgeStone Terrace to Monterey Oaks	Eastbound	6:30 to 8:30 AM	4.5	31	34	37	41
		Eastbound	4:00 to 7:00 PM	4.5	18	20	22	24
	Monterey Oaks to LedgeStone Terrace	Westbound	6:30 to 8:30 AM	4.5	20	22	24	26
		Westbound	4:00 to 7:00 PM	4.5	26	29	32	35
William Cannon Drive	Escarpment Blvd to Vega Ave	Northbound	6:30 to 8:30 AM	0.9	8	9	10	11
		Southbound	4:00 to 7:00 PM	0.9	8	9	10	11
SH 71	Covered Bridge Drive to Monterey Oaks	Eastbound	6:30 to 8:30 AM	3.9	22	24	26	29
		Eastbound	4:00 to 7:00 PM	3.9	20	22	24	26

DB Contractor shall design turning movements on all local streets and driveways to a minimum turning radius of a WB-62 design vehicle, and shall provide the same operational characteristics as their existing conditions or better.

DB Contractor shall provide a minimum lane width of 11 feet at all times for mainlanes and frontage roads, and a minimum lane width of 10 feet at all times for cross streets.

DB Contractor must maintain a minimum vertical clearance of 15 feet during construction.

DB Contractor conducting work on a shoulder without positive protective barriers during peak hours, including setting of barrier during peak hours, shall constitutes a Lane Closure and will require TxDOT approval. DB Contractor shall not include rolling lane closures as a part of a TCP.

26.2.1.1 Traffic Control Plan Requirements and Restrictions

Each TCP shall be presented using "Phase" and "Step" terminology. The term "Stage" shall not be used.

Each TCP shall be submitted to TxDOT for review and approval a minimum of 14 days prior to implementation. This requirement is increased to 21 days for full closures of any direction of a roadway. The TCP shall include details for allowable time and duration of Lane Closure, all detours, traffic control devices, striping, and signage applicable to each phase of construction. Information included in the TCPs shall be of sufficient detail to allow verification of design criteria and safety requirements, including typical sections showing lane width, concrete traffic barrier and barrel placement, alignment, striping layout, drop off conditions, and temporary drainage.

The TCPs shall clearly designate all temporary reductions in speed limits. Changes to posted speed limits will not be allowed unless specific prior approval is granted by TxDOT. DB Contractor shall have no expectation that speed limit reductions will be granted and shall design the Project in such a way as to allow for existing posted speed limits to remain in place during construction. On interstate and U.S. highways, the minimum design speed shall be 10 mph under the existing posted speed limit, except for major alignment transitions, where the design speed may match that of the existing alignment geometry. TCPs meeting this design speed standard do not require a change in the posted speed limit. DB Contractor shall use advisory speed plaques as appropriate.

DB Contractor shall utilize appropriate traffic control devices to ensure that opposing traffic on a divided roadway is separated with appropriate traffic control devices in accordance with Good Industry Practice and TMUTCD based on roadway design speed**.** Approved traffic control devices can be found in TxDOT *Compliant Work Zone Traffic Control Device List*. Traffic control that involves the physical separation of contiguous lanes of the same roadway component (i.e., general purpose or access road lanes) traveling in the same direction will not be allowed.

DB Contractor shall identify a designated route for trucks/hazardous cargo.

DB Contractor shall maintain signing and striping continuity on all active roadways within or intersecting the Project at all times. DB Contractor shall maintain existing overhead signing within the Project throughout the Term. DB Contractor shall use temporary overhead signing structures when existing overhead signing structures cannot be maintained.

Throughout the Term, DB Contractor shall ensure that all streets and intersections remain open to traffic to the greatest extent possible by constructing the Work in phases except as shown on a pre-approved TCP. DB Contractor shall maintain the existing operational characteristics of the US 290 and William Cannon intersection and the US 290 at SH 71 intersection as long as practicable during construction. DB Contractor shall ensure that the appropriate number of turning lanes, based on the existing number of lanes, is provided at intersections and driveways throughout the Term. DB Contractor shall maintain access to all adjacent streets and shall provide for ingress and egress to public and private properties at all times during the Term.

DB Contractor shall coordinate with the respective landowners and tenants and also secure written permission prior to disrupting access to parking facilities, unless the written permission is previously provided by TxDOT. DB Contractor shall coordinate with private property owners for driveway closures. No two consecutive driveways to the same shall be closed simultaneously; DB Contractor shall stagger driveway closures to maintain access.

Any Lane Closures by DB Contractor shall comply with the requirements of Exhibit 15 of the Design Build Agreement. DB Contractor shall provide a tow-truck onsite should a lane reduction occur on US 290 or SH 71 as a part of DB Contractor's TCP. The requirement for a tow-truck shall be noted on the TCP.

DB Contractor, in coordination with TxDOT, shall prepare public information notices, in accordance with Item 11, "Public Information and Communications," in advance of the implementation of any Lane Closures or traffic switches. These notices shall be referred to as traffic advisories. DB Contractor shall also notify the traveling public by placing changeable message signs a minimum of seven days in advance of any roadway closure or major traffic modifications that will be in place for twenty four hours or greater and forty-eight hours in advance of any lane closure. Where available and when possible, DB Contractor shall coordinate and utilize DMS on the regional ITS system.

DB Contractor shall utilize uniformed police officers with jurisdiction in the area to effect Lane Closures. DB Contractor is responsible for noting the requirement for uniformed police officers in the TCPs when Lane

Closure is applied. DB Contractor is responsible for the costs associated with the use of uniformed police officers.

26.3 Construction Requirements

DB Contractor shall ensure construction of the traffic control Elements is in accordance with DB Contractor's TMP, the manufacturer's directions or recommendations where applicable, and the applicable provisions of the TMUTCD.

DB Contractor shall conduct all Work necessary to meet the requirements for this Item 26 in accordance with the requirements of this Item 26 and TxDOT Standard Specifications.

During the hours of 9:00 pm to 5:00 am, hammering for excavation purposes is not allowed.

26.3.1 DB Contractor Responsibility

If at any time TxDOT determines DB Contractor's traffic control operations do not meet the intent of the TMP or the specific TCP, DB Contractor shall immediately revise or discontinue such operations to correct the deficient conditions.

DB Contractor shall provide TxDOT the names of the Lead MOT Implementation Manager and support personnel, including a backup coordinator in the event the primary coordinator is unavailable, and the phone number(s) where they can be reached 24 hours per day, seven days per week.

26.3.2 Access

DB Contractor shall maintain existing bicycle and pedestrian access, connectivity, and mobility. DB Contractor shall minimize temporary and permanent impacts to bicycle and pedestrian facilities by providing the same level of connectivity as existing conditions. In addition, DB Contractor shall maintain existing continuity of sidewalks and shared-use paths along all frontage roads. Access to existing transit stop locations shall be maintained during construction or reasonable alternative locations shall be coordinated with and approved by transit operators.

26.3.3 Detours

DB Contractor shall maintain all detours in a safe and traversable condition. DB Contractor shall provide a pavement transition, suitable for the posted speed and accounting for the vertical and horizontal geometry of the section at all detour interfaces.

DB Contractor shall provide temporary pavement for detours tying the US 290 westbound frontage road to Scenic Brook Drive and allowing connectivity to Circle Drive as directed by TxDOT.

As part of a TCP submittal, DB Contractor shall submit detour or traffic switch exhibits and diagrams in their native file format so that TxDOT may incorporate it into public information packages as needed.

26.3.4 Local Approvals

DB Contractor shall communicate all roadway and ramp closures and staging analyses with each Governmental Entity having jurisdiction for roads that may be affected by the Project. When roadway and ramp movements are diverted or detoured along existing roads, DB Contractor shall be responsible for any and all user costs and schedule risk that may be assessed for the use of these existing roads. This may include traffic operation analysis, temporary traffic control devices, and road user costs. DB Contractor is responsible for obtaining the necessary approvals from any Governmental Entity having jurisdiction over the routes used.

26.3.5 Traffic Signals

DB Contractor shall assume responsibility for signal phasing and timing during construction for traffic signals within the Project limits. DB Contractor shall coordinate with TxDOT and the City of Austin, and provide a minimum of 30 days advance notice to each entity prior to assuming responsibility for signal phasing and timing during construction.

DB Contractor shall coordinate with TxDOT and the City of Austin, and provide a minimum of 30 days advance notice to each entity prior to relinquishing responsibility for signal phasing and timing at Final Acceptance.

If at any time TxDOT determines in their discretion that signal phasing or timing plans need to be modified, DB Contractor shall use revised signal phasing or timing plans as determined by TxDOT.

26.3.6 Pavement Markings and Signing

DB Contractor shall remove existing pavement markings and/or signs that conflict with temporary or permanent pavement markings. DB Contractor shall remove these signs by any method that does not materially damage the existing elements or facilities. DB Contractor shall not remove pavement markings by over-painting, and shall use water blasting to remove all pavement markings that will be removed from pavement that will remain as the final riding surface. DB Contractor shall not use temporary tape at any time during the Term. Final striping for locations impacted by traffic control inside and outside of the Project limits shall be cleared of any visible temporary striping or reflective pavement markers. DB Contractor shall design and construct the final layer of pavement for US 290 and SH 71 frontage roads and cross streets in accordance with the requirements of Item 16, "Geotechnical." DB Contractor shall not place temporary pavement markings on the final layer of pavement for US 290 and SH 71 frontage roads and cross streets.

DB Contractor is responsible for temporary signing outside of the Project limits required for the Project.

DB Contractor shall utilize existing, temporary, or proposed overhead sign structures to mount temporary or proposed guide signs above freeway main lanes where there are at least three main lanes in a given direction, per TMUTCD requirements. DB Contractor shall maintain existing overhead signing within the Project throughout the construction duration.

DB Contractor shall maintain safe travelling conditions when utilizing roadways outside the Project limits including routes to fabrication facilities, plants and haul roads.

26.3.7 Reinstatement of Utility Cuts

After installation of drainage structures, storm sewers, or any other public or private Utility facility by open cut beneath existing pavements carrying traffic during construction, DB Contractor shall be restored the pavement to a structure acceptable to TxDOT or the Governmental Entity having jurisdiction over the affected area and restore it to a riding surface equal to or better than the existing surface.

26.3.8 Hauling Equipment

DB Contractor shall keep traveled surfaces used in its hauling operations clear and free of dirt or other debris that would hinder the safe operation of roadway traffic.

DB Contractor shall use rubber-tired equipment for moving dirt or other materials along or across paved surfaces. Excess dirt or debris shall be swept or removed from the job site with regular cleaning and sweeping at least twice a day.

In the event that DB Contractor moves any equipment not licensed for operation on public highways on or across any pavement, DB Contractor shall protect the pavement from all damage caused by such movement. Damage caused by DB Contractor shall be repaired at the expense of DB Contractor.

DB Contractor is prohibited from using haul routes that utilize any street of an adjacent Governmental Entity.

During the hours of 9:00 PM to 5:00 AM, DB Contractor shall utilize a non-intrusive, self-adjusting noise level reverse signal alarm. This requirement is not applicable to hotmix or seal coat operations.

26.3.9 Final Clean-Up

DB Contractor shall clear and remove from the Site all surplus and discarded materials and debris of every kind and leave the entire Project in a clean, smooth, and neat condition after each construction process.

26.3.10 Stockpiles

DB Contractor shall place barricades and warning signs at stockpiles to adequately warn motorists of a hazard in accordance with TxDOT Engineering Standard Sheets and the TMUTCD. DB Contractor shall not locate any material stockpiles within the clear zone of any traveled lane, unless positive protection is provided.

26.4 Submittals

All Submittals described in this Item 26 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 26-2. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 26-2: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
TCP concept presentation (meeting)	Prior to TCP plan sheet development	Approval	26.2.1
Traffic Control Plans (TCP) and Documentation of meeting Table 26-1 Requirements	Prior to implementation	Approval	26.2.1 and 26.2.2
TCP Corrective Action Plan	Immediately following a Noncompliance Event or safety concern that requires modification to the TCP	For information	26.2.1

Item 27
Maintenance

27.1 General Requirements

27.1.1 General Maintenance Obligations

Throughout the period between NTP2 and Final Acceptance, DB Contractor shall be responsible for and shall carry out Maintenance Work within the Maintenance Limits. DB Contractor shall conduct all Maintenance Work necessary to meet the requirements for this Item 27 in accordance with the requirements of this Item 27 and TxDOT Standard Specifications.

DB Contractor shall establish and maintain an organization that effectively manages all Maintenance Work in a manner set forth in the approved Maintenance Management Plan (MMP) and the requirements of the Contract Documents. DB Contractor shall:

- Coordinate activities of other entities with interests or activities within the Maintenance Limits;
- Conduct daily patrols of all lanes of the Project within the Maintenance Limits to identify conditions that are unsafe or have the potential to become unsafe, and conditions that could threaten the infrastructure, and to attend to existing or changing conditions;
- Minimize delay and inconvenience to Users and, to the extent DB Contractor is able to control, users of related transportation facilities;
- Develop, maintain and implement a Maintenance Management System to record the category, status, intended action and repair for all Defects;
- Facilitate access to such system by TxDOT to allow the notification and categorization by TxDOT of Defects that TxDOT identifies in the course of its maintenance inspections;
- Mitigate hazards and permanently repair all Defects, including those identified by TxDOT, DB Contractor and third parties within the specified periods;
- Identify and correct all Defects and damages from Incidents;
- Monitor and observe weather and weather forecasts to proactively deploy resources to minimize delays and safety hazards due to high winds, severe thunderstorms, tornadoes, heavy rainfall and flooding, hail, snow, ice, or other severe weather events;
- Remove debris, including litter, graffiti, animals, and abandoned vehicles or equipment from the Project ROW;
- Minimize the risk of damage, disturbance, or destruction of third-party property during the performance of Maintenance Work;
- Report to TxDOT the status of its Maintenance Work including Nonconforming Work;
- Coordinate with and enable TxDOT and others with statutory duties or functions in relation to the Project or related transportation facilities to perform such duties and functions;
- Perform Maintenance Work, including inspections, Incident response, traffic control, and routine maintenance in accordance with the MMP and the Contract Documents; and
- Promptly investigate reports or complaints received from all sources.

27.1.2 Scope of Maintenance Work and Interfaces with TxDOT and Third Parties

The Maintenance Work shall apply to all Elements as identified in Attachment 27-1 (Baseline Performance and Measurement Table During Construction). TxDOT will retain maintenance responsibilities for Elements in place or operating prior to the Proposal Due Date within the Maintenance Limits (the “existing Elements”) until NTP2.

TxDOT’s maintenance responsibilities from the Proposal Due Date until NTP2 will be limited to routine maintenance of each existing Element and will not include preventive maintenance or major maintenance as such items are defined in TxDOT *Maintenance Management Manual*.

DB Contractor shall coordinate with TxDOT to achieve a smooth transition of maintenance activities from TxDOT in the period between NTP1 and NTP2. Starting at NTP2, DB Contractor shall perform all necessary Maintenance Work to comply with the Performance Requirements.

DB Contractor shall coordinate Maintenance Work with TxDOT and other Governmental Entities having adjacent maintenance responsibilities to minimize disruption to Users. DB Contractor shall coordinate with TxDOT to ensure a smooth transition of the maintenance responsibilities to relevant parties after Final Acceptance.

27.1.3 Maintenance Limits

DB Contractor shall prepare and submit Maintenance Limits drawings consistent with DB Contractor's then-current design as part of the MMP. The Maintenance Limits drawings shall be consistent with the principles and extents shown in Attachment 27-3 (Maintenance Limits). DB Contractor shall periodically validate that the Maintenance Limits are correctly and clearly identified by physical delineation and shall liaise with TxDOT and Governmental Entities as necessary to review the Maintenance Limits, identify any jurisdictional gaps or inefficiencies and recommend solutions to TxDOT. Within the Maintenance Limits, DB Contractor shall allow adjacent landowners to cross under bridges at breaks in control of access.

27.2 Maintenance Management

27.2.1 Maintenance Management Plan

DB Contractor shall prepare and submit the MMP in accordance with Section 4.2.11 of the General Conditions, update the MMP as required, and shall submit it to TxDOT for approval in TxDOT's discretion. The requirements for the MMP are set forth in Attachment 27-4 (MMP Template).

27.2.2 Reserved.

27.2.3 Maintenance Manager

DB Contractor shall assign a Maintenance Manager who shall be responsible for:

- Implementing the maintenance obligations in this Item 27 and the MMP;
- Causing the Maintenance Work to be performed in accordance with the Contract Documents;
- Causing all maintenance personnel and resources performing Maintenance Work to be available and properly trained;
- The health and safety of personnel delivering the Maintenance Services and the general public affected by the Project; and
- Coordinating with TxDOT and other entities during Incidents and Emergencies

The Maintenance Manager shall meet or exceed the qualifications and experience established in the Contract Documents, and:

- Must have experience on maintenance projects; and
- Must have managerial experience in design, construction, or maintenance on any road project of similar size, scope and complexity.

The Maintenance Manager shall have an active role in the review of Design Work to ensure that maintenance activities can be safely and efficiently performed for the Project and that necessary life cycle activities have been taken into consideration. The Maintenance Manager shall be available whenever Maintenance Work is performed.

27.3 Performance Requirements

27.3.1 Performance and Measurement Table

DB Contractor's performance of the Maintenance Work shall be governed by the Performance and Measurement Table as may be updated in accordance with Section 27.3.4. The Performance and Measurement Table shows for each Element:

- Performance Objectives that each Element is required to meet or exceed;
- The Defect Remedy Periods for each Defect;

- Inspection and Measurement Methods that DB Contractor shall use to determine compliance; and
- Measurement Records that DB Contractor shall establish and maintain based upon inspections and measurements.

DB Contractor shall record a separate Defect upon failure to achieve any of the requirements set forth in the Performance Objective or Measurement Record. DB Contractor shall address each Defect within the specified Defect Remedy Period as further described in this Item 27.

27.3.2 Defect Identification, Recording and Categorization

27.3.2.1 Definitions

For Defects shown on the Performance and Measurement Table:

- Hazard mitigation is an action taken by DB Contractor with respect to a Category 1 Defect to mitigate a hazard to Users or imminent risk of damage or deterioration to property or the environment such that the Category 1 Defect no longer exists; and
- Permanent repair is an action taken by DB Contractor with respect to any Defect to restore the condition of a Element to a condition such that no Defect exists.

27.3.2.2 Sources of Defects and Status

DB Contractor shall identify and record Defects through inspections described in Section 27.4 and reports or complaints by third parties. DB Contractor shall accurately record the status of Defects from all sources in the MMS). Where multiple instances of Defects exist in a Element (for example simultaneous failure to repair damaged guardrail in multiple locations), a separate Defect shall be recorded for each instance where the requirement set forth in the Performance Objective or Measurement Record is not achieved.

Where Defects are identified in the field during the course of any inspection that DB Contractor is required to attend, DB Contractor shall upload information related to such Defects from handheld devices to a storage system accessible by TxDOT. Information shall include description, date-time of identification and categorization. Any such upload of Defect information with Category 1 Defect status shall trigger immediate automatic e-mail notification of TxDOT and the Maintenance Manager.

27.3.2.3 Defects Identified by DB Contractor, TxDOT or Third Party

Whenever DB Contractor identifies, becomes aware of or is notified by TxDOT or a third party of a Defect, DB Contractor shall create within the MMS a Maintenance Record containing details of the associated Element, the nature and categorization of the Defect and the proposed timing and details of hazard mitigation, and permanent repair of the Defect. DB Contractor shall categorize each Defect, based upon its determination as to whether:

- It represents an immediate or imminent health or safety hazard to Users or road workers;
- There is a risk of immediate or imminent structural failure or deterioration;
- There is an immediate or imminent risk of damage to a third party's property; or
- There is an immediate or imminent risk of damage to the environment.

Should a Defect meet any of the above criteria, DB Contractor shall record it as a Category 1 Defect. DB Contractor shall provide training to all relevant personnel on the categorization of Defects. DB Contractor shall maintain a record of the circumstances of the Defect and how it was categorized. DB Contractor shall facilitate the review by TxDOT of Maintenance Records in the MMS associated with DB Contractor-categorized Defects and shall enable TxDOT to flag any Defect where TxDOT disagrees with any attribute or categorization assigned by DB Contractor.

27.3.3 Baseline Inspections and Performance and Measurement Table

27.3.3.1 Baseline Inspections

DB Contractor shall perform the inspections and / or tests to determine the condition of each Element (the "Baseline Inspections") and the preparation of the Baseline Element Condition Report (BECR). DB Contractor shall perform the inspections and/or tests in accordance with Attachment 27-2 (Baseline Inspection Requirements).

DB Contractor shall submit to TxDOT for approval the proposed scope of Baseline Inspections, the methodology proposed for the inspections and/or tests.

Upon TxDOT's approval of the scope of the Baseline Inspections, DB Contractor shall provide to TxDOT a minimum of 14 Days' notice to witness the inspections and/or tests.

27.3.3.2 Baseline Element Condition Report

DB Contractor shall prepare the BECR and shall submit to TxDOT for approval as part of the MMP no later than 60 days prior to NTP2. The BECR shall comply with the following requirements:

- The BECR shall include a record of the condition of each Element shown in Attachment 27-2 (Baseline Inspection Requirements).
- Each photographic record and /or measurement shall be associated with a location accurate to the nearest 10 feet.
- The condition of each Element shall be recorded such that there is a minimum of one record for each Performance Section within which the Element is represented.
- Where the condition of an Element varies within a Performance Section, the BECR shall include sufficient records to demonstrate the range of conditions and a reference condition for the Element shall be recorded for each Performance Section.

DB Contractor shall cause the BECR to include the results of the most recent Specialist Inspections undertaken by TxDOT, including the results of the annual survey of pavement condition for the entire Project, including main lanes, ramps, frontage roads, cross streets and direct connectors as applicable undertaken using automated condition survey equipment.

27.3.3.3 Use of BECR to Establish Performance and Measurement Table Requirements

The results of the BECR shall be used to establish the Performance Objective and Measurement Record for each Element in Attachment 27-1 (Baseline Performance and Measurement Table During Construction). The use of the BECR to establish these requirements is demonstrated in the following example: Referring to Element Ref. 1.2: "edge drop-off", the Performance Objective is that: "all roadways shall be free from edge drop-offs exceeding the measurement record thresholds." Measurement Record 1.2.1 requires: "no edge drop-off greater than the reference condition (on a location-specific basis) in the BECR." If, within a given Performance Section, the maximum edge drop-off recorded in the BECR is 2.5 inches and an edge drop-off of 3.0 inches is measured within the same Performance Section after NTP2, the requirement of the Measurement Record would not be achieved, resulting in a Defect. If the Defect is a Category 1 Defect, this would trigger a 24-hour hazard mitigation period and a 28-day permanent repair period.

27.3.3.4 Defects between Baseline Inspections and NTP2

No later than 14 days after NTP2, DB Contractor shall submit details (if any) of instances of damage or deterioration that, in the opinion of DB Contractor, occurred between the completion of the Baseline Inspections and NTP2. DB Contractor shall identify the Maintenance Work required to cause each such Element to be in compliance with the applicable Performance Objective and Measurement Record, including an estimate of the cost of performing such Maintenance Work. TxDOT may implement one or more of the following: (a) cause Elements to be in compliance with the requirements using its own forces; (b) instruct DB Contractor to perform Maintenance Work that would enable Elements to be in compliance with applicable requirements by means of a Change Order; or (c) agree to a revision to certain Performance Objectives or Measurement Records in Attachment 27-1 (Baseline Performance and Measurement Table During Construction).

27.3.4 Updates of Baseline Performance and Measurement Table During Construction

DB Contractor may propose changes to the Performance and Measurement Table for TxDOT approval. DB Contractor shall propose for TxDOT's approval such amendments to the Inspection and Measurement Method and Measurement Record as necessary to cause these to comply with Good Industry Practice and this Item 27. TxDOT may, at any time, require DB Contractor to adopt amendments to the Inspection and Measurement Method and Measurement Record where such updates are required to comply with Good Industry Practice and this Item 27. In this case, the new Inspection and Measurement Method or Measurement Record shall be determined using the principle that it shall achieve no less than the standard

of maintenance that would have been achieved through DB Contractor's compliance with the original Inspection and Measurement Method and Measurement Record.

27.3.5 **Permanent Repair of Defects**

Where action is proposed to repair any Defect, DB Contractor shall promptly create a Maintenance Record that identifies the nature of the proposed repair.

The Defect Remedy Period set forth in the Performance and Measurement Table shall commence upon the earlier of: (i) the date and time DB Contractor became aware of the Defect; or (ii) the date and time DB Contractor should have known of the Defect. DB Contractor shall take necessary action to avoid any recorded Defect that is not currently a Category 1 Defect from becoming a Category 1 Defect. DB Contractor shall monitor all Defects to verify the condition of the affected Element prior to permanent repair and shall inform TxDOT immediately should any such Defect deteriorate to a Category 1 Defect.

For all Defects not recorded as Category 1 Defects, DB Contractor shall complete the permanent repair within the Defect Remedy Period unless an earlier repair is required to prevent deterioration to a Category 1 Defect.

27.3.6 **Hazard Mitigation of Category 1 Defects**

DB Contractor shall immediately implement hazard mitigation of any Category 1 Defect in an Element of which it is aware through its own inspections, from a third party or through notification by TxDOT to DB Contractor (through the MMS or by other means) that TxDOT requires DB Contractor to perform hazard mitigation for a Category 1 Defect.

For Category 1 Defects, DB Contractor shall take necessary action such that any hazard to Users is mitigated within the Defect Remedy Periods specified in the Performance and Measurement Table. DB Contractor shall continue hazard mitigation until a permanent repair has been completed.

27.4 **Inspections**

27.4.1 **General Inspections by DB Contractor**

DB Contractor shall establish inspection procedures and frequency as well as a plan to implement a program of inspections necessary for the Maintenance Work. Inspection procedures shall ensure:

- The Project is safe for Users;
- Category 1 Defects are identified and repaired such that the hazard to Users is mitigated within the applicable Defect Remedy Period; and
- All Defects are identified and permanently repaired within the applicable Defect Remedy Period.

In performing inspections to identify Defects, DB Contractor shall, for any Element, conform at a minimum to the inspection standards set forth for that Element in the column entitled "Inspection and Measurement Method" in Attachment 27-1 (Baseline Performance and Measurement Table During Construction).

DB Contractor shall perform general inspections in accordance with the MMP so that the repairs of all Defects are included in planned programs of work.

DB Contractor shall record details of the manner of inspection (e.g. center Lane Closure or shoulder), the weather conditions, and any other unusual features of the inspection on inspection records in respect of general inspections.

DB Contractor shall submit to TxDOT non-conformance reports within seven Days of issuance and shall notify TxDOT of Nonconforming Work within two Days of discovering the Nonconforming Work. TxDOT will issue a non-conformance report if TxDOT discovers any Nonconforming Work. DB Contractor's responsibility to correct Nonconforming Work is set forth in the Contract Documents.

27.4.2 **Performance Sections**

As part of the MMP, DB Contractor shall prepare drawings identifying the Performance Sections and shall submit and update these plans with the applicable part of the MMP. The drawings shall identify the boundaries of each Performance Section and shall cross reference to an inventory describing each Element of the Project contained within each Performance Section. Where Performance Sections need to be revised

to take into consideration the progression from an existing facility to the then-current design, DB Contractor shall phase in the new Performance Sections in a logical manner so that new Performance Sections are in place as the Work progresses.

DB Contractor shall implement the Texas Reference Marker (TRM) system used by TxDOT to establish Performance Sections for inspection and maintenance records in accordance with the MMP. DB Contractor shall use the existing TRM system established on existing sections of the Project. DB Contractor shall coordinate with TxDOT to establish the TRM system on newly constructed sections of roadway.

27.4.3 Inspections by TxDOT

TxDOT may undertake Specialist Inspections as follows during the Term and if such inspections are performed will make the results available to DB Contractor.

- Annual survey of pavement condition for the entire Project, including main lanes, ramps, and frontage roads, undertaken using automated condition survey equipment to measure all necessary criteria including: ruts, skid resistance and ride quality according to the "Inspection and Measurement Method" set forth in the Performance and Measurement Table.
- Routine biennial inspections, to the extent required, for all structures within the Maintenance Limits in compliance with the latest FHWA / NBIS and TxDOT requirements.

Upon receipt of TxDOT Specialist Inspections, DB Contractor shall use the results of Specialist Inspections to prioritize Maintenance Work and immediately identify all Defects within each Performance Section established by the inspections and enter these Defects in the MMS with the appropriate Defect Remedy Period.

27.5 Maintenance Management System (MMS)

27.5.1 MMS Attributes

DB Contractor shall implement a MMS to store all the following Maintenance Records:

- Description, location, date-time of identification and categorization of Defects;
- Planned actions and date-time for permanent repair of all Defects;
- Details including date-time of actual repairs performed;
- Complaints and reports received from TxDOT and third parties; and
- Accidents and incidents relating to the Maintenance Work.

Maintenance Records shall be located by Performance Section. When a Element is constructed, installed, maintained, inspected, modified, replaced or removed, DB Contractor shall create and store a Maintenance Record no later than three days after completion of such work. Category 1 Defects shall be recorded in the MMS immediately upon DB Contractor becoming aware of the Defect either by direct upload to the MMS by DB Contractor's inspection personnel in the field or by upload of the information to the MMS when Category 1 Defects are notified to DB Contractor by TxDOT or a third party. All other Defects shall be recorded in the MMS after coming to the attention of DB Contractor. All other recording requirements shall be recorded on the MMS within 15 days of completion or occurrence of the relevant activity.

27.5.2 MMS Interfaces with TxDOT

DB Contractor shall provide TxDOT real-time, remote access to the Maintenance Records for the duration of the Term.

DB Contractor shall hand over the Maintenance Records to TxDOT, or other entity as directed by TxDOT, upon expiration of the Warranty Term.

Requirements for the storage, retention and transfer to TxDOT of Maintenance Records are provided in Section 27.6.4.

27.5.3 MMS Functional and Timeliness Requirements

The MMS shall facilitate the direct upload by DB Contractor personnel from handheld devices in the field of all applicable Defect information and attributes, including description, date-time of identification and categorization. Any such upload of Defect information with Category 1 Defect status shall trigger immediate automatic e-mail notification of TxDOT and the Maintenance Manager.

When an Element is constructed, installed, maintained, inspected, modified, replaced or removed, DB Contractor shall update the MMS no later than three days after completion of such work. DB Contractor shall record all Category 1 Defects in the MMS immediately upon DB Contractor becoming aware of the Defect either by direct upload to the MMS by DB Contractor's inspection personnel in the field or by upload of the information to the MMS when Category 1 Defects are notified to DB Contractor by TxDOT or a third party. DB Contractor shall record all other Defects in the MMS no later than three days after coming to the attention of DB Contractor. DB Contractor shall record all other recording requirements on the MMS within 15 days of completion or occurrence of the relevant activity.

27.6 Maintenance Obligations

27.6.1 Incident and Emergency Management

As part of the MMP for Maintenance Work, DB Contractor shall prepare and implement an Incident and Emergency Management Plan (IEMP). Refer to Attachment 27-4 (MMP Template) for the required contents of the IEMP.

Where an Incident or Emergency has an effect on the operation of the Project, DB Contractor shall clear obstructions and repair damage to the Project under the supervision of the relevant Emergency Services if necessary, such that the Project is returned to normal operating standards and safe conditions as quickly as possible in accordance with the requirements of Section 4.2.3 of the General Conditions.

Where liquid or soluble material spills are involved, DB Contractor shall take all necessary measures to minimize pollution of watercourses or groundwater. Where structural damage to structures is suspected, DB Contractor shall ensure that a suitably qualified bridge engineer or specialist inspector is available to evaluate the structure and to advise on temporary repairs and shoring needed to provide safe clearance of the Incident or Emergency. Where such an Incident or Emergency involves a personal injury, DB Contractor shall not remove any vehicle or other item that may assist a potential investigation by Emergency Services until authorized to do so by such agency or agencies.

27.6.2 Snow and Ice Control

DB Contractor shall report to TxDOT information on weather-related events which may cause unsafe driving conditions such as ice, sleet, snow, floods or high winds.

TxDOT will be responsible to maintain the travel way free of snow and ice. DB Contractor will be responsible for cleaning of debris as a result of snow and ice control operations performed by TxDOT.

27.6.3 Severe Weather Evacuation

DB Contractor shall prepare and train its staff for evacuation and shall assist TxDOT in the event that an evacuation is implemented, in accordance with the Severe Weather Evacuation Plan (SWEP). Requirements for the SWEP are contained in Attachment 27-4 (MMP Template).

27.6.4 Maintenance Document Management

For all Maintenance Records, DB Contractor shall follow the document storage and retrieval requirements set forth in Section 4.2.1.2 of the General Conditions. DB Contractor's document management system shall be compatible with SharePoint.

DB Contractor shall cause all Maintenance Records and Project-related documents to be stored, along with accurate information, on the location consistent with reference markers in accordance with the TRM system, so that all data and records can be retrieved by reference marker and Performance Section.

Maintenance Records shall be kept throughout the Term. Such records shall be provided to TxDOT upon Final Acceptance. All records obtained during the Warranty Term shall be kept and provided to TxDOT at the end of the Warranty Term.

Unless otherwise directed by TxDOT, DB Contractor's record retention shall comply with the requirements of the Texas State Records Retention Schedule.

27.6.5 **Safety**

DB Contractor shall establish and implement safety and health procedures for Maintenance Work in compliance with Section 4.2.3 of the General Conditions and in accordance with the Maintenance Safety Plan. Refer to Attachment 27-4 (MMP Template) for the required contents of the Maintenance Safety Plan.

27.6.6 **Communication**

DB Contractor shall establish and implement communication procedures for Maintenance Work in compliance with Sections 4.2.5 of the General Conditions; and Item 26, "Traffic Control" and Item 11, "Public Information and Communications."

27.6.7 **Hazardous Materials Management**

DB Contractor shall establish and implement Hazardous Materials Management procedures for Maintenance Work in compliance with Section 4.2.4.4 of the General Conditions and in accordance with the Hazardous Materials Management Plan (HMMP). Refer to Attachment 27-4 (MMP Template) for the required contents of the HMMP.

27.6.8 **Environmental Compliance and Mitigation**

DB Contractor shall establish and implement environmental compliance and mitigation procedures for Maintenance Work in compliance with Section 4.2.4.2 of the General Conditions and Item 12, "Environmental" and shall follow the requirements described in Attachment 27-4 (MMP Template).

27.6.9 **Traffic Management**

DB Contractor shall establish and implement traffic management procedures for Maintenance Work in compliance with Item 26, "Traffic Control" and shall follow the requirements described in Attachment 27-4 (MMP Template).

27.7 **Submittals**

All Submittals described in this Item 27 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth on Table 27-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise required.

Table 27-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Maintenance Management Plan (MMP)	After NTP1	Approval	27.2.1
MMP Updates	As required	Approval	27.2.1
Proposal scope and methodology of Baseline Inspections	Prior to the Baseline Inspections	Approval	27.3.3.1
Notice of Baseline Inspections and/or tests	Prior to the Baseline Inspections	For information	27.3.3.1
BECR	Prior to NTP2	Approval	27.3.3.2
Details of the Maintenance Work to cause each Element to be in compliance with applicable requirements	After NTP2	Review and comment	27.3.3.4
Updates to Performance and Measurement Table	As required	Approval	27.3.4
Notification of Nonconforming Work	After discovering the Nonconforming Work	For Information	27.4.1
Nonconformance Report	After notification issuance	Review and comment	27.4.1

Table 27-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Notice of any fatality and incident police report	Within 24 hours of discovering	For Information	27.5.4
All Maintenance Records	Throughout the Term	For Information	27.6.4

Item 28
Bicycle and Pedestrian Facilities

28.1 **General Requirements**

This Item 28 includes requirements with which DB Contractor shall design and construct all bicycle and pedestrian facilities for the Project as shown on the Schematic Design. DB Contractor shall design and construct all bicycle and pedestrian facilities consistent with TxDOT policies and guidelines described in this Item 28. DB Contractor shall coordinate the Elements of this Project with the existing and planned trails and other facilities of local and county administrations for pedestrians and cyclists.

28.2 **Administrative Requirements**

DB Contractor shall maintain equivalent connectivity on all bicycle and pedestrian facilities during construction and throughout the Term.

28.3 **Design Requirements**

DB Contractor shall not utilize contraction or tool joints in bicycle facilities or in pedestrian facilities. DB Contractor shall utilize expansion joints at a maximum spacing of every 40 feet for bicycle and pedestrian facilities and coincide with curb expansion joints. Reinforcement shall be continuous through expansion joints.

28.3.1 **Bicycle Facilities and Shared Use Path**

DB Contractor shall design bicycle and shared use path facilities to be consistent with the region's bicycle and pedestrian plan and accommodate existing bicycle paths and crossings, and on-street bicycle facilities. DB Contractor shall coordinate with Governmental Entities and TxDOT to ensure the bicycle and shared use facility design results in consistency between existing and proposed bicycle and shared use path facilities.

Facilities shall meet the requirements of the AASHTO *Guide for the Development of Bicycle Facilities* and shall incorporate the following Elements, where applicable, relating to bicycle and shared use path facilities into the Design:

- Alignment, profile, cross-section, and materials;
- Points of connection to existing and proposed bicycle facilities;
- Crosswalk and pedestrian ramp locations and details;
- Signing, signalization, and pavement markings;
- Separation between bicycle facilities and the nearest travel lane;
- Methods of illumination indicating light fixture locations and types;
- Methods of separation, including barrier and/or fence type and height; and
- Requirements of the Aesthetics and Landscaping Plan.

DB Contractor shall design twelve-foot-wide shared use paths. Reduced widths are allowed where approved by TxDOT due to physical constraints. Design waivers, described in Section 19.2.2.7, have been prepared for shared use path widths less than ten feet. DB Contractor shall design a two-foot offset from any obstruction to the shared use path edge of pavement with the exception of locations where 12-foot wide box culverts are utilized. Barrier, railing, and continuous smooth vertical surfaces such as retaining walls along the shared use path shall be offset a minimum of one foot from the shared use path edge of pavement. The ends of these features shall be flared away from the shared use path, providing a minimum separation of 2' to the shared use path.

DB Contractor is responsible for obtaining design waivers, other than those previously approved by TxDOT, when the following shared use path criteria detailed in the AASHTO Guide for the Development of Bicycle Facilities are not met:

- Paved width

- Shoulder width
- Shoulder slope
- Horizontal clearance to obstructions
- Horizontal offset to drop-offs
- Vertical clearance to obstructions
- Separation from roadway
- Horizontal alignment
- Grade
- Stopping sight distance
- Horizontal sight line offset

DB Contractor shall design the shared use path so that it is not damaged by a 25-year flood event in those areas where the shared use path is located within the 25-year floodplain. DB Contractor shall design the shared use path above the ordinary high water mark of Williamson Creek as defined in "OHP_WOTUS_Shapes (05-10-2019)" shown in the RIDs.

28.3.2 **Pedestrian Facilities**

DB Contractor shall design, construct, and maintain pedestrian facilities where required by state and federal regulations. Sidewalks and pedestrian facilities shall comply with ADA, the Texas Accessibility Standards, TDLR, Registered Accessibility Specialist (RAS) standards, and Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way. In the event of a conflict among these requirements, the requirements listed in the Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way will prevail. DB Contractor shall install pedestrian signals and curb ramps at all existing and proposed signalized intersections within Project limits and as impacted by Project construction. DB Contractor shall coordinate with Governmental Entities and TxDOT to ensure consistency with existing and proposed pedestrian facilities.

DB Contractor's facilities shall meet the requirements of the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, and shall include the following elements, where applicable, relating to pedestrian facilities:

- Alignment, profile, cross-section, and materials;
- Points of connection to existing and proposed pedestrian facilities;
- Crosswalk and pedestrian ramp locations and details;
- Signing, signalization, and pavement markings;
- Separation between pedestrian facilities and the nearest travel lane;
- Methods of illumination indicating light fixture locations and types;
- Methods of separation, including barrier and/or fence type and height; and
- Requirements of the Aesthetics and Landscaping Plan.

DB Contractor shall design and construct pedestrian facilities along the cross streets as shown on the Schematic Design.

DB Contractor is responsible for obtaining TDLR reviews and approvals of pedestrian facility design and construction.

DB Contractor shall utilize Type B, Type D, or Type F pedestrian handrails for pedestrian and bicycle facilities as shown in the TxDOT Engineering Standard Sheets.

DB Contractor shall ensure that all pedestrian facilities and associated signal infrastructure within the Project limits comply with TMUTCD, TDLR TAS and ADA requirements.

Item 32
Performance Warranty

32.1 **General Requirements**

Throughout the Warranty Term, DB Contractor shall:

- Conduct Warranty Inspections at the specified frequency within the Warranty Limits, providing TxDOT the opportunity to attend;
- Keep a record of all Warranty Defects notified by TxDOT and the status of repair;
- Respond within the specified periods to TxDOT notification of a Warranty Defect and request for a Warranty Action Plan;
- Perform Warranty Action for all Warranty Defects within the specified remedy periods and in accordance with the Contract Documents and the approved Warranty Action Plan;
- Minimize delay and inconvenience to Users when performing Warranty Action;
- Minimize the risk of damage, disturbance, or destruction of third-party property during the performance of Warranty Action;
- Report to TxDOT on the status of Warranty Action; and
- Perform all other obligations identified in this Item 32 and the Contract Documents related to the Warranty.

32.2 **Performance Warranty Requirements**

The Performance Warranty applies to the Performance Warranty Elements identified in Attachment 32-1 (Warranty Performance and Measurement Table).

The Warranty Performance and Measurement Table shows, for each Performance Warranty Element:

- A performance objective that each Performance Warranty Element is required to meet or exceed;
- The maximum permitted remedy period for the completion of Warranty Action by DB Contractor;
- Inspection and measurement methods that DB Contractor shall use to determine compliance;
- Measurement records that DB Contractor shall establish and maintain based upon inspections and measurements;
- Performance Thresholds defining when Warranty Action shall occur; and
- Minimum requirements for Warranty Action as further described in Section 32.9.

For each measurement record, the condition of the Performance Warranty Element shall meet or exceed the Performance Threshold, otherwise a Warranty Defect exists and DB Contractor shall perform Warranty Action. The remedy period for the completion of Warranty Action shall commence upon the date and time DB Contractor was notified of the Warranty Defect or became aware through Warranty Inspections, whichever came first.

32.3 **Warranty Defect Notice and Investigative Inspection**

TxDOT may provide notice to DB Contractor of one or more Warranty Defects at any time before the end of the Warranty Term. DB Contractor shall respond to TxDOT within 7 days following TxDOT's notice with an invitation to TxDOT to jointly inspect the Warranty Defect(s) identified in TxDOT's notification (a "Warranty Investigative Inspection").

DB Contractor shall offer to TxDOT no fewer than three dates for a Warranty Investigative Inspection during normal business hours within the 28 days following TxDOT's notice. Failure by DB Contractor to offer or attend a Warranty Investigative Inspection shall be deemed DB Contractor's acceptance of the existence of the Warranty Defect(s) notified by TxDOT.

Upon agreement by the Parties of a date for the Warranty Investigative Inspection, DB Contractor shall provide safe access to no fewer than two TxDOT employees for such inspection, which shall be attended by DB Contractor personnel with qualifications and experience appropriate to the nature of the Warranty Defect. Following the Warranty Investigative Inspection, DB Contractor may confirm in writing its objection to the Warranty Defect notification and its intention to seek Dispute Resolution in accordance with the Contract Documents. Any such objection shall be issued no later than 28 days following the Warranty Investigative Inspection and shall include observations and evidence from the inspection. The attendance by DB Contractor and TxDOT at the Investigative Warranty Inspection and DB Contractor's subsequent written objection shall be a condition precedent to DB Contractor's initiation of Dispute Resolution procedures under the Contract Documents. Failure to issue an objection within 28 days following the Warranty Investigative Inspection shall be deemed DB Contractor's acceptance of the existence of Warranty Defect(s) notified by TxDOT and DB Contractor's acknowledgement of the Warranty Action Plan obligations set forth in Section 32.9.1.

32.4 Warranty Defect Requiring Hazard Mitigation

TxDOT will determine in its sole discretion whether a Warranty Defect requires hazard mitigation, taking into consideration whether the Warranty Defect:

- Represents an immediate or imminent health or safety hazard to Users or workers;
- Risks immediate or imminent structural failure or deterioration;
- Provides an immediate or imminent risk of damage to a third party's property; or
- Provides an immediate or imminent risk of damage to the environment.

Upon notification by TxDOT that hazard mitigation is required, DB Contractor shall immediately implement hazard mitigation of a Warranty Defect within 24 hours of TxDOT notice and shall continue hazard mitigation until the hazard no longer exists, followed by permanent repair within the time period specified on the Warranty Performance and Measurement Table. Alternatively DB Contractor may request that TxDOT perform hazard mitigation on DB Contractor's behalf.

If DB Contractor fails to complete hazard mitigation within 24 hours following TxDOT notification, or if DB Contractor requests that TxDOT perform hazard mitigation on its behalf, TxDOT shall be entitled to perform such hazard mitigation using its own resources and the cost of any such action performed by TxDOT shall become a debt due from DB Contractor to TxDOT.

TxDOT may, at its sole discretion, perform with its own forces or have performed by a third party the hazard mitigation of a Warranty Defect without notification to DB Contractor. TxDOT's performance of hazard mitigation, whether or not notified to DB Contractor, shall not excuse DB Contractor from its obligation to perform Warranty Action to effect a permanent repair of any Warranty Defect.

32.5 Maintenance Activities by Others

To the extent such activities are not DB Contractor's responsibility under the Warranty described in this Item 32 and Section 3.8 of the General Conditions, TxDOT or other applicable Governmental Entity will perform the following:

- Mowing, litter control, sweeping, debris removal, and vegetation control for the Warranty Performance Elements;
- Repair of incident damage to the Warranty Performance Elements;
- Hazard mitigation activities for the Warranty Performance Elements that TxDOT elects to perform itself or that DB Contractor requests that TxDOT performs on its behalf in accordance with Section 32.4); and
- Routine maintenance, renewal and replacement activities for all elements other than the Warranty Performance Elements.

Performance of the above maintenance activities by TxDOT or other Governmental Entity (or lack thereof) shall not relieve DB Contractor of its Warranty obligations.

32.6 Warranty Limits and Warranty Performance Sections

The Warranty Limits are provided in "Performance Warranty Maintenance Limits" included in the RIDs, based upon the TxDOT Schematic Design. If DB Contractor wishes to seek TxDOT's approval of revised Warranty Limits, DB Contractor may submit for TxDOT's approval no later than 60 days before Final Acceptance. Warranty Limits shall be consistent with the principles and extents shown in "Performance Warranty Maintenance Limits" included in the RIDs and consistent with DB Contractor's Final Design. As a condition to Final Acceptance, DB Contractor shall ensure that the Warranty Limits are correctly and clearly identified including the use of pavement markers approved by TxDOT where Warranty Limits are not otherwise clearly delineated. DB Contractor shall ensure that all markers are correctly positioned and visible as part of the Annual Warranty Inspection.

The basis of all inspections and reporting of Warranty Defects shall be Warranty Performance Sections which shall be a maximum 0.1mile in length. DB Contractor shall prepare drawings identifying the Warranty Performance Sections and shall submit and update these plans for TxDOT approval with the Warranty Limits drawings. DB Contractor shall implement the Texas Reference Marker (TRM) system established on existing sections of the Project to define Warranty Performance Sections and shall coordinate with TxDOT to establish the TRM system on newly constructed sections of roadway.

32.7 Authorized Representative

Throughout the Warranty Term, DB Contractor shall nominate an individual as the Authorized Representative who is an employee of the DB Contractor and has the authority to respond to all contractual matters that may arise throughout the Warranty Term on behalf of the DB Contractor. The Authorized Representative's responsibilities shall include:

- Response to TxDOT communications and requests for Warranty Action;
- Ensuring that the Performance Warranty Bond is in place;
- Ensuring appropriately qualified personnel from the DB Contractor are in attendance at Warranty Inspections;
- Where required by TxDOT, preparing a Warranty Action Plan for TxDOT's approval;
- Ensuring Warranty Action is performed in accordance with the approved Warranty Action Plan and the Contract Documents;
- Arranging for the prompt performance of Warranty Action within the prescribed remedy periods;
- Preparation and timely submittal of required Warranty reports; and
- Maintenance of necessary insurances during the performance of Warranty Action.

DB Contractor shall provide no less than 60 days' notice of its intention to replace the Authorized Representative.

32.8 Records of Warranty Defects and Status

DB Contractor shall record Warranty Defects through Warranty Inspections described in Section 32.10, and upon notice by TxDOT. DB Contractor shall accurately record the status of Warranty Defects from all sources within an electronic record in a TxDOT approved format available at all times for inspection by TxDOT. The record shall include details of the affected Performance Warranty Element, the nature of the Warranty Defect, the status of Warranty Investigative Inspections, the proposed timing and details of Warranty Action including hazard mitigation where necessary and the status of Warranty Action. A record of a Warranty Defect identifying the status shall be maintained by DB Contractor upon notice by TxDOT regardless of whether the existence of a Warranty Defect is accepted by DB Contractor.

32.9 Warranty Action Requirements

32.9.1 Warranty Action Plan

Within 28 days after the Warranty Investigative Inspection described in Section 32.3, DB Contractor shall submit the Warranty Action Plan for TxDOT review and approval. The Warranty Action Plan shall include the timing, scope, and nature of Warranty Action that DB Contractor proposes. The Warranty Action Plan shall comply with or exceed the minimum Corrective Warranty Action applicable to the Warranty Defect as shown on the Warranty Performance and Measurement Table and shall demonstrate that the Warranty Action

addresses the root cause of the Warranty Defect, so that upon completion of the Warranty Action there will be no risk of a recurrence of the Warranty Defect. As part of the Warranty Action Plan, DB Contractor shall submit details of how its organization will be established and maintained to effectively manage all elements of the Warranty Action in compliance with the requirements for a Project Management Plan (Section 4.2 of the General Conditions) and Quality Management Plan (Section 4.3 of the General Conditions).

DB Contractor shall perform the Warranty Action in accordance with the requirements of this Item 32 and the approved Warranty Action Plan. DB Contractor's responsibility to correct Nonconforming Work is set forth in Section 5.9 of the DBA and shall be applicable to all Warranty Action.

All Warranty Action shall follow the design and construction requirements within the Contract Documents applicable to the original design, installation or construction, unless changes to design and construction requirements are needed to address the root cause of the Warranty Defect. Where a change in design requirements is needed, the Warranty Action Plan shall include all necessary design Submittals, such as a pavement design revised by DB Contractor and signed and sealed by a Registered Professional Engineer consistent with Section 16.4.1.2 of the DB Standard Specifications, with design changes to address the root cause of the Warranty Defect.

32.9.2 Evidence for Completion of Warranty Action

Within 28 days after completion of Warranty Action, DB Contractor shall prepare and submit to TxDOT proof documents and conduct joint inspections as approved by TxDOT to verify that each Warranty Defect has been satisfactorily repaired and that each applicable Warranty Threshold is achieved throughout each Warranty Performance Section within which a Warranty Defect was recorded. DB Contractor shall submit evidence to TxDOT to verify that the permanent repair of each Warranty Defect meets the above requirements. Such evidence shall include, where applicable, Specialist Inspections performed in accordance with Section 32.10.

When a Performance Warranty Element is renewed or replaced through Warranty Action, and upon the first installation of the renewed or replaced Element into the Project, DB Contractor shall not have the benefit of any remedy period and the Warranty Action shall not be considered complete until the Performance Threshold for each affected Performance Warranty Element is met or exceeded for each measurement record in the Warranty Performance and Measurement Table.

32.9.3 Warranty Action to be Completed within Warranty Term

The existence of a remedy period for Warranty Action is the maximum period permitted for repair and shall not excuse DB Contractor from completing the repair of all Warranty Defects within the Warranty Term. DB Contractor shall perform Warranty Action so that every Warranty Defect, including any Warranty Defect first identified within the final 6 months of the Warranty Term, has been permanently repaired before the end of the Warranty Term. Prior to the end of the Warranty Term, DB Contractor shall submit to TxDOT a complete set of Record Drawings and supporting calculations and details that accurately show all Warranty Action and any other changes to the Project during the Warranty Term.

32.9.4 Requirements for Pavement Warranty Action

If DB Contractor proposes a permanent repair of a pavement Warranty Defect that includes diamond grinding of the pavement surface, DB Contractor shall submit a Warranty Action Plan that provides information regarding equipment and work methods equivalent in detail to that provided in *TxDOT Standard Specification Item 585 (Ride Quality for Pavement Surfaces)*. The maximum cumulative depth of grinding of any pavement surface shall be ¼" and DB Contractor shall, at TxDOT's sole discretion, provide evidence that this requirement has been achieved by coring of the pavement. Diamond grinding shall not be permitted as a repair method for Warranty Defects in flexible pavement.

For any new pavement construction within the Warranty Limits (including new pavement construction performed as a permanent repair of a Warranty Defect), Section 16.5.2 of the DB Standard Specifications (the "Smoothness Specification") shall apply. For any locations repaired through Warranty Action including tie-ins to adjacent construction that fail to meet or exceed the Smoothness Specification, DB Contractor shall perform further Warranty Action acceptable to TxDOT at DB Contractor's sole expense.

32.9.5 **Damage to other Elements caused by Warranty Action**

Whenever a Warranty Action disturbs, alters, removes or changes any Element other than a Performance Warranty Element, DB Contractor shall restore the affected Element to a condition no less favorable than its original condition before it was subject to Warranty Action. If the Warranty Action requires removal of or causes damage to adjacent Elements such as pavement markings, guardrail or signs, DB Contractor shall reinstate such Elements to as-new condition as part of the Warranty Action.

32.9.6 **Project Management Requirements for Warranty Action**

Whenever Warranty Action is undertaken that requires design work or construction work, DB Contractor shall, unless otherwise approved by TxDOT, follow all the requirements of Section 4.2 of the General Conditions in connection with Project Management.

32.9.7 **Quality Requirements for Warranty Action**

Whenever Warranty Action is undertaken that requires design work or construction work, DB Contractor shall, unless otherwise approved by TxDOT, follow all the requirements of Section 4.3 of the General Conditions in connection with quality management. DB Contractor shall cause all construction work and materials in connection with Warranty Action to be inspected at the frequencies required in compliance with Section 4.3 of the General Conditions and the TxDOT QAP. Depending upon the nature of the Warranty Action, TxDOT may waive any or all of the following requirements at its sole discretion:

- Submittal of design in stages of development in accordance with Section 4.3.6.3 of the General Conditions;
- Employment of one or more independent organization(s) complying with the requirements for the CQAF and PSQF in accordance with Section 4.3 of the General Conditions;
- Employment of professional services personnel and staffing including the assignment of a PSQCM, Engineer of Record and a PSQAM in accordance with Section 4.3.6.2 of the General Conditions; or
- Employment of construction services personnel and staffing including the assignment of a CQCM in accordance with Section 4.3.7.2 of the General Conditions.

32.9.8 **Traffic Control for Warranty Action**

During the performance of Warranty Action, DB Contractor shall implement the requirements of Item 26 “Traffic Control.”

Where Warranty Action is necessary, DB Contractor shall coordinate its Traffic Management Plan with the traffic management to be performed by TxDOT, other Governmental Entities, Utilities or the Systems Integrator having maintenance jurisdiction within the Warranty Limits or on adjacent facilities, to minimize disruption to Users. DB Contractor shall coordinate directly with such entities.

The Lane Closure process shall follow the requirements of Exhibit 15 to the DBA. TxDOT reserves the right to implement a Lane Rental for Warranty Action in accordance with the requirements of Section 8.6.2.1 of the General Conditions.

32.10 **Warranty Inspections**

32.10.1 **Warranty Annual Inspections**

Warranty annual inspections are required to identify and categorize newly identified Warranty Defects and plan Warranty Actions and shall be undertaken within 30 days prior to each anniversary of the Warranty Term.

DB Contractor shall offer to TxDOT no fewer than three dates for a Warranty annual inspection during normal business hours within the 28 days prior to each anniversary of Final Acceptance. DB Contractor shall provide transportation and safe access for up to two TxDOT personnel.

At a minimum, the warranty annual inspections will consist of a visual inspection of all Performance Warranty Elements. TxDOT may, in its sole discretion, include more detailed hands-on inspection of selected Performance Warranty Elements taking into consideration:

- Deterioration trends such as an increase in pattern and frequency of previously identified Warranty Defects;
- Warranty Defects that have been identified in a previous Warranty Inspection or the latest Specialist Inspection analysis report that need to be monitored because there is a risk of their deterioration;
- Extreme weather events or Incidents have occurred and TxDOT has notified the DB Contractor that these may have affected Warranty Elements; or
- Reports or complaints have been received from a third party.

Where a more detailed visual or hands-on inspection is required by TxDOT, DB Contractor shall ensure that personnel attending have the necessary experience and qualifications appropriate for the type of inspection being performed.

32.10.2 Warranty Verification Inspections

Warranty verification inspections are required to confirm the adequacy of any completed Warranty Action on previously identified Warranty Defects and shall be undertaken as needed no later than 28 days after DB Contractor considers the Warranty Action to be complete. For Warranty Action to pavement, DB Contractor shall undertake pavement surveys in accordance with Section 32.10.4 (Specialist Inspections) to verify that permanent repairs of Warranty Defects meet specified ride quality and other pavement requirements.

32.10.3 Warranty Investigative Inspections

Warranty investigative inspections are required to establish the basis of any differences of opinion between TxDOT and DB Contractor regarding the existence, nature and extent of Warranty Defects as identified in Section 32.3 (Warranty Defect Notice and Investigative Inspection).

32.10.4 Specialist Inspections

TxDOT will undertake an annual survey of pavement condition for every lane of the entire Project, including main lanes, ramps, cross streets and frontage roads, undertaken using automated condition survey equipment to measure all necessary criteria including: ruts, ride quality and pavement surface distresses according to the “Inspection and Measurement Method” set forth in the Warranty Performance and Measurement Table.

TxDOT will undertake:

- Biennial inspections of drainage Elements, including headwalls, wingwalls, junctions, manholes, energy dissipaters pipes and non-bridge class culverts in accordance with Good Industry Practice and FHWA’s Culvert Inspection Manual; and
- Routine biennial inspections for all structures within the Maintenance Limits in compliance with the latest FHWA / NBIS and TxDOT requirements.

TxDOT will make the results of these Specialist Inspections available to DB Contractor together with an analysis showing the number and type of Defects within each Warranty Performance Section for each line item in the Warranty Performance and Measurement Table. No later than 14 days after receipt of the Specialist Inspection data and analysis, DB Contractor shall:

- Identify all Defects within each Warranty Performance Section established by the Specialist Inspection analysis report and annual Warranty Inspection and enter these Defects in the electronic Warranty record described in Section 32.8;
- Use the results of Specialist Inspection analysis report to prioritize Warranty Action; and
- Identify any results of the Specialist Inspections that require further investigation and flag these for Warranty Investigative Inspections.

32.10.5 Final Warranty Inspection and Warranty Punch List

No later than 60 days prior to expiration of the Warranty Term, DB Contractor shall arrange a final warranty inspection to be conducted jointly with TxDOT following the procedures for the Warranty annual inspections in Section 32.10.1. TxDOT and DB Contractor shall produce a punch list of any Elements requiring Warranty Action. TxDOT and the DB Contractor shall also jointly review completed Warranty Action including repairs,

corrections and replacements pursuant to the Warranty. TxDOT may also conduct such other investigation as may be necessary to evaluate whether the conditions to Final Warranty Acceptance have been met.

TxDOT will issue a Certificate of Final Warranty Acceptance at expiration of the Warranty Term provided that all of the following conditions have been satisfied:

- TxDOT has determined that the Warranty Action, including punch list items and repairs, corrections or replacements pursuant to a Warranty, meets the standards set forth in this Item 32, including applicable detailed performance criteria set forth in the Warranty Performance and Measurement Table;
- TxDOT has received (i) evidence satisfactory to TxDOT that all Persons eligible to file a claim against the Warranty Bond have been fully paid and (ii) unconditional releases of Liens and stop notices from all Subcontractors who filed preliminary notice of a claim against the Warranty Bond; and
- The statutory period for Subcontractors to file a claim against the Warranty Bond has expired and no such claims have been filed.

32.11 Reporting Requirements

DB Contractor shall submit an annual report to TxDOT within 30 days after each anniversary of Final Acceptance. This annual report shall include the following elements:

- Records of all Warranty Defects and their status;
- Warranty Actions completed; and
- Warranty Actions planned.

32.12 Submittals

All Submittals described in this Item 32 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth in Table 32-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 32-1: Submittals to TxDOT

Submittals	Submittal Schedule	Department Action	Reference Section
Warranty Limits Drawings	At least 60 days before Final Acceptance	Review and Comment	32.6
Warranty Action Plan	Within 30 days after notification by TxDOT of a Warranty Defect	Approval	32.9.1
Evidence for completion of Warranty Action	Within 28 days after completion of Warranty Action	Review and Comment	32.9.2
Record Drawings showing any changes arising from Warranty Action	Before end of Warranty Term	Review and Comment	32.9.3
Final Warranty Inspection	At least 60 days prior to expiration of Warranty Term	Approval	32.10.5
Annual Report	Within 30 days after each anniversary of Final Acceptance	Review and Comment	32.11

Item 10001
Tree Protection

10001.1 **General Requirements**

Tree protection is required for Iconic Trees, Tree Preservation Areas, and Committed Trees. DB Contractor shall:

- Protect and preserve Protected Trees throughout the duration of the Project;
- Protect and assure the continued good health of Protected Trees;
- Provide, install, maintain and remove, upon completion of work, protective fences;
- Provide vegetative watering, mulch, root pruning and canopy pruning; and
- Protect all Protected Trees before any heavy equipment is allowed on site and maintain protections in place for the duration of the Project.

Prior to NTP2, DB Contractor shall prepare and submit to TxDOT a "Tree Preservation Plan" for TxDOT's approval which will describe how DB Contractor will protect in place and preserve Protected Trees. The Tree Preservation Plan shall describe DB Contractor's implementation of Tree protection and preservation measures for all phases of the Work.

The Tree Preservation Plan shall fully describe DB Contractor's policies, plans, Work Site controls, treatments, protection boundaries, Incident response plans, and maintenance program, including scheduled irrigation, fertilization, mulching, and monitoring of Tree health and hazards, to ensure the safety and health of the Trees to be protected and preserved.

DB Contractor shall submit to TxDOT for approval an update to the Tree Preservation Plan prior to each Tree clearing phase not identified in the Tree Preservation Plan and as often as necessary to reflect relevant changes during the Term.

In the Tree Preservation Plan and each update to the Tree Preservation Plan, DB Contractor shall identify Trees outside of the Tree Preservation Areas that DB Contractor commits to protect and preserve in accordance with the provisions of this Item 10,001 ("Committed Trees"). DB Contractor shall identify such Trees as "Committed Trees" in its Tree Preservation Plan. Iconic Trees and Trees in the offsite detention area are excluded from the definition of Committed Trees. TxDOT will not approve the Tree Preservation Plan or any update to the Tree Preservation Plan unless the plan or update (i) identifies at least 2,750 DBH inches of Trees as Committed Trees or (ii) identifies less than 2,750 DBH inches of Trees as Committed Trees and provides for the required increase to the Mass Planting Areas under Section 7.5.3 of the DBA for DB Contractor's failure to preserve the Tree Preservation Amount.

Prior to NTP2, DB Contractor shall prepare and submit to TxDOT for approval a health assessment prepared by DB Contractor's Certified Arborist for all Protected Trees on the Project.

DB Contractor shall prepare and submit to TxDOT for approval an update to the health assessment of the Iconic Trees following NTP2 on an annual basis until one year after Final Acceptance.

DB Contractor shall also comply with the requirement to provide updated health assessments for Iconic Trees before and after performing Warranty Action that occurs within 100 feet of any Iconic Tree in accordance with Section 2.1.4 of the DBA.

DB Contractor shall not relocate an Iconic Tree. DB Contractor shall not remove Trees from the offsite detention pond, except for Trees that are in conflict with the proposed berms for the offsite detention pond. The requirements listed in this Item 10,001 that are applicable to Trees in the Tree Preservation Areas shall also be applicable to Trees in the offsite detention pond, except for Trees that are in conflict with the proposed berms for the offsite detention pond.

10001.2 Plans Preparation

DB Contractor shall delineate site boundaries on plans and in the field to define Iconic Trees, Tree Preservation Areas, and Committed Trees. DB Contractor shall delineate Iconic Tree critical root zones on plans.

DB Contractor shall place structures and underground utilities to avoid impacts to the Protected Trees. DB Contractor shall include in all plans Tree protection fencing for all Iconic Trees, Tree Preservation Areas, and Committed Trees to avoid conflict with the protected areas and placement of structures and utilities during construction, where feasible.

10001.3 Site Preparation

DB Contractor shall assess and treat root collar and structural defects for Protected Trees, including carefully clearing/exposing buried root collars with an air spade or other tool that will avoid scraping or damaging roots, installing aeration pipes if needed, improving aeration to root zones, and installing Tree protection and mulch to prevent re-compaction of the aerated soils.

DB Contractor's Certified Arborist shall remove dead wood, dying limbs, and/or branches which may interfere with canopy clearance for Protected Trees.

DB Contractor shall take soil samples to determine pH and soil nutrient limitations. DB Contractor shall determine necessary soil augmentation to enhance growing conditions and shall implement appropriate soil augmentation measures during the appropriate season and throughout the Iconic Tree critical root zone. Humate/nutrient solutions with mychorrhizae components are highly recommended.

For all Iconic Trees, DB Contractor shall preserve a minimum of 50 percent of the critical root zone at natural grade, with natural ground cover. For one-half of the critical root zone radius distance of all Iconic Trees, DB Contractor shall not cut or fill greater than four inches and any excavation shall be performed with an air spade or hand tool. For all Iconic Trees, DB Contractor shall not cut or fill within one-quarter of the critical root zone radius distance.

10001.4 Tree Protection Fencing

Tree protection fencing shall consist of chain link mesh at a minimum of 5 feet in height with tubular steel support poles or "T" posts. Tree protection fencing shall be highly visible, sturdy, restrict entry, and have warning signs on or near it for the duration of any construction activities.

DB Contractor shall install Tree protection fencing around all Iconic Tree critical root zones, and Tree Preservation Areas in accordance with the Aesthetics and Landscaping Plan prior to the start of site preparation work and maintenance. DB Contractor shall install Tree protection fencing around all Committed Trees in accordance with the Aesthetics and Landscaping Plan prior to the start of site preparation work and maintenance and as required to reflect the Tree Preservation Plan or any update thereof. When Tree protection fencing cannot incorporate the entire Iconic Tree critical root zone, DB Contractor shall provide a 6 inch layer of organic mulch within the entire available critical root zone. Organic mulch shall consist of decomposing plant parts such as shells, hulls, bark, leaves, hardwoods and softwoods.

For Iconic Tree critical root zones that cannot be protected during construction with fencing and where heavy vehicular traffic is anticipated, DB Contractor shall cover those areas with a minimum of 12 inches of mulch to minimize soil compaction. DB Contractor shall utilize material such as alturnamats, plywood, and metal sheets to minimize root impacts from heavy equipment. Upon project completion, DB Contractor shall remove all materials and reduce the mulch to a depth of 3 inches.

DB Contractor shall prohibit these activities in the Tree protection fencing areas:

- Stockpiling of any type, including construction material, debris, soil and mulch;
- Altering soils, including grade changes, surface treatment, and compaction due to vehicle, equipment, and foot traffic;
- Trenching for utility installation or repair and irrigation system installation; and
- Attaching anything to an Iconic Tree or use of equipment that causes injury to an Iconic Tree.

DB Contractor shall not disturb Tree protection fencing during construction activities, except to install or remove fencing around Committed Trees as necessary to reflect the Tree Preservation Plan or any updates thereof.

10001.5 **Tree and Root Care**

DB Contractor shall prune Protected Trees in accordance with the most recent ANSI A300 pruning standard and in compliance with guidelines for prevention of oak wilt in Texas. DB Contractor shall not trim oak trees during the months of February, March, April, May, or June. Iconic Tree crowns shall have a maximum of 25 percent of the foliage removed from the Iconic Tree crowns within an annual growing season, and DB Contractor shall adjust the percentage and distribution of foliage to be removed according to the tree's species, age, health, and site.

DB Contractor shall avoid impacting roots when digging the road base or when relocating utilities, where feasible. DB Contractor shall minimize impacts to existing roots, if present, during removal of existing structures. DB Contractor's Certified Arborist may prescribe subsequent fertilization to facilitate root growth.

If roots of Protected Trees have been damaged and have to be cut, DB Contractor's Certified Arborist shall prune the roots by making a sharp cut and shall not tear the roots.

Prior to excavation within the driplines of any Protected Tree or to the removal of trees adjacent to a Protected Tree, DB Contractor's Certified Arborist shall make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage.

If roots of Protected Trees are exposed, DB Contractor shall rebury them as soon as possible or cover them with a layer of wet burlap covered with wet mulch to avoid desiccation.

Under the direction of DB Contractor's Certified Arborist, DB Contractor shall provide deep watering to Protected Trees of 3 inches per 30 days when rainfall is less than 1 inch per 30 days.

For areas treated for root collar or structural defects, DB Contractor shall complete soil aeration with an air spade, incorporating organic compost deep into soil with an air wand and top the compost with 3 to 4 inches of mulch. For full soil aerated areas, DB Contractor shall water drench the areas with the equivalent of 3 to 4 inches of water to remove air pockets in the freshly aerated soil and water so that the aerated soil receives the equivalent to 3 inches of water every 3 to 4 weeks for the remainder of the Project. DB Contractor shall fence soil aerated area until project completion to avoid further soil compaction.

DB Contractor shall replenish mulch yearly to provide a 3-inch depth layer.

10001.6 **Construction**

DB Contractor shall install and maintain erosion and sedimentation control barriers in a manner that does not result in soil build-up within Iconic Tree, Trees in the Tree Preservation Area, and Committed Tree driplines.

Except as set forth in the next sentence, DB Contractor shall not place underground structural elements or drain systems within 10 feet of an Iconic Tree critical root zone. For construction of the southbound William Cannon roadway, DB Contractor may not place underground structural elements or drain systems within the one-half critical root zone radius distance of the Niece Oaks.

For areas where pavement is currently located or proposed in the Iconic Tree critical root zone, DB Contractor shall consult with the DB Contractor's Certified Arborist, Environmental Compliance Manager, and TxDOT to determine the appropriate course of action based upon Final Design.

If grading within the Iconic Tree critical root zone cannot be avoided, DB Contractor shall perform grading by hand to minimize root damage.

For trails located within the Iconic Tree critical root zone, DB Contractor shall not excavate, dig, or trench the ground for trail construction and shall use sand to build up the trails above grade.

DB Contractor shall minimize impervious cover within the Iconic Tree critical root zone. DB Contractor shall install permanent irrigation to compensate for excessive impervious cover, where unavoidable. When installing concrete adjacent to an Iconic Tree critical root zone, DB Contractor shall use a plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.

10001.7 **Submittals**

All Submittals described in this Item 10,001 shall be in accordance with the schedule and for the purpose (approval, review and comment, for information) set forth on Table 10,001-1. Acceptable electronic formats include Microsoft Word, Microsoft Excel, or Adobe Acrobat files, unless otherwise indicated.

Table 10001-1: Submittals to TxDOT

Submittals	Submittal Schedule	TxDOT Action	Reference Section
Tree Preservation Plan	Prior to NTP2	Approval	10001.1
Update to Tree Preservation Plan	Prior to each tree clearing phase not identified in the Tree Preservation Plan	Approval	10001.1
Health assessment for all Trees	Prior to NTP2	Approval	10001.1
Update to health assessment of Iconic Trees	Annually until one year after Final Acceptance	Approval	10001.1

Item 10004

Next Generation Concrete Surface (NGCS) Grinding

10004.1 **General Requirements**

DB Contractor shall construct Next Generation Concrete Surface (NGCS) using diamond grinding and grooving techniques on all existing and new rigid pavement surfaces and remove resulting residue from the Project limits.

10004.2 **Equipment**

DB Contractor shall provide and utilize machinery, tools, and equipment necessary for execution of the work and utilize diamond grinding equipment that:

- Has diamond blades mounted on a self-propelled machine designed for grinding and texturing pavement;
- Weighs a minimum 35,000 lbs. (grinding head included);
- Has sufficient size to grind a strip at least four feet wide, and can produce overlapping match lines out of the wheel path;
- Will not cause ravels, aggregate fractures, spalls, or disturbance to the transverse or longitudinal joints; and
- Has a positive means of vacuuming the grinding residue from the pavement surface and will leave the pavement in a clean, near-dry conditions.

10004.3 **Construction**

DB Contractor shall perform and schedule construction operations to produce a neat, uniform finished surface. Auxiliary or ramp lane grinding shall be transitioned from the edge of the mainline as required to provide drainage and an acceptable riding surface. If required, DB Contractor shall complete pavement repair operations before performing any grinding. DB Contractor shall install joint sealing in a recessed condition subsequent to the diamond grinding operations.

10004.3.1 **Grinding**

DB Contractor shall perform grinding in a longitudinal direction beginning and ending at lines perpendicular to the pavement lane lines. The smoothness levels stated within this standard must be attained and measured to the satisfaction of the Engineer prior to constructing the second operation.

DB Contractor shall not overlap passes of the grinding head more than one inch. No unground surface area between passes will be permitted. Grinding shall be to a depth sufficient to remove the existing transverse tining, if necessary, but not exceeding 0.25 inches.

10004.3.2 **Two-Pass NGCS Operation**

The NGCS section shall be constructed in two separate operations. The first operation will create a flush ground surface. Blades that are used to flush grind shall be mounted onto a four-foot grinding head, stacked with 0.125-inch-wide blades separated by the 0.035 +/- 0.005-inch-wide spacers. Blades shall be flat across their contact surface and in the same plane with the other flush ground blades when mounted. DB Contractor shall ensure the complete head, when stacked with the blades, is straight across in length without bowing when mounted on the diamond grinding machine.

The second operation will provide the longitudinal grooves.

10004.3.3 **Final Surface Finish**

DB Contractor shall produce a pavement surface that is true to grade and uniform in appearance with a longitudinal grooved texture. The line-type texture shall be cut with corrugations that are:

- 0.125 inches wide,
- 0.125 inches to 0.1875 inches deep,
- Spaced on 0.5 inches to 0.625 inches centers; and
- Parallel to centerline.

DB Contractor shall use a guide to ensure proper alignment of the grooves to centerline and provide a flush ground surface that appears smooth and contains no ridges that exceed 0.03 inches. DB Contractor shall texture at least 98% of the pavement surface with both the flush ground and grooved surface.

10004.3.4 **Repairs**

DB Contractor shall clean and seal existing joints and perform repairs of all spalling if spalls are 0.25 – 3 inches in depth.

10004.3.5 **Smoothness Requirements**

DB Contractor shall generate the smoothness profile using inertial profile equipment on TxDOT's approved list of Inertial Profilers with equipment shown to have line lasers and provide operators from the approved list of Inertial Profile Operators.

Corrective action acceptable to TxDOT is required, at DB Contractor's sole expense, for any 0.1-mile section that measures an average IRI in excess of 50 inches per mile when measured in accordance with Tex-1001-S. Bumps exceeding 0.3 in. per 25 ft. will not be allowed in the finished ground surface.

If corrective action is required, DB Contractor shall subsequently re-profile the pavement section to ensure that corrections have achieved the required level of smoothness.

Depressed pavement areas due to subsidence or other localized causes are excluded from the smoothness requirements.

10004.3.6 **Slurry Removal**

DB Contractor shall remove and dispose of residue from the pavement surface in a manner to satisfy environmental regulations. Immediately and continuously, DB Contractor shall remove the slurry or residue resulting from the grinding operation and keep pavement in a washed clean condition, free of slipperiness from the slurry, etc. Residue flowing across shoulders or lanes occupied by traffic or into gutters or other drainage facilities will not be permitted.

10004.3.7 **Surface Treatment**

All new concrete pavement surfaces utilizing NGCS shall be surface treated in accordance with *TxDOT Standard Specification Item 428* as modified in Table 10,004-1 below.

Table 10,004-1: Penetrating Sealant Requirements

Test	Value
Water Absorption (Fed Spec SS-W-110C)	0.3%
Water Absorption Reduction (NCHRP 244, Series II)	72%
Water Penetration Reduction Under 'Wind Driven Rain' (ASTM E514)	89%
Chloride Intrusion Reduction (NCHRP 244, Series II)	76%
Accelerated Weathering Reduction in Soluble Chloride (NCHRP 244, Series IV)	90%

Note: Use Hydropel or similar material that meet the specification shown in table.