

October 23, 2019

John Espinoza, PE, CFM
City of San Marcos
630 E Hopkins
San Marcos, Texas 78666

**Re: Phase 1 Purgatory Creek Improvements (Johnson Avenue to San Marcos River)
Proposal for Professional Engineering Services, 30% Design**

Dear Mr. Espinoza:

LAN is pleased to present this proposal to provide professional engineering services through 30% design for the Phase 1 channel improvements of Purgatory Creek from Johnson Avenue to the San Marcos River. The attached scope of services includes a comprehensive task list and description for the data collection, design, permitting, and plans, specifications, and estimate development necessary to fulfill the requirements of the conceptual design as proposed in the Purgatory Creek Channel Improvement Project Preliminary Engineering Report delivered on March 15th, 2019. The budgets presented herein includes all LAN and subconsultant services necessary to complete the 30% design phase and expected permitting requirements for the project. The estimated project fee for 30% design is \$1.69M.

The scope for 30% design consists of project management; stakeholder input, city coordination and city review meetings; data collection; property requirements evaluation; design of the Purgatory channel improvements, improved creek crossings, trail and pedestrian connectivity improvements, and associated street and utility improvements; development of design deliverables for coordination with UPRR and TXDOT; and federal and state permitting activities.

Project management will include development of a project work plan, quality assurance/quality control plan, monthly status reports, performing monthly project administrative activities, and meeting with the city on a monthly basis to review project status.

The data collection effort includes design and boundary survey, a geotechnical investigation, a geomorphic assessment of the existing channel, environmental field assessments, a landscape and ecological assessment, a geologic assessment, and an archeological field survey.

Purgatory channel improvements will include natural channel design with pilot a channel for low flows and varying side slopes. At the San Marcos River, high flows will be diverted through a spillway providing a park amenity for river access. The natural channel will include pool complexes at strategic locations, invasive species management, tree protection, and selective native plantings to establish a stable, natural channel.

Improvements to the Purgatory Creek crossings from Johnson Avenue to the San Marcos River include bridge/culvert modifications or replacements at S. Mitchell Street, Jackman Street, Guadalupe Street (modifications only), S. LBJ Drive, and S. CM Allen Parkway crossings. A low water crossing modification will be incorporated at the Comal Street crossing to improve creek connectivity.

Street improvements include street modifications to tie-in the existing roadways with the vehicular bridge upgrades at S. Mitchell Street, Jackman Street, S. LBJ Drive, and S. CM Allen Parkway. Mill and overlay repairs are assumed for proposed utility improvements.



**Lockwood, Andrews
& Newnam, Inc.**

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Trail, sidewalk, and pedestrian connectivity improvements to be designed include a concrete pedestrian path extending from S. CM Allen Parkway to S. Mitchell Street, including a connection to Dunbar Park. The path will be designed to be pedestrian and bike friendly, will include access for maintenance vehicles along the trail, and is expected to be designed with trailheads at three (3) crossings. One pedestrian creek crossing between S. Mitchell Street and S. CM Allen Parkway is expected. Trail design will include wayfinding and illumination. Connectivity of the trail along the San Marcos River will be maintained with the installation of the spillway/outfall to include an ADA-compliant access point to the San Marcos River trail at Children's Park through the spillway. This may include a pedestrian bridge over the spillway or some other configuration allowing the continuity of the trail over the spillway.

Lastly, sidewalks will be replaced for the crossings at S. Mitchell Street, Jackman Street, and S. LBJ Drive on both sides of the crossing. Sidewalks on S. CM Allen Parkway will be added on the Children's Park side of the crossing. Sidewalks at S. CM Allen Parkway and S. LBJ Drive will extend further than the crossing and will be designed to an appropriate endpoint considering the roadway tie-ins for the crossing upgrades to bridge structures. Approximately 4000 LF of sidewalk is anticipated.

An estimated project schedule has been included herein including documentation of critical path tasks. The estimated duration for the 30% design is 11 months from notice to proceed.

A Statement of Qualifications document is attached that describes the project team and organization, subconsultant roles, provides project examples, and includes highlighted resumes for key individuals on the project team. Our subconsultant partners have been carefully selected to deliver this signature project for the City.

Thank you for the opportunity to be part of your team on this important project.

Sincerely,

A handwritten signature in black ink that reads "Jennifer L. Miller".

Jennifer L. Miller, PE
Project Manager

Attachments

- 1 - Scope of Services
- 2 - Fee Estimate
- 3 - Estimated Project Schedule
- 4 - Statement of Qualifications
- 5 - Subconsultant Proposals

CC: Laurie Moyer, PE – City Director of Engineering & CIP
Travis Michel, PE – LAN Project Principal

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PROJECT UNDERSTANDING

The work to be performed by Lockwood Andrews & Newnam, Inc. (LAN or the Consultant) under this contract will consist of providing Design Phase Services for the Purgatory Creek Phase 1 Improvements and a preliminary hydrologic and hydraulic analysis of Purgatory Creek Phase 2 channel and mitigation storage area.

Final construction documents will be developed for a flood conveyance channel that reduces existing flooding for Phase 1, approximately 5,200 linear feet along Purgatory Creek from Johnson Avenue to the San Marcos River within the City of San Marcos as described in Purgatory Creek Channel Improvement Project Preliminary Engineering Report (March 15th, 2019, herein referred to as "PER"). The Design Phase Services will consist of developing 30% design documents. Future authorizations will be required to prepare 60%, 90%, 99%, and 100% design documents. Ancillary improvements to be incorporated into the design of Phase 1 include two local drainage projects, utility relocations, and incorporation of a pedestrian trail that will run the length of the project.

The Phase 1 Purgatory Creek Improvement project consists of the following improvements:

1. Drainage improvements described in the City of San Marcos Drainage Master Plan for the following Purgatory Creek project options. (These improvements are part of the City's Capital Improvement Project # 679)
 - a. Drainage Master Plan Project # 6: Modification to the Jackman Street low water crossing over Purgatory Creek.
 - b. Drainage Master Plan Project #13: Modification to Children's Park low water crossing over Purgatory Creek (Comal Street).
 - c. Drainage Master Plan Project #14: Bridge upgrade at the South LBJ Drive crossing.
 - d. Drainage Master Plan Project # 15: Curb cuts along S. Mitchell Street and creek improvements due to the area being flat, large drainage area and lack of storm drain infrastructure.
 - e. Drainage Master Plan Project #25: Improvements to address flooding near the 300 block of S. LBJ Drive and Cheatham Street; local drain system currently has no outfall. Possible options include extending the storm drain pipe along S. LBJ Drive, constructing a drainage channel along railroad tracks, and or constructing a culvert under the railroad.
2. Purgatory Creek improvements:
 - a. Bridge/culvert modifications or replacements at: S. Mitchell Street, Jackman Street, Guadalupe Street (modifications only), S. LBJ Drive, and S. CM Allen Parkway.
 - b. Low water crossing modification at Comal Street to improve creek connectivity.
 - c. Channel improvements that include: Natural channel design elements with pilot channel for low flows and varying side slopes.
 - d. Channel spillway/outfall to San Marcos River: High flows will be diverted through a spillway into the San Marcos River providing a park amenity for river access.
 - e. Pool complexes at strategic locations, invasive species management, tree protection, and selective plantings along the channel to establish a stable, natural channel.

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3. Street improvements:
 - a. Street modifications to tie-in the existing roadways with the vehicular bridge upgrades at S. Mitchell Street, Jackman Street, S. LBJ Drive, and S. CM Allen Parkway.
 - b. Mill and overlay of street pavement impacted by the proposed improvements.
4. Trail, sidewalk, and pedestrian connectivity improvements:
 - a. A concrete pedestrian path will be designed extending from S. CM Allen Parkway to S. Mitchell Street, including a connection to Dunbar Park. The path will be designed to be pedestrian and bike friendly, will include access for maintenance vehicles along the trail, and is expected to be designed with trailheads at three (3) crossings. One pedestrian creek crossing between S. Mitchell Street and S. CM Allen Parkway is expected.
 - b. Trail design will include wayfinding and illumination.
 - c. Connectivity of the San Marcos River Pathway will be maintained with the installation of the spillway/outfall to include an ADA-compliant access point to the San Marcos River Pathway from Children's Park through the spillway. This may include a pedestrian bridge over the spillway or some other configuration allowing the continuity of the San Marcos River Pathway.
 - d. Sidewalks will be replaced for the crossings at S. Mitchell Street, Jackman Street, and S. LBJ Drive on both sides of the crossing. Sidewalks on S. CM Allen Parkway will be added on the Children's Park side of the crossing. Sidewalks at S. CM Allen Parkway and S. LBJ Drive will extend further than the crossing and will be designed to an appropriate endpoint considering the roadway tie-ins for the crossing upgrades to bridge structures. Approximately 4000 LF of sidewalk is anticipated.
 - e. Up to three hybrid beacon crossings will be designed for pedestrian connectivity of the trail at street crossings where the trail cannot be constructed underneath the vehicular bridges. Layout, plans, and profiles will be developed.
5. Utility Improvements:
 - a. Relocations or improvements for utilities that are in conflict with project improvements noted in items 1 through 4.

BASIC SCOPE OF SERVICES

Task A: Project Management – Project management is proposed for eleven (11) months in duration to account for the time period estimated for submittal of the 30% Design package. Project management for future design phases will be included in a future authorization.

1. Project Management and QA/QC: This task consists of effort associated with project administration, project planning, coordination with City staff, coordination and supervision of the project team including subconsultants, and quality management so that project milestones and deliverables meet schedule and budget constraints. A Project Work Plan, Project Schedule, and QA/QC Plan will be developed at the beginning of the project and refined throughout the project life as needed.
2. Monthly Project Status Meetings: The LAN project manager and necessary project team members will meet with the City project manager monthly to review status of the project.

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3. Kick-off Meetings: A kick-off meeting will occur with the City of San Marcos to initiate the project and discuss project expectations, communication, schedule, and any other administrative items necessary to initiate the project. LAN will also coordinate a project team kick-off meeting which will include all subcontractors.

Task A: Deliverables

Submittal Item:	Submittal Description:
Monthly Status Report	LAN will provide a monthly status report, including a brief summary of work completed and an updated project schedule. One Electronic copy, in PDF format of the documents.
Project Work Plan	LAN will develop a Project Work Plan to be utilized and refined throughout the project detailing scope, project schedule with milestones, project organization, communication plan, critical project elements, QA/QC, and document controls.
Project Schedule	LAN will develop a project schedule in Microsoft Project format showing baseline schedule and critical path tasks. The project schedule will be updated monthly and submitted with the monthly report/invoice package.
QA/QC Plan	A project specific QA/QC plan will be developed describing personnel and subconsultant team members to be included in QC activities including a Design Concept Review, Peer Reviews, and Detail Checks. This plan will outline QC processes and forms to use. The plan will be based on LANs QA/QC protocol.

Task B: Phase 1 Design

Task consists of development of final construction documents for the Phase 1 project area, approximately 5,200 linear feet along Purgatory Creek from Johnson Avenue to the San Marcos River in accordance with goals and design guidelines stipulated in the PER. Tasks include final design of ancillary improvements to be incorporated into the Phase 1 design including two local drainage projects, utility relocations, and incorporation of a multi-use trail that will run from S. Mitchell Street to S. CM Allen Parkway.

Task B.1: 30% Design

1. Meetings

- a. Stakeholder Input Meetings: Stakeholder input meetings will be necessary to refine goals for the improvements and obtain input on options and materials for the improvements. Meetings with the City as well as with outside organizations will be planned to gain consensus on project direction. LAN will review meeting agendas and minutes prepared by the City for each meeting. Expected meetings are as follows:
 - i. City Stakeholder Meeting: This meeting will be necessary to obtain input on natural channel design goals, vehicular and pedestrian bridge design, trail layout preferences, and other input for incorporation into 30% Design. At this

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- meeting, LAN will present a variety of concepts to the City to facilitate input both during and after the meeting.
- ii. **Advisory Committee Meeting:** One meeting will be planned during 30% Design with an advisory committee consisting of the River Foundation, The San Marcos Greenbelt Alliance, and Texas State University Meadows Center for Water and the Environment.
 - iii. **ADA Community Open House:** Preparation for and attendance at one ADA Community Open House meeting is planned to obtain input from citizens regarding trail design, park access points, pedestrian crossings, and the San Marcos River access area.
 - iv. **Public Meeting:** One (1) public meeting has been budgeted which consists of preparing exhibits and attending the meeting. The public meetings will include a presentation of the 30% Design deliverable.
- b. **Project Coordination Meetings:** Project coordination meetings will be held with City departments to address specific design elements. These meetings will focus on one aspect of the design and will include discussion of options and preferences. LAN will review meeting agendas and minutes prepared by the City. Expected meetings are as follows (these meetings can potentially be held sequentially on the same day if scheduling allows):
- i. **Utility Coordination:** One (1) utility coordination meeting will be held during the 30% Design Phase. LAN will attend meetings with City of San Marcos Staff to determine project constraints and needs as well as discuss design considerations.
 - ii. **Habitat Conservation:** One (1) planning meeting will be held with the City's Habitat Conservation Plan Manager, Urban Forester, and associate staff to discuss natural channel design options and wetland restoration. This meeting will include detailed review of design considerations for bank stabilization methods, grow zone characteristics, wetland restoration/preservation areas, invasive species management, project tie-in to the San Marcos River, and the environmental mitigation plans required as part of the USACE permitting process. This meeting will be held after 30% design.
 - iii. **Parks Department:** One (1) planning meeting to discuss trail layout and design, wayfinding, placemaking, and trail safety with the City's Parks Department and any other City stakeholders. This meeting will be held after 30% design.
 - iv. **CPTED:** One (1) meeting has been budgeted to discuss Crime Prevention Through Environmental Design (CPTED) with the City Planning Department with regard to trail connectivity planning. This meeting will be held after 30% design. It may be possible to combine the meeting with the Parks Department and the Planning Department for CPTED.

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- c. Project Review Meeting: One meeting will be attended to review City comments on the 30% Design and review how the comments will be addressed moving into 60% Design Phase. During these meetings, LAN will present the current status of the design to the City of San Marcos staff to answer any questions and obtain stakeholder input for the next design phase. LAN will review meeting agendas and minutes prepared by the City.

2. Data Collection

a. Survey

- i. Right-of-Entry Determination: Research will be performed to determine ownership of all landowners where access will be needed to perform the required survey services including geotechnical drilling, archaeological trenching, and environmental surveying. If access is denied, the City will be notified to obtain access to the properties.
- ii. Areas to be surveyed:
 - a. Purgatory Creek Topographic and Tree Survey (includes area for Drainage Master Plan Project #13) : Area to be surveyed shown in Exhibit A.
 - b. Drainage Master Plan Project #15 Survey: Area to be surveyed shown in Exhibits B-1 and B-2.
 - c. Drainage Master Plan Project #25 Survey: Area to be surveyed shown in Exhibits B-1 and B-3.
- iii. Perform GPS survey to establish horizontal and vertical control based on Texas State Plane, Central Zone NAD 83 (2011) and NAVD 88. Provide benchmarks along project corridor and sufficient horizontal control for use as construction baseline.
- iv. Locate by actual on-the-ground survey visible and accessible on-grade and above-grade features, including but not limited to pavement marking, edge of pavement, curbs, gutters, driveways, ramps, sidewalks, signs, fences, utility valves, water meters, manholes, hydrants, clean-outs, inlets, utility poles, guy anchors, overhead lines and other surface utility features. LAN will coordinate with One Call to identify utilities within the project area and within the right-of-way boundaries.
- v. Surveys of trees will consider the following:
 - a. Prior to conducting surveys of trees, coordinate with City staff to identify which trees will be surveyed.
 - b. For trees considered as “stand alone” and having a tree diameter of 9-inches (9”) or greater, identify the tree location, measure the diameter and tag the tree.
 - c. For trees located in groups, identify the area and not each individuals tree.
- vi. Provide contours at one-foot interval. Elevations will be taken on an approximate 50’x 50’ grid, at abrupt changes in grade and along drainage courses. Elevations of survey points will be on a separate layer and will not be part of the final plotted drawing.

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- vii. Provide spot elevations at top of accessible manhole and valve box covers. Provide invert elevation of manholes and elevation and size of pipes entering or exiting manholes of accessible sewer and storm drain structures. Provide top elevation of valve nut of accessible valves on main lines.
- viii. Locate sufficient boundary monumentation, obtain and review available tax plats, subdivision plats, property deeds (for unplatted tracts) identified from Hays Central Appraisal District records and show approximate location of boundary/ROW lines. Show owner name, book and page information, subdivision name, lot and block number, HCAD parcel number, easements adjoining survey area as shown on subdivision plats and physical address of each tract within or adjoining project limits. This item shall be limited to areas within existing easements.
- ix. Field locate proposed geotechnical bore holes (26) along project corridor.
- x. Provide drawing showing data outlined above on 11" x 17" sheet size at a scale of 1" = 40' horizontal and 1" = 10' vertical as an AutoCAD Civil3D file utilizing the National Cad Standard (NCS).
- xi. Provide field notes from survey activities.
- xii. Boundary Survey: Perform boundary survey for 42 parcels identified in the PER for easement or property acquisition. Locate sufficient boundary monumentation, obtain and review available tax plats, subdivision plats, property deeds (for unplatted tracts) identified from Hays Central Appraisal District records and show approximate location of boundary/ROW lines. Show owner name, book and page information, subdivision name, lot and block number, HCAD parcel number, easements adjoining survey area as shown on subdivision plats and physical address of each tract within or adjoining project limits. This item shall be limited to areas within existing easements. The fees associated with the boundary survey of these lots is based on their location which is in a much older part of the City where monumentation is scarce. It is very likely that monumentation will need to be recovered that is well outside the blocks of the lots.

b. Geomorphic Assessment

- i. Desktop Data Analysis:
 - a. Stream dynamics: Review of historical aerals and topography will be completed to assess the dynamics of the Phase 1 channel. Meanderbelts will be delineated to identify where the stream is more likely to migrate laterally over time. Observations on meanderbelts, sinuosity, migration patterns, cut through channels, relic thalweg development over time will be utilized in final design to define key points of armoring/stabilization needed to prevent future movement of the stabilized stream.
 - b. Geomorphic Like Reaches: Review of aerals, topography, and HEC-RAS model data will be performed to estimate number of Purgatory Channel Geomorphic Like Reaches in the Phase 1 project limits. Geomorphic Like Reaches (GLR) are stream segments that exhibit

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similar geomorphic characteristics including pool/riffle/run sequences and pilot channel geometry. Desktop estimates will be confirmed during field reconnaissance. Defining the pre-project geomorphic characteristics will provide a baseline for the 30% pilot channel design.

- ii. Field Reconnaissance: Pre-project stream-channel stability will be defined based desktop data analysis and visual inspection. Locations of existing instability and erosion will indicate areas within the project area that may warrant armoring and or grade control structures to be incorporated into the natural channel design.
 - a. Digital Photography: Photos will be collected of geomorphic features including headcuts, knickpoints, erosion sites, hydraulic structures, roadway crossings, utility crossings, and sediment sampling sites.
 - b. Geomorphic Reach Characterization:
 - 1. Start and end points of GLRs will be digitally logged with waypoints.
 - 2. Qualitative cross-sections will be logged at a representative point in the reach. Details will include cross section geometry, flow type, bed controls, bed sediment classification, vegetation, erosion and geotechnical failures (if applicable), and bank debris.
 - 3. Rapid Geomorphic Assessment (RGA): Once the geomorphic reach is inspected in its entirety, an RGA will be performed to document evidence of aggradation, degradation, widening, and planimetric form adjustment. Together, these characteristics will be presented as a Stability Index for the reach.
 - c. Erosion Site Assessments: Observed erosion that threatens existing structures and utilities will be documented including erosion damage length, bank height, bank side slopes, bank material, and bed composition.
 - d. Sediment Source Assessment: The City has field reports of heavy sediment loading on the environmentally sensitive San Marcos River, receiving stream for Purgatory Channel runoff. Urban silt is one potential source of sediment loading. The following investigation will be performed to identify the source of the sediments:
 - 1. Inspect the pre-project stream channel for erosion sites for both Phase 1 and Phase 2 project limits.
 - 2. Observe the discharge at up to 8 storm drain outfalls during two storm events to assess if any of the outfalls is the source of the heavy sediment load.

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3. Observe the discharge at the SCS reservoir during two storm events to assess if it may be the source of the heavy sediment load.
 4. Perform a windshield survey of the storm drain drainage area to identify potential sources of heavy sediment loads, e.g., construction sites.
 5. If it is determined that the source of the heavy sediment load is the existing channel itself, then proposed improvements to the channel will address the problem; otherwise, if desired by the City, LAN will propose additional scope to address the heavy sediment load based on potential sources identified in the above investigation.
- e. Sediment Sampling: Depending on the bed material type, up to two (2) sediment samples will be collected per GLR. Sediment sampling will consist of Wolman pebble counts and/or bulk bed samples for sieve analysis. It is estimated that no more than three (3) sieve analysis will be needed to complete this assessment.

c. Landscape Assessment

- i. Site Assessment: The project site and its context will be assessed to define local ecology and culture so that site appropriate sustainable design and maintenance decisions can be made. Field observations will document upland ecological health, opportunities for connectivity with the surrounding ecological region, opportunities to combine educational, experiential and stormwater management goals, and opportunities to enhance vegetative community resilience in all areas. Reference sites and adjoining natural and landscaped areas that will influence the project or that could serve as resources for design will be identified. Reference sites and upstream areas will be visited with the goal of ascertaining current ecological health, identification of opportunities for, and constraints to, protecting and enhancing the ecological health of the site and enhancing connectivity with surrounding area.
 - a. Project Site:
 1. Identification of Level III Ecological Region and NRCS Ecological Sites.
 2. Assessment of the bank vegetative communities' placement within expected community dynamics as informed by the ecological sites and reference sites.
 3. Location of significant vegetation patches that can be incorporated into site design including: special status vegetation, blocks of habitat and corridors or connections between habitat patches, species of particular utility for riparian function, pollinator and avian habitat, in-stream habitat, post-construction recovery, and human engagement.

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4. Identification of invasive species of particular concern for development, off-site sources, conditions that encourage spread, and relationship of invasive to valuable species.
5. Evaluation of current and historic land management.
6. Assessment of site context for sources of contamination and possible ecological and social connections.
- b. Reference and Adjacent Sites:
 1. Identify appropriate vegetative and soil targets for the project site that support stormwater management, ecological and human engagement goals.
 2. Assess offsite wildlife habitat and potential for connectivity with project site, particularly pollinator habitat.
- ii. Soils Assessment: Investigation of existing soils will be performed to analyze agronomic suitability of the existing soils and organize the information in a format that facilitates its use during the project development phase. The intent is to provide recommendations on soil management planning and protection that will be used to adjust drainage characteristics, improve soil structure, add organic matter, mitigate compaction and manage irrigation demand. See "Soils Design" within the Landscape and Illumination Design section for more information on the necessity of restoring the channel with properly amended soils.
 - a. On-site Investigation and Soil Sampling: Assess and analyze existing site soils for agronomic performance and irrigation management technologies. Surface soil samples and a split of selected soil boring samples will be collected for laboratory analysis.
 - b. Soils Testing: Determine an existing agronomic soil testing approach and methodology including:
 1. Particle Size Analysis
 2. Uniformity Coefficient, D15, D50, D85
 3. Saturated Hydraulic Conductivity (K-sat)
 4. Bulk Density
 5. Compost: Organic Amendment Evaluation
 6. Procter with Infiltration Rates
 7. Nutrient & Salinity Diagnostic Test
 8. Soil Microbial Community Analysis
 - c. Soils Assessment Report: Prepare inventory and summary of laboratory test results. Develop a collection of overlay maps depicting the location, patterns and relationships of natural soil features and agronomic suitability. Review and comment on the geotechnical and environmental soil reports. Evaluate potential soil system profiles including amending native soils for each specified plant species and associated soils map for the project site including a narrative of each soil type and technical specifications for each soil type design. Prepare a report summary that identifies natural soil

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systems including estimates of agronomic health and soil management approach. Define (as needed) soil amendments for soil types and current condition.

d. Provide presentation of findings to team and City.

d. Geotechnical Investigation: A geotechnical investigation will be performed including field, laboratory and engineering phases. The investigation will be completed at the beginning of the project to include information from the geotechnical report in the 30% design. Services provided include the following:

- i. Borings: Up to 26 borings with total drilling footage up to 1,230 ft will be performed as listed below (expected boring locations shown in Exhibit C):
 - a. Two (2) borings will be obtained at each of the four (4) proposed vehicular bridge locations.
 - b. Up to two (2) borings each will be obtained at the two (2) proposed pedestrian bridges locations.
 - c. Up to two (2) borings each will be obtained total at the five (5) proposed retaining wall locations.
 - d. Up to three (3) borings will be obtained within the channel.
 - e. One (1) boring will be obtained at the proposed spillway outfall.
 - f. Laboratory soil analyses will be completed on all borings and soil samples. Analyses conducted will depend on the types of soils encountered in the field.
- ii. Bulk Bed Samples: Up to three (3) sieve analysis of bulk bed samples will be analyzed for grain size to support the sediment transport analysis.
- iii. Geotechnical Engineering Report: Report will be developed detailing the field and laboratory analyses and providing recommendations for bridge/bridge class culvert foundations, retaining walls, and slope configurations. In particular the report will contain the following information:
 - a. General subsurface conditions, including boring logs with descriptions of strata, summaries of laboratory test results, and water levels obtained at the time of drilling;
 - b. Boring location plan;
 - c. Soil boring logs with detailed descriptions and soil classifications based on the Unified Soil Classification System (ASTM D 2487);
 - d. Discussion of area geology, and subsurface information including stratigraphy and generalized subsurface conditions;
 - e. Depth to groundwater, if encountered, and comments regarding potential impact on construction;
 - f. Recommended foundation design for bridges and culverts including type, allowable bearing, and associated settlement;
 - g. Recommendations for below grade walls including equivalent fluid pressures, sliding coefficient, and provisions for drainage;
 - h. Global stability analysis for retaining walls taller than 6 ft, including sliding and overturning;

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- i. Slope stability analyses for 3 types of channel cross-sections with varying side slope configurations;
 - j. Support of scour and erosion analysis by others, including grainsize size analyses, recommended D50, and soil erosion characteristics;
 - k. General earthwork comments and excavation potential; and general construction recommendations.
- e. Environmental Investigation: A biologic assessment, geologic assessment, and stream and wetland functional assessment will be performed. Details of these assessments are provided below.
 - i. Biologic Assessment: Issuance of a Section 404 Permit by the USACE for this project constitutes a federal action that may affect one or more endangered or threatened species listed by the ESA. Section 7 of the ESA requires that the USACE consult with the USFWS to determine potential impacts and identify associated mitigation measures for the potentially impacted species. To complete this consultation, a Biological Assessment (BA) report will be prepared for the USFWS as supporting documentation for a Biological Opinion (BO) issued by the USFWS that confirms the extent of impacts and lists required mitigation measures. The biologic assessment includes the following work:
 - a. Pre-field Ecological Investigations and Coordination:
 - 1. Coordination will be initiated with the USFWS, TPWD, and any other relevant entities. If agency meetings are necessary to be conducted in person, they will be scheduled for the same time that the field visit is conducted, if feasible.
 - 2. Reports will be obtained as well as data related to available ecological investigations pertaining to threatened and endangered species previously conducted in the project vicinity.
 - 3. Shapefiles will be obtained showing existing and proposed channel features and reasonable alternatives to be assessed.
 - 4. A request will be made to the TPWD Texas Natural Diversity Database (TXNDD) for any recorded sensitive species element occurrences for a search area that will include the watersheds of Purgatory Creek and the San Marcos River. This information will be portrayed on GIS-produced maps.
 - b. Ecological Field Reconnaissance: Field assessments and investigations will be conducted to assess the impact of all project alternatives on the ecological setting, vegetation, wildlife, and threatened and endangered species.
 - 1. Vegetation (species and physiognomy) will be listed, described and mapped in the field.

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2. Wildlife observed will be noted and the presence of any rare and/or listed species documented.
- c. BA report preparation. A BA report will be prepared including the following tasks:
 1. Summarize investigations performed to date for projects in the vicinity;
 2. Incorporate data acquired from USFWS and TPWD regarding rare and listed species, known habitat on refuge lands, refuge boundary shape files, etc.;
 3. Acquire, describe, and map soils and geology data for ecological context;
 4. Perform regional and site-specific habitat assessment for listed plant species;
 5. Perform regional and site-specific habitat assessments for listed invertebrate, insect, and mollusk species as applicable;
 6. Perform regional and site-specific habitat assessment for listed fish species;
 7. Perform regional and site-specific habitat assessment for listed reptile and amphibian species;
 8. Perform regional and site-specific habitat assessment for endangered avian species;
 9. Perform regional and site-specific habitat assessment for endangered mammal species;
 10. Analyze data acquired; quantify direct, indirect and cumulative impacts (effects); analyze avoidance, minimization and mitigation strategies as appropriate, and include results in a BA for submission to and approval by the USFWS;
 11. Address comments, prepare comment response matrices (assume one round per agency), and submit final BA; and
 12. Assist USFWS in drafting BO, if necessary.
- ii. WOTUS Review: A review of the previously completed preliminary jurisdictional determination (PJD) of WOTUS will be conducted. This will include desktop review of forms, maps, photos, and any other pertinent documentation. A field investigation will be conducted to ground truth the preliminary delineation and determine if the wetland plots and Stream Assessment Reaches (SARS) are adequate. Any inconsistencies will be corrected in the field and any changes in boundaries of WOTUS will be recorded using hand-held GPS instrumentation with sub-meter accuracy.
- iii. Stream and Wetland Functional Assessment: As a part of field investigations, an assessment of stream and wetland ecological function will be conducted using the USACE Texas Rapid Assessment Method (TXRAM). Information collected from this assessment will be used to determine compensatory mitigation requirements for any wetland or stream impacts.

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f. Archeological Investigation:

i. National Historic Preservation Act Compliance:

- a. Historic Resources Survey: Much of the Phase 1 project area is within an area recently surveyed as part of a large-scale historic resources survey for the City of San Marcos Department of Planning and Development Services and the THC. The final report was adopted by the San Marcos City Council and approved by the Texas Historical Commission in September 2019. The previous survey data will be utilized as the basis for standing structures in the historic resources survey for Phase 1.

1. Conduct a reconnaissance-level field survey of historic resources within the APE determined by the USACE and THC. It is anticipated that the APE, at a minimum, will include all parcels immediately adjacent to the proposed project area.
2. All historic-age resources (45 years of age or older) within the APE will be photo-documented from the public right of way and evaluated for potential NRHP eligibility based on integrity and significance.
3. For parcels not visible from the public right of way, right of entry will be coordinated to the extent possible.
4. For resources that are recommended NRHP eligible, an assessment of project effects to the resources will be provided.

- b. Historic Resources Survey Report: A historic resources survey report documenting the findings of the reconnaissance field survey. The report will include background research; previously documented and designated historic resources; an historic context statement; and NRHP eligibility recommendations, assessment of effects, and photographs and survey forms for all inventoried resources. A draft and final report will be provided to the USACE and the THC for review and concurrence.

- ii. Antiquities Code of Texas Compliance: As the proposed construction will occur on public lands owned or administered by the City of San Marcos (a political subdivision of the State of Texas) the project is subject to the terms of the ACT. This legislation requires political subdivisions of the state to consider the effects a proposed project will have on historical and archeological resources on public land.

In November 2018, on behalf of the City of San Marcos, archeologists from AmaTerra Environmental, Inc. (AmaTerra) conducted an intensive cultural resources survey of proposed Phase 1 channel improvements under Texas Antiquities Permit No. 8609. Fieldwork included a pedestrian survey, systematic shovel testing, and backhoe trenching. Archeologists excavated 45 shovel tests and nine backhoe trenches across accessible portions of the 26.5-acre study area; right of entry was not obtained for the entire proposed

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project. As a result of field investigations, AmaTerra archeologists revisited one previously recorded prehistoric site (41HY135) and discovered three historic-period sites (41HY551, 41HY552, and 41HY553) (Butler 2018). Sites 41HY551 and 41HY552 were recommended as not eligible for listing to the NRHP or as a SAL, and no additional work was recommended. Site 41HY553 was recommended as having undetermined eligibility and should be avoided by the planned project or additional investigations would be necessary. AmaTerra archeologists did not find any trace of site 41HY135; however, because the site is listed as a contributing element in the San Marcos River SAL group, it was recommended that archeological monitoring during construction at 41HY135 was warranted.

Based on the results of the AmaTerra survey, it is anticipated that THC will request the following tasks:

- a. **THC Coordination:** A teleconference will be held with the THC to provide initial project coordination, discuss any specific agency concerns, and determine the appropriate level of effort required for the field investigations considering previous investigations, in conjunction with guidance from the USACE. Information from this teleconference will also guide the development of the Area of Potential Effect and scope for archeological investigations. On-going coordination will be held (i.e., additional teleconferences and letters) with the THC as necessary (i.e., discuss new and/or unexpected findings) to facilitate the successful completion of the project.
- b. **Desktop Archeological Literature and Records Review:** Search site files, records, and maps from the Texas Archeological Research Laboratory (TARL) and the THC, available on the THC's online Texas Archeological Sites Atlas and Historic Sites Atlas. The review will search the database for all previously recorded archeological surveys and prehistoric and historic sites located in or near the project area. Other resources to be reviewed in the database include properties listed in the NRHP, SALs, RTHLs, cemeteries, OTHMs, and historical maps to trace the development of the project area and help provide temporal data for historical archeological resources encountered during survey efforts.
- c. **Texas Antiquities Permit Application and Scope of Work:** An appropriate scope of work and a Texas Antiquities Permit (which authorizes archeological investigations on public land) application for submittal to THC for review. The scope of work will reflect the results of the coordination with the THC (and USACE), as well as include the results of the archeological resources background review, maps clearly depicting the project area, and any recommended areas of concern or recommendations made by previous investigations for additional work at known archeological sites. Additionally, the scope of work will discuss the environmental

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setting of the project, as it relates to the potential to discover intact archeological resources and provide recommendations on the appropriate level of effort and methods for survey investigations based on the results of the background study and environmental factors.

- d. Archeological Field Investigations: Surface investigations will involve an examination of the ground surface and any erosional exposures for evidence of archeological materials and cultural features. Subsurface investigations will involve the excavation of shovel tests to sample shallow (less than one meter deep) soils and backhoe trenches to test deep soils for deeply buried archeological materials. All newly discovered and revisited sites will be explored as much as possible with consideration to project limits. The sites will be assessed for significance so that recommendations can be made for proper management, such as avoidance or additional work. A Texas Archeological Site Data Form will be completed for all newly discovered archeological sites, as well as an updated Texas Archeological Site Data Form for revisited sites to supplement the existing site data originally recorded by AmaTerra. A detailed plan map of the sites will be produced, and their location will be plotted on U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps and relevant project maps. In addition, if potential historical buildings and/or standing structures are located within or immediately adjacent to the current project, such areas will be shovel tested as if an archeological site.
- e. Archeological Report: Upon completion of the archeological survey, a draft report of investigations will be provided for review by the City. The draft report will conform to the Council of Texas Archeologists and THC standards. The report will include the results of the background review and field survey. Specifically, the report will provide the methodology used in the investigations, the presence and condition of previously recorded sites located in and around the project area, a description of archeological/cultural resources encountered during the survey, recommendations for management of those cultural resources, and recommendations for additional investigations, if warranted.

g. Geologic Assessment:

- i. Pre-field Geologic Research: Published reports and maps of the area geology will be reviewed prior to performing the geologic assessment field survey. Aerial photography will also be examined for the presence of structural features that may require field verification. In addition, a literature and internet review will be conducted for the presence of documented caves or other karst features on or near the property and a formal request will be submitted to the Texas Speleological Survey (TSS) for a review of the TSS

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database for the existence of any known caves or karst features that may occur within or adjacent to the project area.

- ii. **Geologic Assessment Field Survey:** A geologic field assessment will be performed of the project area (45 acres in area and one mile in length and includes Dunbar Park and Children's Park) using the methods outlined in the TCEQ Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zones (TCEQ-0585-Instructions, Rev. 10-01-04). Field activities will focus on a survey of the ground surface for the presence of geologic and manmade features. The site will be surveyed on foot by walking the entire site on 50-foot spaced transects. The assessment will include the project area and approximately 50 feet beyond the estimated project boundary. Exploration of features identified during the assessment will be limited to probing and minor hand clearing or excavation as needed for proper classification and evaluation of each feature.
Geologic and manmade features identified during the survey will be evaluated in the field by our qualified project geologist licensed in the State of Texas. Features will be evaluated for sensitivity (i.e., the potential for hydraulic interconnectedness between the surface and the Edwards Aquifer), and the potential for rapid infiltration to the subsurface. Adequate information about the features identified in the field, and any features identified during pre-field research, will be collected so that appropriate Best Management Practices (BMPs) can be designed to protect the features.
- iii. **Geologic Assessment Report:** Data evaluation and report production. The geologic assessment will be documented in accordance with the TCEQ's Instructions to Geologists which will include a narrative description of site geology, a soils description, geologic site map, a soils map, a geologic assessment table, a stratigraphic column, and site photographs. The geologic assessment report will be signed and sealed by our project geologist. The geologic assessment will be summarized in the overall report and provided as an attachment.

- 3. **Project Funding Evaluation and Coordination:** LAN will attend up to two (2) meetings alongside the City in pursuit of securing funding partners for the project. Funding partners to be evaluated by the City may include: FEMA, EPA, TWDB, and TPWS. LAN will prepare documents to support the discussion to include exhibits and summary text highlighting key aspects of the project in terms of quantified flood risk reduction measures, ecological merit, and trail connectivity.
- 4. **Purgatory Creek Natural Channel Design**
 - a. Schematic Design: PER concept plan will be reassessed, integrating ecological and interpretive goals. Measurable performance benchmarks will be determined.
 - b. Natural Channel Design Workshop: A site visit to San Antonio River Mission Reach project will be coordinated by the City will be attended by LAN and appropriate subconsultants. A total of one day for four people has been included in the associated fee. Mission Reach is an exemplary project for natural channel design

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and holistic flood mitigation and linear park improvements. Completed in 2011, provides an example of an established natural channel solution for flood mitigation channel conveyance. Workshop to be attended by SARA representatives, LAN design team and select subconsultants and City stakeholders. Three specific locations of the project will be visited to see examples of natural channel design, channel stabilization, and pedestrian integration. The visit will provide an opportunity to hold a dialog with City stakeholders concerning preferences and goals for final design esthetic including material preference, trail orientation, and long-term maintenance management. SARA representative can provide lessons learned, summary of maintenance challenges, and expected and unexpected benefits brought about by the project.

- c. Initial Pilot Channel Design: Based on the geomorphic assessment, LAN will define pre-project GLR extent and characteristics including slope, sinuosity, cross section geometry and pool/riffle/run sequences. Considering pre-project conditions, post-project GLR extents will be assigned utilizing the PER planimetric layout and hydraulic modeling. Initial post-project pilot channel planimetrics will be defined including depth, width, side slope, meander, and pool/riffle/run sequences (incorporating planned utility and pedestrian crossings). Pool locations to conform with planned aquatic sites.
- d. Purgatory Creek Sediment Transport Analysis: LAN will assess existing versus design relationships of bankfull shear stress, velocity, and stream power versus stage and discharge along Purgatory Creek to ensure that the pilot channel design transports appropriate particles sizes at bankfull discharge. For the purpose of quantifying this effort, it is assumed the Phase 1 project area will be made up of two (2) geomorphic like reaches.
 - i. Existing Conditions: Using data logged in the geomorphic assessment field reconnaissance, a quantitative analysis of channel stability, including reach-averaged bankfull hydraulic parameters, incipient motion shear stress, incipient motion discharge, and bankfull excess shear stress will be calculated. Sediment transport calculations will be performed using SAMwin. Outcome of this analysis will be identification of sediment Production, Transport, and Deposition Zones within the pre-project stream.
 - ii. Proposed Conditions: Using the initial pilot channel design and SAMwin post-project shear stress, velocity, and stream power versus stage of discharge will be calculated and compared to pre-project conditions.
 - iii. Pilot Channel and In-stream Structures Design: Pilot channel geometry and in-stream structures will be refined in two (2) iterations to ensure the resultant geometry achieves a sediment balance throughout the project limits.
- e. Channel Plans and Profiles: Natural channel design plans and profiles will be developed in accordance with the following project goals:
 - i. The channel will conform to the hydraulic goals stated in the PER;
 - ii. The channel will have an integrated plan that functions on multiple levels enhancing the site's ecological performance and efficiency, while adhering to the main goals of hydrologic and hydraulic function;

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- iii. Fully vegetated overbank areas;
 - iv. Bank stabilization methods will be defined based on calculated shear stresses;
 - v. Toe protection alternatives will be discussed with City staff prior to developing typical cross sections;
 - vi. Complex channel cross-section (benched) and stream profile (riffle, run, pool) to mimic a natural channel, with portions of overbank area being inundated frequently (flood benching);
 - vii. Pilot channel sinuosity;
 - viii. Maximum use of on-site materials and optimization of inherent channel characteristics;
 - ix. Minimal armoring and grade control, except where necessary.
5. Landscape and Illumination Design: Design will incorporate recommendations and guidance from the City of San Marcos Open Spaces Master Plan. LID design principles, CPTED principles, and best practices in Universal Access will be incorporated into the project where feasible. Hardscape layout and details, landscape design, placemaking and wayfinding elements, site furnishing, and exterior landscape lighting shall be provided in the following project areas:
- Landscape areas along both banks of length of channel and pilot channel, including the multi-use trail,
 - Landscape layout and details within channel and pilot channel area,
 - Key habitat "pool" areas,
 - Creek edge along Children's Park and spillway location, and
 - Bridge connections
- a. Landscape Layout: Hardscape layout will be developed. Tree layout sheets will be prepared.
 - b. Restoration Plan: A site restoration plan will be developed to correspond with performance goals and construction sequencing. This plan will incorporate the Vegetation Restoration plan developed for USACE 404 permitting, but will also incorporate upland areas, modification of strategies and targets as appropriate to the construction phase, and will include concepts of site hygiene intended to reduce the spread and establishment of invasive species during and immediately after construction when the site is particularly vulnerable.
 - i. Identify opportunities for education and landscape monitoring.
 - ii. Opportunities for upland (e.g. amenities that also function as bioswales and raingardens) and in-channel ecosystem services (e.g. bank communities that provide stability as well as in-stream shade and organic matter). Integration of green infrastructure, wildland riparian restoration techniques and educational strategies.
 - iii. Assign typologies to streambank and stream health restoration and stabilization
 - iv. Assign typologies of top of bank run-off management opportunities.
 - v. Assign typologies to streambank and stream health restoration and stabilization.

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- vi. Assign typologies of opportunities to modify stormwater outfalls to align with public trail access program.
 - vii. Assist and review plant palette of sustainable features and plant communities for site conditions and required function.
 - viii. Develop seed/plug mixes with application rates and density for restoration areas.
 - ix. Provide restoration plan technical memorandum with illustrative documentation.
- c. Soils Design: Soil design is the foundation of the channel restoration plan. Properly amended soils are necessary due to pressures exerted upon existing soils by invasive species; amendments will help alleviate environmental stressors on the developing native vegetation allowing for faster development of dense communities in turn providing quicker establishment of the vegetation which will ultimately stabilize the channel. Plant community evolution and species composition is driven by symbiotic relationships between soil microbes and plants. If the soils aren't designed to ensure the presence of beneficial fungi and protozoa over time, the species composition will trend towards pioneer plant species and prevent the emergence of later successional perennial species. The analysis for soils design will include determining the suitability of using amended in-situ soils for the vegetation which if feasible would provide cost savings during construction. If the analysis shows that bringing in outside soils is desirable, the soils design will determine necessary amendments. Soil amendments are necessary to create a biological environment that promotes establishment of native riparian vegetation (for either in-situ or outside sourced soils). Locally sourced topsoil without amendments is a sterile environment where invasive species can thrive and quickly create unwanted dense communities. This harms the ability of the native species to thrive and results in more maintenance to remove unwanted species and develop the desired communities. Plant communities also affect water quality, as well as, create optimal habitat for larger food webs that contribute to the health and sustainability of endangered species such as the fountain darter. It is important for the design team to understand that the creation of sustained, successful habitat will only occur if the channel design is based on measures of function rather than measures of structure. Structure, or patterns of an ecosystem, describes the various physical and biological parts of that ecosystem, whereas function includes the interactions of organisms with one another and with their physical environment. Soils design is integral for the function of the native riparian ecosystem; it is imperative that this restoration effort start with a soils plan to ensure success. Work to be performed includes:
- i. Evaluate engineered and native soil characteristics related to plant community strategies and project needs.
 - ii. Soil Management Plan: Prepare soil management plan with profile design information with details. Evaluate native soil amendment options and possible imported soils. Provide cost analysis of soil amendment options. Plan to include:
 - a. Topsoil and agronomic subsoil types and areas to be stripped.

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- b. Methods for stripping, stockpiling, re-spreading and improving the soils.
 - c. Agronomic soil haul routes.
 - d. Location and content of each soil stockpile.
 - e. Schedules of volumes for each agronomic material.
 - f. Expected after-use for each harvested material.
 - g. Site sustainability methods and practices including vegetative slope stabilization material and products.
 - d. Illumination Design: A basis for the electrical design of the lighting components will be developed for light fixtures to illuminate the multi-use trail. Feasibility for using solar power for illumination will be evaluated.
6. Purgatory Channel Flood Mitigation Design: This task consists of performing hydrologic and hydraulic modeling calculations in support of the final design of the proposed Phase 1 reach (Johnson Avenue to San Marcos River). Goals of the flood mitigation design include reduction of flood risk to habitable structures while also enhancing water quality through the use of natural channel design to include: strategically preserving and enhancing natural areas, establishing grow zones, promoting infiltration through the use of flood benching, and the use of native landscaping. The PER hydrologic and hydraulic model will serve as the basis for this analysis.
- a. NOAA Atlas 14 Rainfall Evaluation: The hydrologic model utilized as the basis for the PER (Upper San Marcos River basin, USACE, 2016) will be updated with NOAA Atlas 14 data (2018) for the basins that directly contribute to the project area (both Phase 1 and Phase 2). Incorporation of the latest Atlas 14 precipitation data set will consider the depth and aerial reduction and duration and temporal distribution included in the effective model. Previously completed model calibration will be considered. It is anticipated that soil loss rates and Synder peaking coefficients will need to be revisited. Update routing data and diversion curves with hydraulic optimization. Review results and present to the City.
 - b. Phase 1 Hydrologic Analysis: Improved conveyance along Purgatory Creek proposed in the design of Phase 1 may alter outflow into the San Marcos River. Potential for downstream impacts to existing structures will be evaluated. Valley storage will be evaluated by updating Modified Puls routing data in HEC-HMS. Changes in runoff to the San Marcos will be evaluated in the San Marcos River HEC-RAS model (to be provided by the City). Structures at risk will be identified. Results will be summarized in the Drainage Technical Memorandum. Mitigation for impacts downstream are not included in this analysis.
 - c. Hydraulic Model Development: The PER hydraulic modeling included utilizing models already developed on behalf of the City to capitalize on previous efforts to define flood risk along Purgatory Creek. Hydraulic models utilized included a steady state 1-Dimensional HEC-RAS model and 2D InfoWorks ICM model. ICM 2D modeling was performed in the PER effort to better define flow relationships within the Phase 2 project area which has a complex braided stream and spill that was not completely captured by the 1D HEC-RAS model. ICM models are not currently accepted by FEMA for defining flood risk and are less efficient at modeling

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riverine/channel flow in comparison to HEC-RAS 2D. Moving into design it is recommended that a HEC-RAS 2D model be developed to accurately capture the complex flow relationship in the Phase 2 project area and to anticipate the required FEMA review that will be needed with the proposed alteration of the FEMA effective floodplain on Purgatory Creek. Phase 2 flow relationships may impact conveyance timing to the Phase 1 area which is why it is recommended to convert the model as part of this effort. The PER 1D HEC-RAS model will be converted to unsteady HEC-RAS 2D to compute flood elevations as well as to assess the potential for hydrologic impacts of the combined Phase 1 and 2 projects. Once developed, the unsteady HEC-RAS 2D model will serve as the basis for the design.

- d. Phase 1 Hydraulic Analysis: Optimize the proposed conditions HEC-RAS model within the Phase 1 area using the identified ROW from the PER. The target design flow from the PER is 7,900 cfs which correlates to the future conditions 100-year frequency without consideration for Atlas 14. It is understood that the targeted design flow may not be fully contained within the proposed channel banks given its magnitude, right of way limitations and adjacent low-lying areas. Atlas 14 flows will be run in the proposed conditions hydraulic model. A discussion will be held with the City to determine if the design flow can be altered while maintaining the water quality goals defined in the PER.
 - i. Channel Geometry: As stipulated in the PER, channel side slopes will vary from 4:1 to 3:1 and/or vertical walls to accommodate limited ROW and to avoid impacts to adjacent lots. Channel side slopes and geometry will also be optimized as part of this effort to evaluate placement of the trail system which requires ADA compliance.
 - ii. Landscaping: Optimize locations for preservation/restoration/enhancement of trees and grow zones to accomplish ecological and pedestrian goals while maximizing reduction of flood risk to habitable structures.
 - iii. Spillway: Optimization of the overflow spillway to be located in Children's Park. Optimization to incorporate input from UPRR permitting to be initiated in the 30% Design phase.
 - iv. Crossings: Final sizing of bridge/culvert crossings at Comal Street, S. CM Allen Parkway, S. LBJ Drive, Jackman Street and S. Mitchell Street as well as two pedestrian bridge crossings.
 - v. Floodplain Delineation: Task includes mapping the resultant floodplain for inclusion in design plans.
- e. Phase 2 Preliminary Channel and Storage Area Design: The PER included a conceptual layout of the Phase 2 channel from Wonder World Drive to Johnson Avenue. In the existing conditions the Phase 2 area includes a braided stream and spill between Purgatory Creek and Willow Springs. The proposed improvements as identified in the PER include maximizing floodwater conveyance in the upper (northern) channel and limiting impacts to the lower (southern) channel which includes environmentally sensitive features. Phase 2 improvements will be designed

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in a manner such that there are no adverse impacts to Willow Springs. This task includes:

- i. Phase 2 Optimization: The conceptual Phase 2 channel design will be refined into a preliminary design with set bottom widths, slide slopes and longitudinal slopes.
 - ii. Storage Area: The Phase 2 reach will include a storage area to reduce downstream flows as stipulated in the PER. The storage configuration will be optimized to maximize flood risk reduction.
 - iii. Split Flow: The Phase 2 preliminary design will include proposed grading at the upstream junction of the upper and lower channel to optimize the flow split to maintain ecological goals in the lower channel and maximize flood risk reduction in the upper channel.
 - iv. HEC-RAS Model: The proposed conditions HEC-RAS model will be updated with the Phase 2 preliminary layout.
 - v. HEC-HMS Model: The proposed conditions HEC-HMS model will be updated with routing curves that reflect the preliminary Phase 2 channels.
 - vi. Plan Sheets: The preliminary design will be presented in layout sheets separate from the Phase 1 design construction set (similar to those included in the Phase 1 PER). These preliminary design sheets will be part of the Drainage Technical Memorandum.
 - vii. Floodplain Delineation: Task includes mapping the resultant floodplain for inclusion in Drainage Technical Memorandum Exhibits.
 - viii. The Phase 2 preliminary design does not include utility coordination, cost estimating, natural channel design, water quality or geomorphic assessments.
- f. Drainage Technical Memorandum: Along with the 30% construction documents, a Drainage Technical Memorandum with an overview of the tasks completed in the 30% Flood Mitigation Design effort will be drafted for inclusion with the 30% design deliverables. Hydrologic and Hydraulic modeling methods, assumptions, and outputs will be summarized for the Phase 1 project area as well as preliminary design of the Phase 2 channel and storage area.
7. Purgatory Channel Utility Conflict Resolution and Design
- a. Utility Conflict Evaluation produced for the PER will be advanced by evaluating available GIS and as-built information. No detailed subsurface utility exploration (SUE) will be conducted during the 30% design phase of the project.
 - b. Information provided by the City regarding utilities that are anticipated to affect the proposed infrastructure to be relocated or improved will be evaluated. LAN will review data provided by the City including relevant design/construction/record information to benefit the relocation/improvement design.
 - c. A Utility Conflict Matrix will be developed based on the Utility Conflict Evaluation produced for the PER. The Utility Conflict Matrix will include additional conflicts identified with overall design progress evaluation of record documentation.

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- d. LAN will prepare design drawings for proposed utility relocations and improvements. The 30% design drawings will illustrate preliminary horizontal alignments only and will not include vertical alignments/profiles/sections. No relevant construction notes or details will be provided at the 30% design stage.
 - e. LAN will provide proposed relocation and improvement horizontal alignments in CAD format to Client for preliminary coordination with utility owners, as necessary.
8. Roadway and Traffic Design
- a. LAN shall prepare schematic plan layouts for all roadway design for completion of all vehicular bridge upgrade locations (S. CM Allen Parkway, S. LBJ Drive, Jackman Street, S. Mitchell Street).
9. Trail, Sidewalk, and Pedestrian Connectivity Design
- a. Trail Design: LAN will design a multi-use trail from Children's Park to S. Mitchell Street that connects to the San Marcos River Pathway and Dunbar Park.
 - i. Concept Review: The trail concept will be reviewed with the City to determine input for expected use, materials of construction, and considerations for layout.
 - ii. Design Criteria Review: Design criteria will be selected to guide the trail design. This will include a review of TXDOT, AASHTO, and UPRR requirements as well as Federal, State, and Local ADA requirements.
 - iii. Trailhead Evaluation: The entrances/connections to the trail will be evaluated for suitability of pedestrian/bike access. This will include review of nearby parking areas, sidewalks, and pedestrian crossings.
 - iv. Opportunity Evaluation: Opportunities for enhancements to the trail will be evaluated including scenic overlooks, seating areas, places for pedestrians to gather, and creek crossings.
 - v. Trail Layout: A functional basic layout of the trail will be developed that shows connectivity at trailheads, layouts of ramps and stairs, and connectivity to existing trails.
 - vi. Evaluation of trail opportunities: Opportunities for overlooks, gathering spaces, and seating areas.
10. Property Requirements Evaluation
- a. Property Acquisition Refinement: An update to the property requirements evaluation completed in the PER phase will be completed with 30% design that will include any additional property easements required for the bridge upgrades and trail layout as well as any temporary construction easements that will be required.
 - b. Updated Property Map: The property map prepared as part of the PER phase will be updated including the summary tables for properties/easements to be acquired.

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11. Purgatory Channel Structures Design

- a. Vehicular Bridge Design: LAN shall prepare a bridge layout plan sheet for the following bridges along the proposed Purgatory Creek Improvement project corridor:
 - i. Vehicular Bridges (PS Concrete Beam)
 - S. Mitchell Street Bridge
 - Jackman Street Bridge
 - S LBJ Drive Bridge
 - S CM Allen Parkway Bridge
 - ii. Preparation of Bridge Layouts:
 - a. Prior to preparation of each bridge layout, LAN shall prepare a comparative analysis of bridge structures to determine the optimum bridge beams / girders for vertical clearance of waterways.
 - b. LAN shall submit each bridge layout early in the plan preparation process to obtain approval from the City and/or State (for State owned facilities).
 - c. LAN shall comply with all relevant sections of the latest edition of the State's LRFD Bridge Design Manual, Bridge Project Development Manual, Bridge Detailing Guide, and AASHTO LRFD Bridge Design Specifications (8th Edition) and respective checklists.
 - d. Each bridge layout sheet must include plan and elevation, bridge typical sections, structural dimensions, abutment and bent locations, superstructure and substructure types.
 - e. LAN shall locate and plot all soil borings and utilities, and, for staged construction, indicate limits of existing bridge for removal and reconstruction.
- b. Pedestrian Bridge Design: LAN shall prepare a bridge layout plan sheet (as described in 11.A.i above) for the following bridges along the proposed Purgatory Creek Improvement project corridor:
 - i. Pedestrian Bridges (PS Concrete Beam)
 - San Marcos River Pedestrian Bridge (at spillway location)
 - Pedestrian Bridge (Location to be determined)
- c. Retaining Wall Design: Currently it is expected that five (5) retaining walls will be designed within the channel for a total linear footage not to exceed 2000 LF.
 - i. Submit channel retaining wall layout early in the plan preparation to obtain approval from the City.
 - ii. Wall geometry, stability, and structural details will be developed.
 - iii. LAN shall select between MSE wall, CIP spread footing wall, and Drilled Shaft wall systems for this site based on the geotechnical recommendations and specific site conditions and/or constraints.

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- d. Weir and Spillway Design: LAN will design a reinforced concrete spillway and weir including headwall and toewall components downstream of the S CM Allen Parkway as proposed in the PER.
 - i. An evaluation of code-required environmental loads imposed by wind and/or seismic events will be performed.
 - ii. The 30% deliverables will include the design criteria.

12. UPRR Design Deliverables

- a. Design Compliance with UPRR Standards: The design of this project must comply with UPRR's technical standards. LAN will comply with the technical requirements of the UPRR Public Projects Plan Submittal Guidelines and the Public Projects Check Sheet. It is assumed that UPRR will require two separate submittals at each of the required milestones of 10%, 25%, 30%, 90% and 100% design, one for the UPRR crossing by Guadalupe Street and another for the work that encroaches into the UP ROW.
 - i. Design Submittals: At 30% design, the 10% Design submittal will be coordinated with UPRR. UPRR requires survey and Geotech for the 10% completion package submittal which will be completed with the 30% project design package.
 - ii. In accordance with the UPRR Public Projects Plan Submittal Guidelines, 6-8 weeks should be allowed for each plan submittal review. UPRR also notes that project schedules should account for multiple submittals for each milestone. The project scope and schedule accounts for one review by UPRR at this milestone assuming that UPRR will allow revision of comments with the UPRR 25% design submittal.

13. TXDOT Coordination: S LBJ Drive & S Guadalupe Street crossing Purgatory Creek are on the TX-82 Loop corridor which is a TXDOT facility. Therefore, all design efforts within TXDOT ROW for S LBJ Drive and S Guadalupe Street will be coordinated with and approved by TXDOT.

- a. Coordination Meetings: LAN will meet with TXDOT representatives as necessary to discuss and coordinate design issues with the TX-82 Loop bridge and roadway modifications proposed for the Purgatory Creek Project. Meeting minutes will be documented.
- b. Design Submittals: Provide separate submittal packages of the S LBJ Drive and S Guadalupe Street crossings for TXDOT review and approval for the Bridge Layout and 30% Design Submittals in parallel with the City review process.
- c. Submittal Review Meeting: Conduct a comment review/resolution meeting after design submittal. Comments received for each design package will be addressed in the subsequent design package. Meeting minutes will be documented.

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14. 30% Design Deliverables: Design drawings to be developed in accordance with the City of San Marcos Engineering/CIP Plan Review Checklist (revised 08/08/2018). Comments to 30% Design Deliverables to be addressed in the 60% Design phase under a future authorization.
- a. 30% Plans and Estimates:
 - i. The 30% plan set will include the following sheets and sheet quantities Note that sheet quantities provided reflect the maximum sheet quantity budgeted. Actual sheet quantity may vary.
 - 1. Cover (1 sheet)
 - 2. Index (1 sheet)
 - 3. General Notes (3 sheets)
 - 4. Overall Project layout (2 sheets)
 - 5. Existing Conditions/Survey Detail (13 sheets)
 - 6. Tree list (4 sheets)
 - 7. Channel Improvements: Overall Plan and Phasing (2 sheets; plan only)
 - 8. Channel Improvements: Plan and Profile (10 sheets)
 - 9. Spillway Layout (2 sheets)
 - 10. Landscaping and Restoration Layout (13 sheets)
 - 11. Pedestrian Trail Improvements: Plan and Profile (16 sheets; plan only)
 - 12. Pedestrian/Utility Bridge: Plan and Elevation (3 sheets; plan only)
 - 13. Water Utility Improvements: Plan and Profile (3 sheets)
 - 14. Road Improvements: schematic Plan and Profile (4 sheets; plan only)
 - 15. Bridge Improvements: Demolition Plan (5 sheets)
 - 16. Bridge Improvements: Plan and Elevation (5 sheets; plan only)
 - ii. Engineer's Opinion of Probable Construction Cost
 - b. Survey Data Drawings: Provide drawing showing data outlined above on 11" x 17" sheet size at a scale of 1" = 40' horizontal and 1" = 10' vertical as an AutoCAD Civil3D file utilizing the National Cad Standard (NCS).
 - c. 30% Drainage Technical Memorandum
 - d. 30% Engineering Report to include:
 - i. Updated Property Map
 - ii. Utility Conflict Matrix
 - iii. Soils Assessment Report
 - iv. Geotechnical Engineering Report
 - v. Biological Assessment Report
 - vi. Historic Resources Survey Report
 - vii. Archeological Report
 - viii. Geologic Assessment Report

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15. Permitting – Permitting for all agencies as outlined is an on-going task throughout the life of the design and will not be finalized at the time of the 30% design submittal.

a. United States Army Corps of Engineers (USACE):

- i. USACE Coordination: Coordination with USACE will be on-going throughout the project. An initial coordination meeting will be scheduled to review the existing data and project plans with USACE. This meeting will provide insight for environmental and archeological field investigations as well as set the stage for determining potential mitigation requirements. Coordination will be conducted to develop the framework and outline the design requirements necessary to obtain required permits. All USACE coordination will be documented.
- ii. US Army Corps Section 404 Individual Permit: It is assumed that an Individual Permit will be required for the project. An application will be prepared and submitted; an on-site and off-site 401(b)(1) alternatives analysis will be completed; and the completed application along with all supporting documentation will be submitted to the USACE, after review by the City of San Marcos.
- iii. Vegetation Management Plan: A vegetation management plan will be developed for the riparian corridor including the high-level flood benches within the Phase 1 project area. This plan will be based on the need for vegetation reestablishment associated with identified project design features with associated future management. This plan will also be developed with the intent that portions of designated vegetation management and restoration features will be applicable for credit to the mitigation plan required by the USACE Section 404 Permit. The plan will also be consistent with City of San Marcos tree protection and vegetation establishment guidelines and with the goals and objectives of vegetation management and control as described in Section 5.3.8, Control of Non-native Plant Species, of the Edwards Aquifer Recovery Implementation Program (EARIP) Habitat Conservation Plan (HCP) (RECON et al. 2012), for which the City of San Marcos is a participant. This task will include the following:
 1. Identification of Vegetation Management Needs and Goals: Based on results of field investigations and meetings conducted with the design team and the City, management recommendations and strategies will be developed for protecting existing high-quality plant communities; enhancing lower quality communities through control of non-native noxious vegetation and selective vegetation plantings; and complete vegetation restoration in areas where needed or required.
 2. Identification of problems and needs;

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3. Description of existing conditions showing vegetation communities of high, medium, and low quality with illustrative maps and graphics;
 4. Identification of goals and strategies;
 5. Identification of specific restoration, enhancement, and management objectives to include noxious vegetation control and location of management treatments; and procedures for monitoring management measures.
 6. This plan will include a list of native vegetation species to be planted for streambank stabilization following construction of the bankfull channel, with planting to be implemented concurrently with construction of the bankfull channel. The plan will include maps displaying locations of proposed vegetation restoration and enhancement areas and also include locations recommended for irrigation with frequency and duration of irrigation to be applied. Areas of riparian habitat restoration that can be managed for long-term protection under an approved conservation easement held by an accredited Texas Land Trust or conservation agency will also be identified.
- iv. Tier I or Tier II 401 Certification: As required by an Individual Permit, and upon approval by the City of San Marcos, a Tier I checklist or a Tier II 401 Certification Questionnaire and water quality certification documentation will be prepared and submitted.
 - v. NEPA and Public Interest Review: A public notice for the proposed project as required by the USACE for Individual Permits will be prepared and coordinated with the agency. Written responses to public comments (and/or public hearings) will be prepared and submitted along with responses to any USACE questions and comments.
 - vi. Compensatory Mitigation Plan: If compensatory mitigation is required by the USACE to offset environmental losses from unavoidable temporary or permanent stream or wetland impacts, a compensatory mitigation plan will be developed in coordination with the City. This plan is to be developed after the 60% Design Phase. For the purposes of this Scope of Services, it is assumed that the project will adversely impact some WOTUS that will require compensatory mitigation under current USACE regulations and policies. It also assumed that the project area is not within the service area of a USACE-approved mitigation bank and that the City of San Marcos will be required to have a Permittee Responsible Mitigation site and plan, which will require development of mitigation measures either on-site or within the same watershed as the project. Concurrently, with the completion of the Section 404 Individual Permit application and 401(b)(1) alternatives analysis, a compensatory mitigation plan will be developed based on projected TXRAM scores for on-site and/or off-

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site mitigation pursuant to the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule effective June 9, 2008, and the Fort Worth District USACE policy. Components of a Permittee-Responsible Mitigation Plan will include the following:

1. A mitigation work plan to establish the desired plant community and to control invasive species;
 2. A maintenance plan to ensure the continued viability of the incorporated mitigation measures;
 3. Ecologically based performance standards to determine the extent to which the mitigation objectives are met;
 4. A monitoring program to monitor specific parameters to determine if performance standards are being met. Monitoring will include a schedule and reporting to document results;
 5. A long-term management plan to describe how the compensatory mitigation project will be managed after all performance standards are met to ensure long-term sustainability;
 6. An adaptive management plan to address unforeseen changes in site or watershed conditions that may affect the mitigation project;
 7. Financial assures to be provided by the City of San Marcos to ensure a high level of confidence that the compensatory mitigation measures will be successfully completed in accordance with the performance standards; and
 8. Long-term protection will be provided by integrated natural resource management plans such as approved habitat conservation plans or conservation easements held by accredited land trusts.
- vii. Archeologic Report: Following review and comment by the City of San Marcos, edits will be made, and a draft report will be submitted to the THC and USACE for their review and concurrence. Once the agencies have reviewed the document and provided the results of those reviews, revisions will be included in the final report. The final report will be submitted the USACE and the THC, the City will be copied on this submittal.
- b. Texas Parks and Wildlife Department (TPWD)–
- i. TPWD Coordination: An initial meeting will be coordinated with the TPWD to discuss project specifics and obtain direction on obtaining the Marl, Sand, Gravel, Shell, and Mudshell Permit. On-going coordination with the TPWD is expected. Coordination will be conducted to obtain required permits. All coordination will be documented.
 - ii. Marl, Sand, Gravel, Shell and Mudshell Permit Application: The proposed project will include a diversion channel that will connect directly to the San Marcos River disturbing its bed and banks and

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could also potentially affect the San Marcos River bed and banks at the confluence of Purgatory Creek. Consequently, such disturbance will require a Marl, Sand, Gravel, Shell, and Mudshell Permit issued by the TPWD pursuant to Chapter 86.002 of the Parks and Wildlife Code.

- iii. TPWD Application: An application for a Marl, Sand, Gravel, Shell, and Mudshell Permit will be completed and submitted to the TPWD. Information that will be required for the application will include applicant information, location of the proposed activity, description of the proposed activity, contact information for publishing a public notice in a local newspaper and providing a mailing list with pre-printed mailing labels of along-shore property owners for one-half river mile above and below the proposed area. Commission rule Texas Administrative Code (TAC) Title 31, §69.108(c) requires that new permit applications include a Sedimentation Impact Assessment study. This study must be approved by the Parks and Wildlife Commission and completed before a permit may be issued (see scope Task B.2.3.a which covers the assessment).
- iv. TPWD Field Reconnaissance Visit: In response to an anticipated request by the TPWD as part of the application review process, a field reconnaissance visit will be conducted with officials of the TPWD and LAN on the proposed project.
- c. Record of Agency Coordination: An administrative record will be kept of consultation with the local, state, and federal permitting agencies identified in the permitting tasks. This record will be provided to the City upon project completion.
- d. Archeologic Curation: As per the requirements of the Texas Antiquities Permit, all paperwork and photographs generated during investigations must be curated at an approved facility. For this project, all materials will be curated at the Center for Archaeological Studies (CAS) in San Marcos, Texas.

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Tasks B.2 through B.5 to be authorized as additional scope in a future contract.

Task B.2: 60% Design (NOT INCLUDED)

1. Meetings

- a. Project Coordination Meetings: Project coordination meetings will be held with City departments to address specific design elements. These meetings will focus on one aspect of the design and will include discussion of options and preferences. LAN will review agendas and minutes for the meetings to be prepared by the City. Meetings will be combined into one extended meeting if possible.
 - i. One (1) utility coordination meeting will be held during the 60% Design Phase to review and refine utility coordination on the project.
 - ii. One (1) planning meeting will be held during the 60% Design Phase with the City's Habitat Conservation Plan Manager, Urban Forester, and associate staff to review and refine the natural channel design options and wetland restoration. This meeting will include detailed review of progress made on defining the bank stabilization methods, grow zone characteristics, wetland restoration/preservation areas, invasive species management, project tie-in to the San Marcos River, and the environmental mitigation plans required as part of the USACE permitting.
 - iii. One (1) planning meeting will be held during the 60% Design Phase to review and refine the trail design, wayfinding, placemaking, and trail safety with the City's Parks Department and any other City stakeholders.
- b. Project Review Meeting: A meeting will be coordinated to review City comments on the 60% Design and review how the comments will be addressed moving into 90% Design Phase. During these meetings, LAN will present the current status of the design to the City of San Marcos staff to answer any questions and obtain stakeholder input for the next design phase. LAN will provide updates on permitting requirements and timelines for the project include Federal, State, and Local. LAN will review agendas and minutes for the meetings to be prepared by the City.

2. Master Plan Projects

- a. DMP #15: Mitchell Street Drainage Improvements identified in the City of San Marcos Drainage Basin Masterplan includes defining conveyance solution for low lying area without drainage infrastructure adjacent to the Purgatory Creek Improvements project area. Solution presented in the Drainage Master Plan included use of curb cuts and channel grading and/or the addition of storm drain pipe. The 60% design task will include:
 - i. Hydrology: Define localized watershed area and amount of runoff for the 25- and 100-year events using rational method.
 - ii. Hydraulic Design: Hydraulic design of conveyance solutions for the 25-year design storm and 100-year check storm (inlet and channel calculations or StormCAD for storm drain). The design solution will pass the 25-year design storm in accordance with City of San Marcos criteria. The 100-year check storm will be run to ensure no structural flooding within the vicinity of the

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improvement with emphasis on maintaining the 100-year conveyance within the ROW and/or drainage easements areas.

- b. DMP #25: The 300 S LBJ Drive at Cheatham Street Drainage Improvements and Water Quality Best Management Practice (BMP) Design will consist of the following. The existing UPRR currently impounds runoff in this area causing localized flooding issues. The area also has a lack of stormdrain infrastructure to promote positive drainage away from roadway surfaces and structures. Drainage improvement solutions identified in the Drainage Master Plan include extending the storm drain pipe along S. LBJ Drive, constructing a drainage channel along railroad tracks, and constructing a culvert under the railroad. These improvements will address localized flooding in the area and serve as a biofiltration pond to promote sedimentation and infiltration to enhance water quality entering Purgatory Creek. The 60% design of this task will include:
 - i. Hydrologic Analysis: Define localized watershed area and amount of runoff for the 25 and 100-year events using rational method.
 - ii. Water Quality Design: Estimate the water quality volume of the biofiltration pond. Since this is a water quality retrofit, the standard required in the manual may not be attained. The design will maximize the treatment level given the available area and other site constraints. Estimate the percentage of annual TSS load that can be removed by the biofiltration pond following the calculation approach in Section 3.2.2.1 of the San Marcos Stormwater Technical Manual. The ponds will be designed to infiltrate the treated water into the ground.
 - iii. Hydraulic Design: Hydraulic design of conveyance solutions for the 25-year design storm and 100-year check storm (using StormCAD, FlowMaster, and/or HY-8). The design solution will pass the 25-year design storm in accordance with City of San Marcos criteria. The 100-year check storm will be run to ensure no structural flooding within the vicinity of the improvement with emphasis on maintaining the 100-year conveyance within the ROW and/or drainage easements areas.
 - c. DMP # 13: The Comal Street low water crossing will be improved to allow the Purgatory Creek pilot channel to flow through the crossing undisturbed. This will improve creek connectivity, contribute to environmental enhancement, and self-mitigating status. The crossing will remain a low-water crossing. The drainage improvement includes upgrading the crossing to a low profile three-sided box culvert. The 60% design task will include:
 - i. Hydraulic Design: Hydraulic design of conveyance solutions for the 1 to 2-year design storm and provision for 100-year storm overtopping conveyance . The 100-year check storm will be run to ensure no structural flooding within the vicinity of the improvement with emphasis on maintaining the 100-year conveyance within the drainage easements and/or existing flood hazard zone.
3. Purgatory Creek Natural Channel Design
- a. San Marcos River Sediment Impact Study: To support the Texas Parks and Wildlife Department – Marl, Sand, Gravel, Shell and Mudshell Permit a 2-Dimensional sediment transport analysis will be performed for the San Marcos River, Purgatory Creek confluence. The purpose of this analysis is to define the pre to post-project sediment

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loading alteration posed by the addition of the overflow spillway and the resultant removal of channel section from the San Marcos River as a source for sediment loading. This analysis will utilize the unsteady HEC-RAS 2D hydraulic model developed in the 30% Design effort as the basis for this analysis. Analysis will include evaluation of the bankfull flow (channel forming flow) and design storm. The outcome of this analysis will be summarized in a technical memorandum. Task excludes model calibration.

- b. Channel Stabilization Methods: Hydraulic modeling will determine which channel sections require engineered reinforcement, which areas can be held with vegetation alone, and which areas lie in between these extremes. The Wildflower Center will work with LAN to develop soft solutions, where possible, in these border cases. This task will focus on stabilization methods to be applied for toe protection, pilot channel configuration, and areas in the overbank with steep slopes and or pinch points where ROW is limited. This task will include identifying opportunities to maintain and improve ecosystem services, by section/reach. Location of appropriate vegetation/soil communities will be identified by section/reach for bank stability and in stream habitat as defined by modeling results, maintenance capacity for the section and experiential goals.
- c. Channel Plans, Profiles, and Typical Cross-sections: LAN will refine the natural channel design plan and profiles and develop typical cross-sections in accordance with the project goals. Typical cross-sections will integrate the optimized channel geometry, landscaping plan, planting schemes, bank stabilization methods, and toe protection for the pilot channel and overbanks.

4. Landscape and Illumination Design

- a. Landscape Layout: Develop a refined landscape plan with proposed plant selection. Incorporate City comments regarding layout and grading issues.
 - i. Finalize hardscape design and propose paving material selection.
 - ii. Develop wayfinding graphics package with signage design and locations. Wayfinding shall include design of signage and locations, material selections, and graphic design and other design related to the presentation of information on signage.
 - iii. Develop site furnishing plan with proposed furniture selections.
- b. Planting/Restoration Plan: Refine site restoration plan to incorporate City comments and progress from other disciplines. Including providing criteria for maintenance in restoration areas.
- c. Irrigation Design: Develop irrigation main line plan, including irrigation zones and details. Identify areas of probable temporary irrigation.
- d. Soils Design: Provide soil system profiles for each soil type.
- e. Illumination Design:
 - i. Develop landscape lighting concepts with fixture selection.
 - ii. Develop illumination layout and specifications.
- f. Specifications:
 - i. Prepare specifications and guidelines for temporary and permanent site irrigation system construction. The guidelines would emulate the intent of the landscape water management goals.

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- ii. Specifications will include planting plans and planting soil profile.
 - iii. Prepare outline of technical specifications for agronomic soils.
 - g. Standards:
 - i. Develop construction standards for irrigation improvements to address the following items:
 - 1. System design guidelines, details and equipment schedules.
 - 2. System control, communication and sensor methods.
 - 3. Schematic illustrations of irrigation methods by landscape type and priority.
5. Purgatory Channel Flood Mitigation Design
- a. Hydraulic Modeling: Interim update to the hydraulic model to reflect refinement in design geometry
 - b. Scour Analysis: Scour analysis will be performed for the four (4) vehicular bridge upgrades, one (1) culvert upgrade, two (2) pedestrian bridges, five (5) retaining walls, and one (1) spillway to estimate the lifetime potential for scour on the structures contained within the channel.
 - i. The scour analysis will use methodology approved by the City. The methodology will depend on the site conditions such as the presence of cohesive or cohesionless soil, rock or depth of rock, proposed foundation type, and existing site performance. HEC-18 will be used for sites with cohesionless soils. For other conditions, the Engineer may use the TSEAS 1993 (Texas Secondary Evaluation and Analysis for Scour) guidelines. Scour analysis results will be summarized in the plan sheets and discussed in the Drainage Technical Memorandum.
 - c. Storm Sewer Outfall Design: There are five (5) existing storm drain outfalls that intersect the Purgatory Phase 1 project area. This task includes design and specification of headwall removal and design of new structure, dissipation design, and riprap sizing.
 - d. 60% Drainage Technical Memorandum: Updated Drainage Technical Memorandum to include floodplain maps and supporting hydraulic output.
6. Purgatory Channel Utility Conflict Resolution and Design
- a. Utility Conflict Matrix will be updated based on related design progress and Client review, as necessary.
 - b. Design drawings will be advanced for proposed utility relocations and improvements based on related design progress and Client review, as necessary. The 60% design drawings will illustrate vertical alignments/profiles/sections (as relevant) and revised horizontal alignments and include relevant construction notes. No construction details will be provided at the 60% design stage.
 - c. CAD files will be provided to Client for coordination with utility owners, as necessary.

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7. Purgatory Channel Roadway and Traffic Design
 - a. LAN shall prepare all roadway and traffic control design elements as necessary for completion of all vehicular bridge work (4 locations), utility relocations within the right-of-way, DMP #15, DMP #25, and DMP#15 projects included in this scope of work. Design shall include typical sections, plan and profiles, cross-sections (25-ft intervals), signage and striping plans, and traffic control and detour plans.
8. Purgatory Channel Trail, Sidewalk, and Pedestrian Connectivity Design
 - a. Trail Design: Detailed plans will be developed including typical sections, plan and profiles, rails, tie-ins for pedestrian bridges, trailheads and any necessary railing.
 - b. Sidewalk Design: Sidewalk sections, plans, and profiles will be prepared for the crossings at S. Mitchell Street, Jackman Street, and S. LBJ Drive to be on both sides of the crossing; the sidewalks on S. CM Allen Parkway will only be on the Children's Park side of the crossing. Sidewalks at S. CM Allen Parkway and S. LBJ Drive will extend further than the crossing and will be designed to an appropriate endpoint considering the roadway tie-ins for the crossing upgrades to bridge structures. Approximately 4000 LF of sidewalk is anticipated.
 - c. Pedestrian Connectivity Design: Up to three hybrid beacon crossings will be designed for pedestrian connectivity of the trail at street crossings where the trail cannot be constructed underneath the vehicular bridges. Layout, plans, and profiles will be developed.
9. Purgatory Channel Structures Design
 - a. Vehicular Bridge Design: LAN shall prepare each structural design and develop detailed structural drawings of all required details in compliance with above-listed manuals and guidelines. LAN shall assemble and complete all applicable State Standard Details sheets. Work to include:
 - i. Perform calculations for design of bridge bents & abutments.
 - ii. Perform calculations for bridge slab design.
 - iii. Perform calculations to determine control elevations of bridge elements.
 - iv. Perform calculations for beam / girder design.
 - v. Prepare necessary foundation details and plan sheets.
 - vi. Prepare plan sheets for bent & abutment design.
 - vii. Prepare plan sheets for additional bent & abutment details.
 - viii. Prepare framing plan and slab plan sheets.
 - ix. Compute and prepare tables for bearing seat elevations, slab dead load deflections, etc.
 - x. Design beams / girders and prepare beam / girder design tables.
 - xi. Existing Bridge Modification Details (Guadalupe Drive)
 - xii. Prepare special provisions and special specifications.
 - b. Pedestrian Bridge Design: LAN shall prepare each structural design and develop detailed structural drawings of all required details in compliance with above-listed manuals and guidelines. LAN shall assemble and complete all applicable State Standard Details sheets.

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- c. Retaining Wall Design:
 - i. Provide layouts, elevations, typical sections and applicable structural details for each retaining wall.
 - ii. Perform design calculations to check the external stability of the walls including slope stability, bearing, sliding and overturning and detail drawings in accordance with the standard requirements of the State of Texas.
 - iii. Perform design calculations applicable for the structural design of the wall system and provide appropriate design details for construction.
 - d. Weir and Spillway Design:
 - i. Prepare structural general notes.
 - ii. Prepare Layout and sectional views of overflow weir and spillway.
10. Erosion and Sedimentation Control Design
- a. Limits of Construction: Develop Limits of Construction and Vegetation Soil Protection Zones
 - b. BMP strategies: To be developed for critical environmental feature protection during construction and restoration efforts
 - c. Dewatering Plan: To be established to accommodate base flow and actions required in the event of a major storm event during construction. Dewatering plan to be developed for wet and dry flows. Evaluate the need for additional filtration to ensure fine particles are not discharged downstream of the construction area.
 - d. Sequencing: A phased approach will be developed for placement of the erosion and sedimentation controls to minimize disturbed areas.
11. FEMA CLOMR: The flood risk mitigation resulting from the Purgatory Channel Improvement Project will result in a measurable change to the FEMA regulatory floodplain. A Conditional Letter of Map Revision (CLOMR) will be drafted for the purpose of communicating the City's intent to alter the floodplain. CLOMR will include the unsteady HEC-RAS 2D model prepared in a manner consistent with FEMA standards and required MT-2 forms. LAN will coordinate with City to sign required forms and will submit to FEMA on behalf of the City. LAN will respond to two (2) rounds of comments from FEMA reviewers.
12. UPRR Design Deliverables: At 60% design, the UPRR 25% Design submittal will be submitted and a site visit will be completed.
- a. Design Compliance with UPRR Standards: The design of this project must comply with UPRR's technical standards. LAN will comply with the technical requirements of the UPRR Public Projects Plan Submittal Guidelines and the Public Projects Check Sheet.
 - i. Design Submittals: At 60% design, a 25% Design submittal will be coordinated with UPRR and will be based on the 60% design. Two packages will be submitted, one for the UPRR crossing and another for the encroachment into UP ROW.
 - ii. In accordance with the UPRR Public Projects Plan Submittal Guidelines, 6-8 weeks should be allowed for each plan submittal review. UPRR also notes that project schedules should account for multiple submittals for each milestone. The project scope and schedule accounts for one submittal at this milestone

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assuming that UPRR will allow revision of comments with the UPRR 30% design submittal.

- b. Attendance of 25% Site Visit with UPRR: It is expected that after the 25% design package review, UPRR will want to coordinate a site visit. LAN will attend a site visit coordinated by the City and document notes from the visit.

13. TXDOT Coordination:

- a. Monthly Meetings: LAN will meet with TXDOT representatives as necessary to discuss and coordinate design issues with the TX-82 Loop bridge and roadway modifications proposed for the Purgatory Creek Project. Meeting minutes will be documented.
- b. Design Submittals: Provide separate 60% Design submittal packages of the S LBJ Drive and S Guadalupe Street crossings for TxDOT review and approval in parallel with the City review process.
- c. Submittal Review Meeting: Conduct a comment review/resolution meeting after each submittal. Comments received for each design package will be addressed in the subsequent design package. Meeting minutes will be documented.

14. 60% Design Deliverables: Design drawings to be developed in accordance with the City of San Marcos Engineering/CIP Plan Review Checklist (revised 08/08/2018).

- a. 60% Plans, Specifications, and Estimates: The scale shall be 1"=40' (horizontal) and 1"=10' (vertical).
 - i. 60 Plan set including the following sheet and quantities (Note that all sheet quantities provided reflect the maximum sheet quantity budgeted. Actual sheet quantity may vary.):
 1. Cover (1 sheet)
 2. Index (1 sheet)
 3. Legend (1 sheet)
 4. General Notes (3 sheets)
 5. Overall Project layout (2 sheets)
 6. Existing Conditions/Survey Detail (13 sheets)
 7. Proposed Conditions (13 sheets)
 8. Tree list (4 sheets)
 9. SWPPP (6 sheets)
 10. Erosion and Sedimentation Control Plan (21 sheets)
 11. Hydrological Calculation Data (2 sheets)
 12. Drainage Area Map (2 sheets)
 13. Channel Improvements: Overall Plan and Phasing (2 sheets)
 14. Channel Improvements: Plan and Profile (10 sheets)
 15. Channel Improvements: Cross Sections (27 sheets)
 16. Channel Improvements: Retaining Wall Layout and Elevation (5 sheets)
 17. Spillway Layout (2 sheets)
 18. Spillway Sections (2 sheets)
 19. Spillway Overflow Weir Plan and Sections (1 sheet)
 20. Landscaping and Restoration: Layout (13 sheets)
 21. Landscaping and Restoration: Sections (12 sheets)

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22. Landscaping and Restoration: Irrigation Plan (10 sheets)
 23. Pedestrian Trail Improvements: Plan and Profile (16 sheets)
 24. Pedestrian Trail Improvements: Typical Sections (1 sheet)
 25. Pedestrian Trail Improvements: Cross sections (5 sheets)
 26. Illumination Improvements: Legend (1 sheet)
 27. Illumination Improvements: Key Plans (2 sheets)
 28. Illumination Improvements: Layout Plans (16 sheets)
 29. Pedestrian/Utility Bridge: Plan and Elevation (3 sheets)
 30. Pedestrian/Utility Bridge: Sections and Details (6 sheets)
 31. Stormdrain Hydraulic Calculation Data (1 sheet)
 32. Stormdrain Utility Improvements: Plan and Profile (4 sheets)
 33. Water Utility Improvements: Plan and Profile (3 sheets)
 34. Water Quality Calculation Data (1 sheet)
 35. Water Quality Improvements: Layout (1 sheet)
 36. Road Improvements: Plan and Profile (5 sheets)
 37. Road Improvements: Typical Sections (5 sheets)
 38. Road Improvements: Cross-sections (5 sheets)
 39. Bridge Improvements: Demolition Plan (5 sheets)
 40. Bridge Improvements: Plan and Elevation (5 sheets)
 41. Bridge Improvements: Abutment Sections and Details (5 sheets; sections only)
 42. Bridge Improvements: Interior Layout and Details (5 sheets; layout only)
 43. Bridge Improvements: MSE Wall Plan (5 sheets)
 44. Signage and Striping (5 sheets)
 45. Traffic Control Plan Narrative (1 sheet)
 46. Traffic Control Plan (7 sheets)
 47. Pedestrian Detour Plan (1 sheet)
- ii. Specifications
1. List of Standard Specifications: City of San Marcos Division 1 specifications will be used. City of Austin standard specifications will be used.
 2. Project Specific/Special Specifications
 3. Project Specific/Special Details
- iii. Engineer's Opinion of Probable Construction Costs (OPCC)
- b. Construction Project Schedule: LAN will develop a Construction Schedule for the project.
 - c. 60% Comment Response Letter: Prepare a letter documenting PER 30% review comments have been addressed in 60% designs. In addition, complete the City's Plan Review Checklist showing designs meet submittal requirements.
 - d. 60% Drainage Technical Memorandum
 - e. 60% Engineering Report: Engineering Report to be updated with Vegetation and Restoration Plan.

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Task B.3: 90% Design **(NOT INCLUDED)**

1. Meetings
 - a. Project Review Meeting: A meeting will be coordinated to review City comments on the 90% Design and review how the comments will be addressed moving into 100% Design Phase. During these meetings, LAN will present the current status of the design to the City of San Marcos staff to answer any questions and obtain stakeholder input for the next design phase. LAN will update the City on permitting coordination, requirements and timelines for the project include Federal, State, and Local. LAN will review agendas and minutes for the meetings to be prepared by the City.
2. Master Plan Projects
 - a. DMP #15: Refine hydraulic design of Mitchell Street area drainage improvements to address City comments and reflect progress made by other disciplines.
 - b. DMP #25: Refine hydraulic and water quality design of the proposed improvements at 300 S LBJ Drive at Cheatham Street to address City comments and reflect progress made by other disciplines.
 - c. DMP #13: Refine hydraulic design of Comal Street drainage improvements to address City comments and reflect progress made by other disciplines.
3. Purgatory Creek Natural Channel Design
 - a. Channel Plans, Profiles, and Typical Cross-sections: Refine the channel design plan, profiles and typical cross-sections with updates from the other disciplines and coordination efforts completed in the 60% permitting phase.
4. Landscape and Illumination Design
 - a. Plan Sheets and Specifications: Prepare construction plans and specifications for landscape design elements.
 - i. Prepare tree preservation and mitigation plans and details, including removal of invasive species
 - ii. Prepare a hardscape layout plan, identifying all proposed improvements.
 - iii. Prepare fine grading plan(s).
 - iv. Prepare landscape plan, planting details and plant schedules.
 - b. Illumination Design: Prepare lighting design details and schedules.
 - c. Site Furnishing Plan: Prepare a site furnishing plan including wayfinding signage plan and details.
 - d. Irrigation Design: Refine irrigation plan based on direction provided by City and progress from other disciplines. Further develop design to include piping, construction details, and specifications. Prepare hydraulic calculations.
 - e. Soils Design: Provide technical specifications detailing soil mix properties and parameters related to the installation of planting soils and soil systems. Provide agronomic recommendations concerning:
 - i. Compost Organic Amendment Evaluation
 - ii. Gravel Distribution Analysis
 - iii. Physical Evaluation of Landscape Soil Mixes

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- iv. Fertility and tissue testing
 - v. Growing Medium Particle Size Analysis
 - vi. Landscape Soils Microbiological Amendments
5. Purgatory Channel Flood Mitigation Design
- a. Hydraulic Modeling: Interim update to the hydraulic model to reflect refinement in design geometry.
 - b. Scour Analysis: Update scour analysis with comments from the City and refinement of channel structures design for the five (5) bridge/culvert upgrades, three (3) pedestrian bridges, five (5) retaining walls, and one (1) spillway.
 - c. Storm Sewer Outfall Design: Refinement of the outlet design for the five (5) existing storm drain outfalls that intersect the Purgatory Phase 1 project area to incorporate City review comments.
 - d. 90% Drainage Technical Memorandum: Updated Drainage Technical Memorandum to include updated floodplain maps and supporting hydraulic output.
6. Purgatory Channel Utility Conflict Resolution and Design
- a. Utility Conflict Matrix will be updated based on related design progress and Client review, as necessary.
 - b. Design drawings will be advanced for proposed utility relocations and improvements based on related design progress and Client review, as necessary. The 90% design drawings will illustrate revised vertical alignments/profiles/sections (as relevant) and revised horizontal alignments, as well as include relevant construction notes and details.
 - c. Updated CAD files will be provided to Client for coordination with utility owners, as necessary.
7. Purgatory Channel Roadway and Traffic Design
- a. Standard details will be added.
8. Purgatory Channel Trail, Sidewalk, and Pedestrian Connectivity Design
- a. Trail Design: Standard details will be added.
 - b. Sidewalk Design: Standard details will be added.
 - c. Pedestrian Crossing Design: Standard details will be added.
9. Purgatory Channel Structures Design
- a. Vehicular Bridge Design:
 - i. Details will be added to plans as required.
 - ii. Applicable TXDOT Standard Drawings will be incorporated.
 - iii. Final bridge design calculations will be performed.
 - b. Pedestrian Bridge Design:
 - i. Details will be added to plans as required.
 - ii. Applicable TXDOT Standard Drawings will be incorporated.
 - iii. Final bridge design calculations will be performed.

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- c. Retaining Wall Design:
 - i. Layouts, elevations, typical sections and applicable structural details for each retaining wall will be provided.
 - ii. Design calculations will be performed to check the external stability of the walls including slope stability, bearing, sliding and overturning and detail drawings in accordance with the standard requirements of the State of Texas.
 - iii. LAN shall perform design calculations applicable for the structural design of the wall system and provide appropriate design details for construction.
 - d. Weir and Spillway Design:
 - i. Structural general notes will be developed.
 - ii. Layout and sectional views of overflow weir and spillway will be developed.
 - iii. Technical Specifications for concrete and earthwork will be developed.
 - e. Light Pole Foundation Design:
 - i. Up to three (3) identifiably unique light pole foundations to accommodate 4-foot, 12- to 14-foot, and 20-foot high light poles will be designed.
 - ii. Typical sections and details will be developed.
10. Erosion and Sedimentation Control Design: Refine the erosion and sedimentation control design with updates from the other disciplines and coordination efforts completed in the 60% permitting phase.
11. UPRR Design Deliverables:
- a. Design Compliance with UPRR Standards:
 - i. For 90% Design, a 30% Design submittal will be coordinated with UPRR. Two submittals are expected. One for the UPRR crossing and another for work that encroaches into the UPRR.
 - ii. In accordance with the UPRR Public Projects Plan Submittal Guidelines, 6-8 weeks should be allowed for each plan submittal review. UPRR also notes that project schedules should account for multiple submittals for each milestone. For this submittal, the project scope and schedule only include one review and assumes that the comments received can be addressed in the 90% UPRR design submittal.
12. TXDOT Coordination:
- a. Monthly Meetings: LAN will meet with TXDOT representatives as necessary to discuss and coordinate design issues with the TX-82 Loop bridge and roadway modifications proposed for the Purgatory Creek Project. Meeting minutes will be documented.
 - b. Design Submittals: Separate 90% Design submittal packages of the S LBJ Drive and S Guadalupe Street crossings will be provided for TxDOT review and approval parallel to the City review process.

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- c. Submittal Review Meeting: Comment review/resolution meetings will be conducted after each submittal. Comments received for each design package will be addressed in the subsequent design package. Meeting minutes will be documented.
13. 90% Design Deliverables: Design drawings to be developed in accordance with the City of San Marcos Engineering/CIP Plan Review Checklist (revised 08/08/2018).
- a. 90% Plans, Specifications, and Estimates: The scale shall be 1"=40' (horizontal) and 1"=10" (vertical).
 - i. 90 Plan set including the following sheet and quantities (Note that all sheet quantities provided reflect the maximum sheet quantity budgeted. Actual sheet quantity may vary.):
 - 1. Cover (1 sheet)
 - 2. Index (1 sheet)
 - 3. Legend (1 sheet)
 - 4. General Notes (3 sheets)
 - 5. Construction Sequence/Phasing (2 sheets)
 - 6. Summary of Quantities (5 sheets)
 - 7. Overall Project layout (2 sheets)
 - 8. Existing Conditions/Survey Detail (13 sheets)
 - 9. Proposed Conditions (13 sheets)
 - 10. Tree list (4 sheets)
 - 11. SWPPP (6 sheets)
 - 12. Erosion and Sedimentation Control Notes (1 sheet)
 - 13. Erosion and Sedimentation Control Plan (21 sheets)
 - 14. Erosion and Sedimentation Control Details (4 sheets)
 - 15. Hydrological Calculation Data (2 sheets)
 - 16. Drainage Area Map (2 sheets)
 - 17. Channel Improvements: Overall Plan and Phasing (2 sheets)
 - 18. Channel Improvements: Horizontal Alignment Data (3 sheets)
 - 19. Channel Improvements: Plan and Profile (10 sheets)
 - 20. Channel Improvements: Cross Sections (27 sheets)
 - 21. Channel Improvements: Details (5 sheets)
 - 22. Channel Improvements: Retaining Wall Layout and Elevation (5 sheets)
 - 23. Channel Improvements: Retaining Wall Details (5 sheets)
 - 24. Spillway Layout (2 sheets)
 - 25. Spillway Sections (2 sheets)
 - 26. Spillway Details (2 sheets)
 - 27. Spillway Overflow Weir Plan and Sections (1 sheet)
 - 28. Spillway Overflow Weir details (2 sheets)
 - 29. Spillway Scour Analysis Calculation Data (1 sheet)
 - 30. Landscaping and Restoration Phasing and Notes (2 sheets)
 - 31. Landscaping and Restoration: Layout (13 sheets)
 - 32. Landscaping and Restoration: Sections (12 sheets)
 - 33. Planting Details and Schedules (5 sheets)

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- 34. Invasive Vegetation and Control (2 sheets)
- 35. Soil Design (2 sheets)
- 36. Landscaping and Restoration: Irrigation Plan (10 sheets)
- 37. Irrigation Details (2 sheets)
- 38. Pedestrian Trail Improvements Notes (1 sheets)
- 39. Pedestrian Trail Improvements: Plan and Profile (16 sheets)
- 40. Pedestrian Trail Improvements: Typical Sections (1 sheet)
- 41. Pedestrian Trail Improvements: Cross sections (5 sheets)
- 42. Pedestrian Trail Improvements: Details (5 sheets)
- 43. Illumination Improvements: Legend (1 sheet)
- 44. Illumination Improvements: Key Plan (2 sheets)
- 45. Illumination Improvements: Layout Plans (16 sheets)
- 46. Illumination Improvements: Schedules (2 sheets)
- 47. Illumination Improvements: Details (2 sheets)
- 48. Pedestrian/Utility Bridge Notes (1 sheet)
- 49. Pedestrian/Utility Bridge: Plan and Elevation (3 sheets)
- 50. Pedestrian/Utility Bridge: Sections and Details (6 sheets)
- 51. Pedestrian/Utility Bridge: Details (2 sheets)
- 52. Stormdrain Hydraulic Calculation Data (1 sheet)
- 53. Stormdrain Utility Improvements: Plan and Profile (4 sheets)
- 54. Stormdrain Utility Improvements: Details (3 sheets)
- 55. Water Utility Improvements: Plan and Profile (3 sheets)
- 56. Water Utility Improvements: Details (3 sheets)
- 57. Water Quality Calculation Data (1 sheet)
- 58. Water Quality Improvements: Layout (1 sheet)
- 59. Water Quality Improvements: Details (2 sheets)
- 60. Horizontal Alignment Data (2 sheets)
- 61. Road Improvements: Plan and Profile (5 sheets)
- 62. Road Improvements: Typical Sections (5 sheets)
- 63. Road Improvements: Cross-sections (5 sheets)
- 64. Road Improvements Standards (10 sheets)
- 65. Bridge Improvements Notes (2 sheets)
- 66. Bridge Improvements: Demolition Plan (5 sheets)
- 67. Bridge Improvements: Plan and Elevation (5 sheets)
- 68. Bridge Improvements: Abutment Sections and Details (5 sheets)
- 69. Bridge Improvements: Interior Layout and Details (5 sheets)
- 70. Bridge Improvements: Beam Details (5 sheets)
- 71. Bridge Improvements: Cross Section (5 sheets)
- 72. Bridge Improvements: MSE Wall Plan (5 sheets)
- 73. Bridge Improvements: MSE Sections and Details (5 sheets)
- 74. Bridge Improvements: Details (5 sheets)
- 75. Bridge Improvements Standards (15 sheets)
- 76. Signage and Striping Notes (1 sheet)
- 77. Signage and Striping (5 sheets)
- 78. Signage and Striping Standards (2 sheets)

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- 79. Traffic Control Notes (1 sheets)
- 80. Traffic Control Plan Narrative (1 sheet)
- 81. Traffic Control Plan (7 sheets)
- 82. Traffic Control Standards (10 sheets)
- 83. Pedestrian Detour Plan (1 sheet)
- ii. Specifications: Prepare Project Manual including contract documents, bid form and applicable standard and special specifications.
- iii. Engineer's Opinion of Probable Construction Costs (OPCC)
- b. Construction Project Schedule: Updated construction schedule will be provided in Microsoft Project and PDF formats.
- c. 90% Comment Response Letter: Prepare a letter documenting 60% review comments have been addressed in 90% designs. In addition, complete the City's Plan Review Checklist showing designs meet submittal requirements.
- d. 90% Drainage Technical Memorandum
- e. 90% Engineering Report

Task B.4: 99% Design **(NOT INCLUDED)**

1. Meetings

- a. Project Review Meeting: Meeting to review City comments on the 99% Design and review how the comments will be addressed moving into 100% Design Phase. During these meetings, LAN will present the current status of the design to the City of San Marcos staff to answer any questions and obtain stakeholder input for the next design phase. LAN will update City on permitting coordination, requirements and timelines for the project include Federal, State, and Local. LAN will review agendas and minutes for the meetings to be prepared by the City.

2. Master Plan Projects

- a. DMP #15: Refine hydraulic design of Mitchell Street area drainage improvements to address City comments and reflect progress made by other disciplines.
- b. DMP #25: Refine hydraulic and water quality design of the proposed improvements at 300 S LBJ Drive at Cheatham Street to address City comments and reflect progress made by other disciplines.
- c. DMP #13: Refine hydraulic design of Comal Street drainage improvements to address City comments and reflect progress made by other disciplines.

3. Purgatory Creek Natural Channel Design

- a. Channel Plans, Profiles, and Typical Cross-sections: Refine the channel design plan, profiles and typical cross-sections with updates from the other disciplines, comments from the City, and permitting authorities.

4. Landscape & Illumination Design

- a. Refine landscape, illumination, site furnishing, irrigation, and soil designs to address comments from the City and permitting authorities.

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5. Purgatory Channel Flood Mitigation Design
 - a. Hydraulic Modeling: Final update to the hydraulic model to reflect refinement in design geometry.
 - b. Scour Analysis: Finalize scour analysis with comments from the City and refinement of channel structures design for the four (4) bridge upgrades, one (1) culvert upgrade, two (2) pedestrian bridges, five (5) retaining walls, and one (1) spillway.
 - c. Final Drainage Technical Memorandum: Updated Drainage Technical Memorandum to include updated floodplain maps and supporting hydraulic output.
6. Purgatory Channel Utility Conflict Resolution and Design
 - a. LAN will update the Utility Conflict Matrix based on related design progress and Client review, as necessary.
 - b. LAN will advance design drawings for proposed utility relocations and improvements based on related design progress and Client review, as necessary. The 99% design drawings will illustrate refined vertical alignments/profiles/sections (as relevant) and refined horizontal alignments, as well as include relevant construction notes and details.
7. Purgatory Channel Roadway and Traffic Design
 - a. Refine plans based on comments from City and permitting authorities.
8. Purgatory Channel Trail, Sidewalk, and Pedestrian Connectivity Design
 - a. Refine plans based on comments from City and permitting authorities.
9. Purgatory Channel Structures Design
 - a. Vehicular Bridges: Refine plans based on comments from City and permitting authorities.
 - b. Pedestrian Bridges: Refine plans based on comments from City and permitting authorities.
 - c. Retaining Walls: Refine plans based on comments from City and permitting authorities.
 - d. Weir and Spillway: Refine plans based on comments from City and permitting authorities.
 - e. Light Pole Foundation Design: Refine plans based on comments from City and permitting authorities.
10. Erosion and Sedimentation Control Design
 - a. Refine plans based on comments from City and permitting authorities.
11. UPRR Design Deliverables:
 - a. Design Compliance with UPRR Standards:
 - i. For 99% Design, a 90% Design submittal will be coordinated with UPRR. Two submittals are expected. One for the UPRR crossing and another for work that encroaches into the UPRR.

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- ii. In accordance with the UPRR Public Projects Plan Submittal Guidelines, 6-8 weeks should be allowed for each plan submittal review. UPRR also notes that project schedules should account for multiple submittals for each milestone. For this submittal, the project scope and schedule include two rounds of reviews.

12. TXDOT Coordination:

- a. Monthly Meetings: LAN will meet with TXDOT representatives as necessary. Meeting minutes will be documented.
- b. Design Submittals: Separate 99% Design submittal packages of the S LBJ Drive and S Guadalupe Street crossings will be provided for TxDOT review and approval parallel to the City review process.
- c. Submittal Review Meeting: Comment review/resolution meetings will be conducted after each submittal. Comments received for each design package will be addressed in the subsequent design package. Meeting minutes will be documented.

13. 99% Design Deliverables: Design drawings to be developed in accordance with the City of San Marcos Engineering/CIP Plan Review Checklist (revised 08/08/2018).

- a. 99% Plans, Specifications, and Estimates: The scale shall be 1"=40' (horizontal) and 1"=10" (vertical).
 - i. 99% Plan set will comprise all sheets previously submitted with 90% deliverable and will be revised per City review comments to 90% Plan Set.
 - ii. Update Project Manual per review comments.
 - iii. Engineer's Opinion of Probable Construction Cost (EOPCC)
- b. Construction Project Schedule: Updated construction schedule will be provided in Microsoft Project and PDF formats.
- c. 99% Comment Response Letter: Prepare a letter documenting 90% review comments have been addressed in 99% designs. In addition, complete the City's Plan Review Checklist showing designs meet submittal requirements.
- d. Final Drainage Technical Memorandum: The Drainage Technical Memorandum will be finalized and submitted to the City.
- e. 99% Engineering Report

Task B.5: 100% Design **(NOT INCLUDED)**

1. Meetings

- a. Public Meeting: One (1) public meeting has been budgeted which consists of preparing exhibits and attending the meeting. The public meetings will include a presentation of the 100% Design deliverable. LAN will review agendas and minutes for the meetings to be prepared by the City.
- b. Project Review Meeting: A meeting will be coordinated to review City comments on the 100% Design and review how the comments will be addressed in the final, signed and sealed set. During these meetings, LAN will present the current status of the design to the City of San Marcos staff to answer any questions and obtain stakeholder input for the next design phase. LAN will review agendas and minutes for the meetings to be prepared by the City.

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2. Master Plan Projects
 - a. DMP #15: Finalize plans and specs of Mitchell Street area drainage improvements to address final comments from the City and permitting authorities.
 - b. DMP #25: Finalize hydraulic and water quality design of the proposed improvements at 300 S LBJ Drive at Cheatham Street to address final comments from the City and permitting authorities.
 - c. DMP #13: Finalize hydraulic design of Comal Street drainage improvements to address final comments from the City and permitting authorities.
3. Purgatory Creek Natural Channel Design: Finalize the channel design plan and profiles and typical cross-sections incorporating final comments from the City.
4. Landscape and Illumination Design: Finalize the landscape and illumination drawings and specifications to address final comments from City.
5. Purgatory Channel Utility Conflict Resolution and Design
 - a. LAN will finalize the Utility Conflict Matrix.
 - b. LAN will finalize drawings for proposed utility relocations and improvements. The 100% design drawings will illustrate final vertical alignments/profiles/sections (as relevant) and final horizontal alignments, as well as include relevant construction notes and details.
 - c. LAN will provide updated CAD files to Client for coordination with utility owners, as necessary.
6. Purgatory Channel Roadway and Traffic Design
 - a. Finalize plans and specifications to address final comments from City and permitting authorities.
7. Purgatory Channel Trail, Sidewalk, and Pedestrian Connectivity Design
 - a. Finalize plans and specifications to address final comments from City and permitting authorities.
8. Purgatory Channel Structures Design
 - a. Finalize plans and specifications to address final comments from City and permitting authorities.
9. Erosion and Sedimentation Control Design
 - a. Finalize plans and specifications to address final comments from City and permitting authorities.
10. UPRR Design Deliverables:
 - a. Design Compliance with UPRR Standards:
 - i. At 100% completion a 100% Design Submittal will be coordinated with UPRR. Two submittals are expected. One for the UPRR crossing and another for work that encroaches into the UPRR.

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- ii. In accordance with the UPRR Public Projects Plan Submittal Guidelines, 6-8 weeks should be allowed for each plan submittal review. UPRR also notes that project schedules should account for multiple submittals for each milestone. For this submittal, the project scope and schedule include two rounds of reviews.

11. TXDOT Coordination:

- a. Monthly Meetings: LAN will meet with TXDOT representatives as necessary to discuss and coordinate design issues with the TX-82 Loop bridge and roadway modifications proposed for the Purgatory Creek Project. Meeting minutes will be documented.
- b. Design Submittals: Separate 100% Design submittal packages of the S LBJ Drive and S Guadalupe Street crossings will be provided for TxDOT review and approval parallel to the City review process.
- c. Submittal Review Meeting: Comment review/resolution meetings will be conducted after each submittal. Comments received for each design package will be addressed in the subsequent design package. Meeting minutes will be documented.

12. 100% Design Deliverables: Design drawings to be developed in accordance with the City of San Marcos Engineering/CIP Plan Review Checklist (revised 08/08/2018).

- a. 100% Plans, Specifications, and Estimates: The scale shall be 1"=40' (horizontal) and 1"=10" (vertical).
 - i. 100 Plan set will comprise all sheets previously submitted with 99% deliverable and will be revised per City review comments to 99% Plan Set.
 - 1. Final 100%: LAN will provide two (2) hard copies of 11" x 17" plan sets and one (1) pdf electronic copy. Upon approval by the City, two (2) hard copies of 11" x 17" plan sets, one (1) pdf copy, and one (1) CAD copy will be provided.
 - 2. Construction plans and specifications signed and sealed by a PE licensed in Texas.
 - ii. Final Project Manual.
 - iii. Final Engineer's Opinion of Probable Construction Cost (EOPCC).
- b. Final Construction Project Schedule
- c. 100% Comment Response Letter: Prepare a letter documenting 99% review comments have been addressed in 100% designs. In addition, complete the City's Plan Review Checklist showing designs meet submittal requirements.
- d. Final Engineering Report

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Deliverables Task B.1

Submittal Item:	Submittal Description:
Engineering Report 30% Draft	One electronic copy, in PDF format of the document.
Drainage Technical Memorandum 30% Draft	One electronic copy, in PDF format.
30% Plans and OPCC	LAN will provide two (2) hard copies of 11" x 17" plan sets and one (1) pdf electronic copy.
Survey Data Drawings	One electronic copy, in AutoCAD Civil 3D format.

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SCHEDULE

An estimated schedule is shown in Attachment B. The project schedule is estimated to be 11 months in duration from notice to proceed (NTP).

PROJECT ASSUMPTIONS

This scope of services and associated fee has been developed on a time and materials basis. Costs are included for estimating projected fees; billing will be based on actual rates.

Coordination by LAN with TXDOT, USACE, and TPWD has been estimated at the level of effort expected at this time. After initial consultation with these agencies, level of effort will be re-assessed. All coordination with these agencies will be documented for justification of hours billed.

If substantial changes occur in the project boundary or design plans to require reevaluations after field investigations have been completed, additional services will be supplemental to this Scope of Services.

The fee developed for Flood Mitigation Design assumes the level of vegetation represented in the PER. If major modifications to the level of vegetation are required based on USACE compensatory mitigation requirements after the modeling effort is completed in 30% Design, then additional scope/fee may be required to account for multiple re-iterations of the model.

All survey work within UPRR ROW can be performed with terrestrial scanning equipment which will not require Roadway Worker In Charge (RWIC) to be present. Any scope of services work requiring RWIC will be supplemental to this Scope of Services.

The anticipated tasks proposed for archeological services are dependent upon concurrence of the USACE and THC with AmaTerra's recommendations in their draft report of investigations, as well as any additional investigations requested by the agencies.

Further work at Site 41HY553 would consist of additional shovel testing and backhoe trenching to better determine the nature of its subsurface component and the site's overall boundaries. The need for significance testing or data recovery excavations at site 41HY553 has been noted in previous documentation; should such investigations be necessary, they would proceed under a separate scope and budget.

Long-term assessment of stream and wetland ecological functions will utilize TXRAM. The USACE may require five to 10 years of monitoring through functional assessments. Such future functional assessments could be performed under a separate scope of services and budget.

This Scope of Services does not include a Phase I Environmental Site Assessment (ESA). A Phase I ESA could be performed under a separate scope of services and budget, if needed or required.

For the purposes of this Scope of Services, it is assumed that the preliminary jurisdictional determination (PJD) of WOTUS will suffice for the completion of Section 404 compliance requirements; however, should an Approved Jurisdictional Determination be required, anticipated hours and associated cost are provided as a supplemental task.

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This proposal does not include services for mitigation planning or restoration design outside of the project area.

Upgrades to storm sewer outfalls to the Purgatory Creek channel are not included in this scope of work as they would require analysis of upstream systems; modifications to the existing outfalls have been included but does not include upsizing or significant changes to energy dissipation devices already in place.

A storm water pollution prevention plan (SWPPP) report is not included in this scope. The SWPPP has been proposed to be included in the construction plan set as detailed in the sheet list.

This proposal does not include services for design of mechanical equipment for water harvesting and storage.

This scope does not include channel design alternative analyses for the purpose of USACE Section 404 permitting or submittals to FEMA (e. g. CLOMR/LOMR).

Flagging services for work within the UPRR ROW is not included in this scope of services.

UPRR Standard Specifications will be used for all work on UP ROW.

LEED and SITES accreditation is not included in this scope of services.

Lady Bird Johnson Wildflower Center (LBJWC) has the right to include representations of the design of the project, including photographs and drawings in promotional and professional materials. LBJWC shall not include the Clients confidential or proprietary information if the Clients have previously advised LBJWC in writing of the specific information considered to be confidential or proprietary. The Client shall provide professional credit to LBJWC on promotional or educational materials concerning the project.

CITY RESPONSIBILITIES

The City will perform all coordination with UPRR necessary coordinate improvements that may impact UPRR facilities.

The City will provide a Texas Sales Tax and Use Tax Resale Certificate to not pay sales tax on the boundary survey services.

The City will provide to LAN all data in the City's possession relating to LAN's services on the Project. LAN will reasonably rely upon the accuracy, timeliness, and completeness of the information provided by the City.

The City will give prompt notice to LAN whenever the City observes or becomes aware of any development that affects the scope or timing of LAN Scope of Services.

The City will examine information submitted by LAN and render in writing or otherwise provide comments and decisions in a timely manner.

The City will obtain all necessary right-of-entries from required landowners if access is initially denied to LAN or its subcontractors.

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The City will provide Title Reports for properties with proposed easements.

The City will tag all individual trees in the project survey areas that they would like protected, removed, or noted on the tree plan.

Flow and pressure readings at all points of connection from the City water utilities to support the irrigation design.

Any known existing hydraulic information, subsurface investigations, soil mixes, and any other site-specific investigations.

Any as built drawing documentation, specification, and/or construction plans of the existing facility (if available).

The City will obtain all permanent, access, and temporary construction easements, including services such as appraisal of properties, negotiations with the property owners, and actual purchase of the easements.

The City shall furnish Consultant with available Elevation Certificates to support future LOMR and Benefit Cost Analysis services. Providing available Elevation Certificates will result in reduced effort for finish floor survey included in additional services. Unless otherwise specified, the Consultant may rely upon City-furnished information without independent verification.

UPRR Permit, Flagging and Insurance Fees to be paid by the City.

The City shall designate a single representative to have authority to issue instruction, receive information, interpret and define city policies and make decisions with respect to Consultant's activities.

The City will attend meetings with Consultant, provide feedback, and participate in the services to the extent necessary to allow Consultant to perform the services requested.

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ADDITIONAL SERVICES

Additional Services to be performed, if authorized in writing by the City, but which are not included in the above-described Basic and Supplemental Scope of Services, and once a mutually agreed upon fee is negotiated are as follows:

- Flood Risk Structures Finish Floor Elevations (Phase 1 Area Only); estimated fee is provided in fee sheet as a supplemental task.
- Approved Jurisdictional Determination may be required, anticipated hours and associated cost are provided in the fee sheet as a supplemental task.
- Bathymetry at the Purgatory Channel outfall into the San Marcos River to support the 2D sediment transport analysis if required by TPWD to support the Marl, Sand, Gravel, Shell and Mudshell Permit.
- Benefit Cost Analysis to support grant applications.
- Accompanying the City when meeting with regulatory agencies during the course of the Project, beyond those meetings identified in this proposal.
- Preparing applications and supporting documents that may be required to request a Letter of Map Revision from (LOMR) FEMA.
- Appearing before regulatory agencies or courts as an expert witness in any litigation with third parties or condemnation proceedings arising from the development or construction of the Project, including the preparation of engineering data and reports for assistance to the City.
- Providing professional services associated with the discovery of any hazardous waste or materials in the project site.
- Flagging services for work in the UP ROW.
- Landscape management workshops to provide training on identification of problematic and valuable species, orientation to the timing of recurring maintenance tasks as well as to the tasks themselves and provide a primer on challenges that are likely to develop during the first few years of establishment and how to navigate them. Training workshops would be for City maintenance staff and for Construction Contractor.
- Seed harvesting and plant rescue services. The project site and adjacent sites may contain valuable plant species that are not available commercially. Rescuing individual plants or seed from plant populations likely to be lost to construction activities lessens the overall impact of the project. Ecological restoration projects benefit from the use of local genotypes when possible because local genetic stock is better adapted to site conditions and avoids the possibility of introducing poorly suited genes to adjacent populations. This task would include initial collection during field visit, processing, and storage until construction.

Exhibit A: Channel Topographic & Tree Survey Area

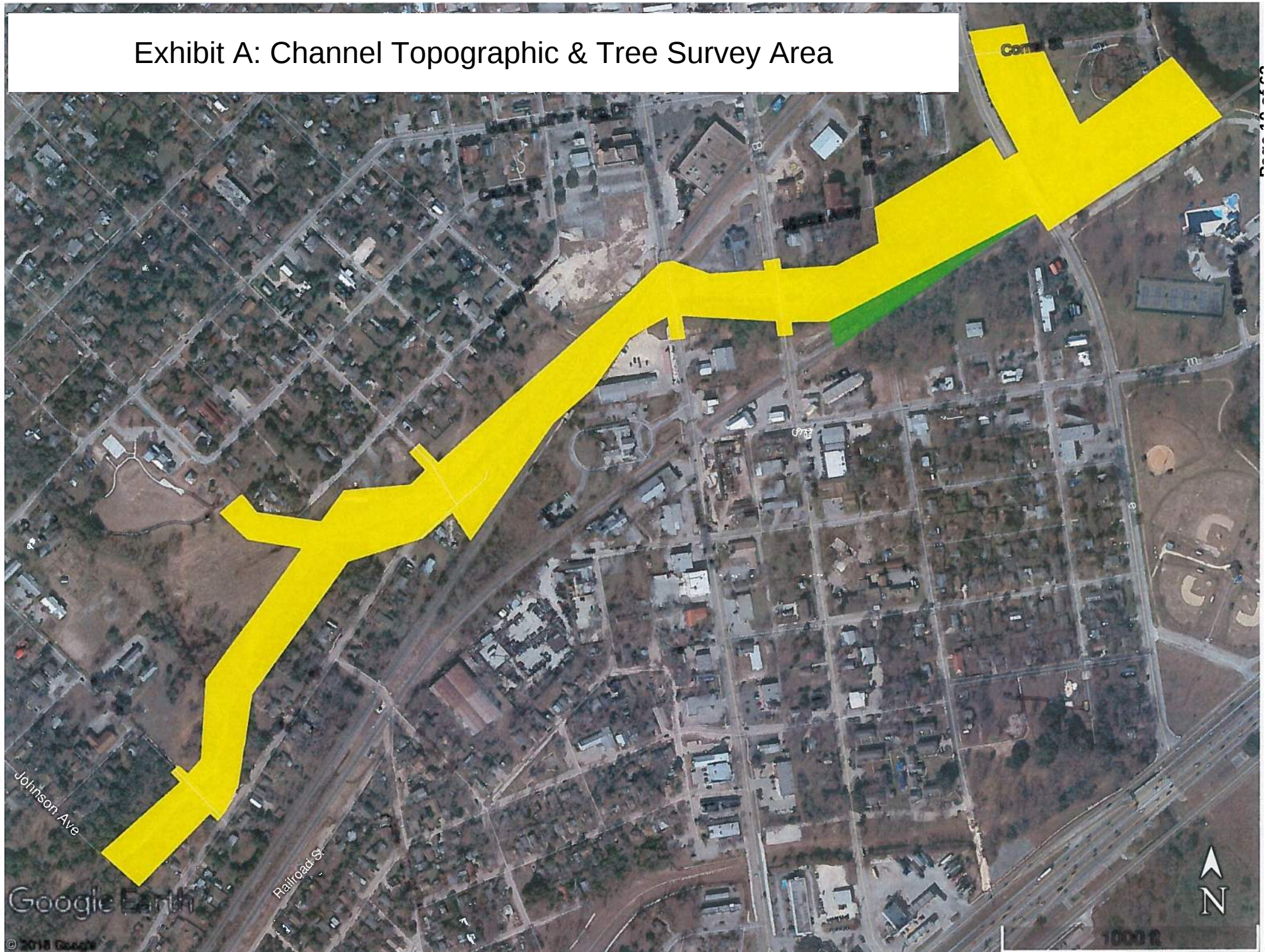


Exhibit B-1: Drainage Master Plan Right-of-Way Survey



Exhibit B-2: DMP #15 Topographic & Tree Survey Area

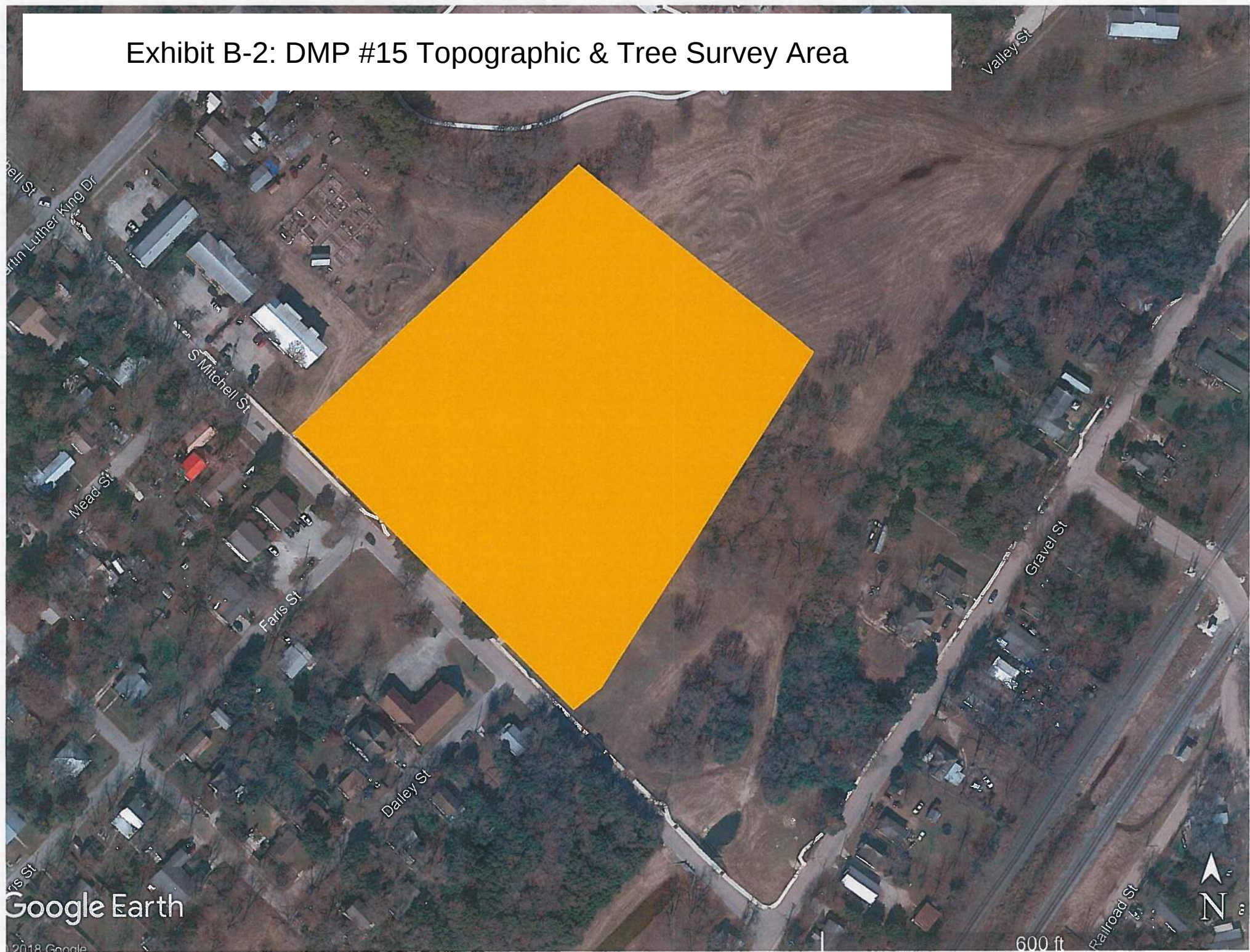
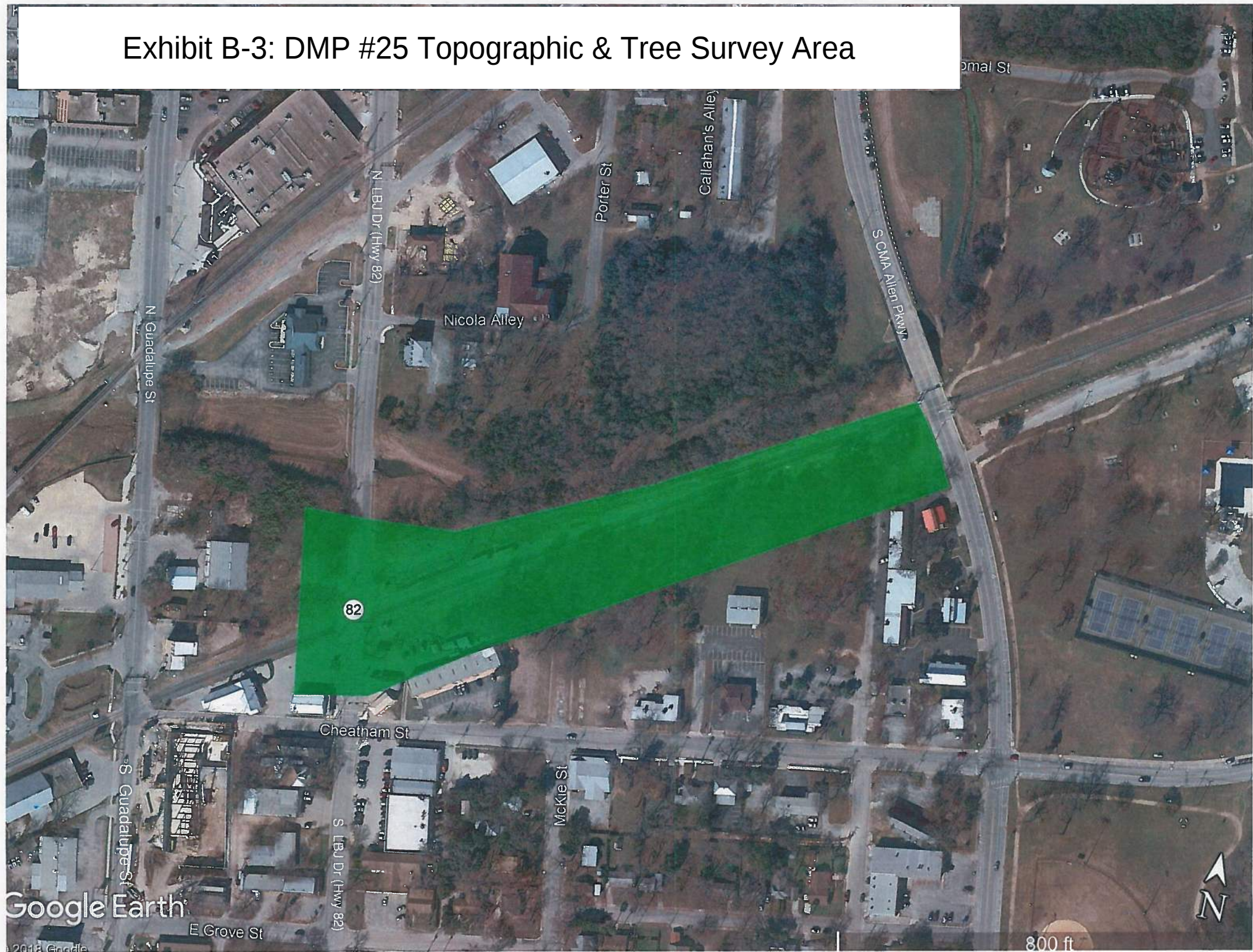
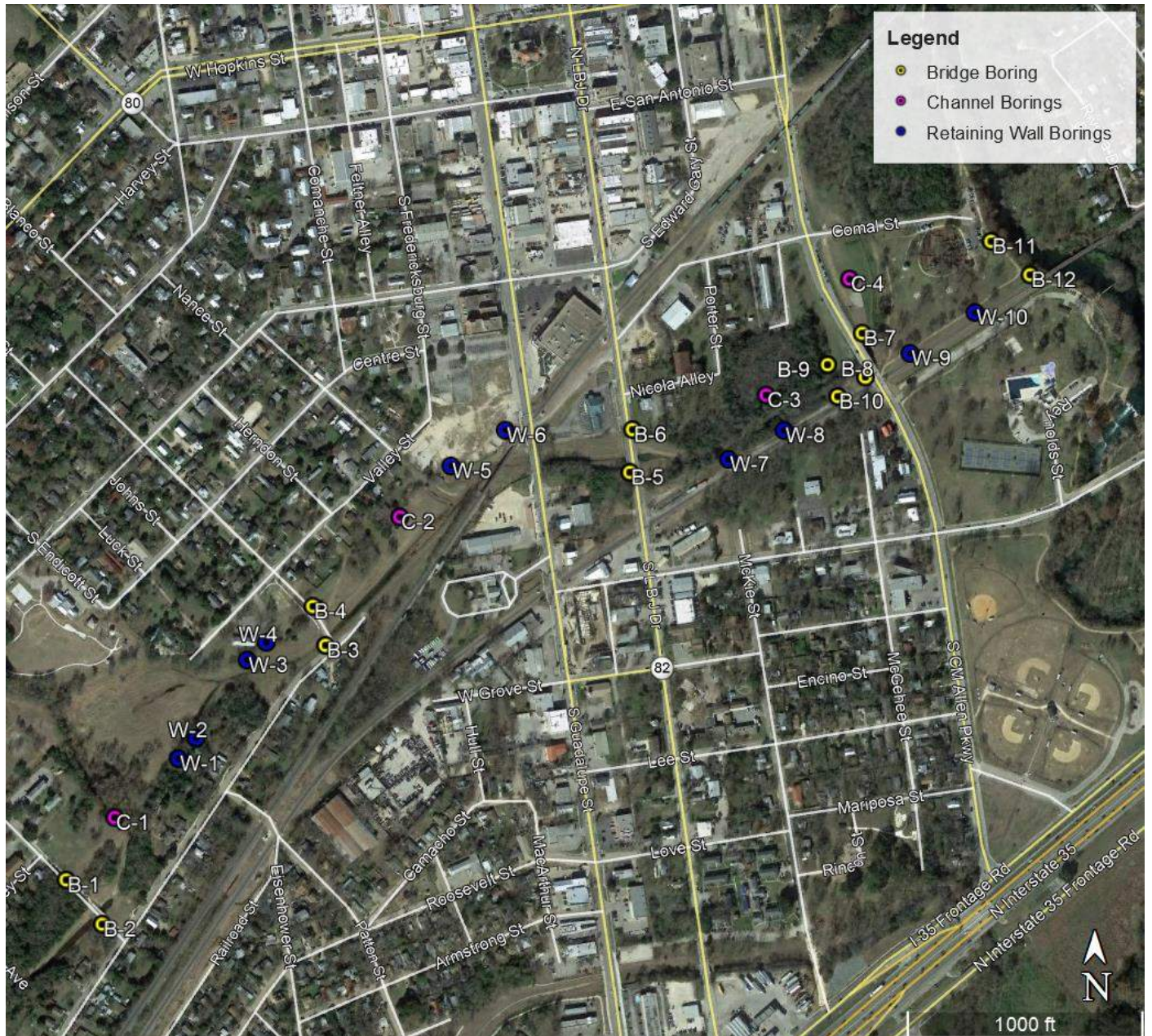


Exhibit B-3: DMP #25 Topographic & Tree Survey Area





Map Source: Google Earth Professional, Imagery Date 12/21/2018

Exhibit C : Boring Locations Plan

ATTACHMENT 2 - Fee Estimate

Prime Provider: Lockwood, Andrews & Newnam, Inc.		FIRMS							LOADED HOURLY NOT TO EXCEED
TASKS	Description	Lockwood, Andrews & Newnam, Inc.	Hicks & Company	Asakura Robinson	Lady Bird Johnson Wildflower Center	Jeffrey L Bruce & Co	Balcones Geotechnical	McGray & McGray	
A	Project Management	\$ 139,690.00							\$ 139,690.00
B	Phase 1 Design (through 30%)	\$ 646,510.00	\$ 144,768.21	\$ 64,878.00	\$ 102,103.20	\$ 29,745.00	\$ 33,620.00	\$ 385,631.50	\$ 1,407,255.91
Labor Subtotals:		\$ 786,200.00	\$ 144,768.21	\$ 64,878.00	\$ 102,103.20	\$ 29,745.00	\$ 33,620.00	\$ 385,631.50	\$ 1,546,945.91
Other Direct Expenses:		\$ 4,188.00	\$ 11,591.00	\$ 1,946.34	\$ 1,186.68	\$ 6,985.00	\$ 78,865.00	\$ -	
LOADED HOURLY NTE SUBTOTALS:		\$ 790,388.00	\$ 156,359.21	\$ 66,824.34	\$ 103,289.88	\$ 36,730.00	\$ 112,485.00	\$ 385,631.50	\$ 1,651,707.93
5% Mark-Ups:			\$ 7,817.96	\$ 3,341.22	\$ 5,164.49	\$ 1,836.50	\$ 5,624.25	\$ 19,281.58	\$ 43,066.00
LOADED HOURLY NTE TOTALS:		\$ 790,388.00	\$ 164,177.17	\$ 70,165.56	\$ 108,454.37	\$ 38,566.50	\$ 118,109.25	\$ 404,913.08	\$ 1,694,773.93
PROVIDER TOTALS:		\$ 833,454.00	\$ 156,359.21	\$ 66,824.34	\$ 103,289.88	\$ 36,730.00	\$ 112,485.00	\$ 385,631.50	\$ 1,694,773.93
Percentage:		46.64%	9.69%	4.14%	6.40%	2.28%	6.97%	23.89%	100.00%
Total Work Authorization No. #:									\$ 1,694,773.93

Notes:
The hours listed in Attachment 2 and Attachment 5 are an estimate. The hours assigned to the Phase are not exclusive to the Phase which they are assigned. The total fee will not exceed the total contract amount as discussed in Article 2. The hourly rates of this contract shall apply throughout the remainder of this contract and to all change in services.

A LAN rate schedule is shown on page 3 of this attachment.

- Payment to the ENGINEER will be made as follows:
- 1.Basic Services - The amounts of these invoices will be based upon the extent of work completed by the Engineer on an hourly basis.

2.Supplemental Services - The Engineer will receive approval in writing before performing supplemental services. The amounts of these invoices will be based upon the extent of work completed by the Engineer on a lump sum basis.

3.Reimbursable Expense -Reimbursable expenses including such things as expenses for plotting, reproduction of documents, auto travel mileage (current IRS approved mileage rate), delivery charges, long distance communications, freight, and state accessibility will be invoiced with appropriate backup documentation.

Invoice and Time of Payment
Invoices will be prepared in a format approved by the City prior to submission of the first monthly invoice. Invoices shall be submitted monthly and paid within 30 days.

ATTACHMENT 2 - Fee Estimate

TASK ID	TASK DESCRIPTION	Project Principal	Project Manager	Technical Manager	Quality Manager/ Technical Lead	PE V	PE IV	PE III	PE II	EIT III	EIT II	EIT I	CADD Supervisor	CADD TECH III	CADD TECH I	ADMIN II	TOTAL HRS.	EXPENSES	TOTAL COSTS
	CONTRACT RATE PER HOUR	\$ 250.00	\$ 200.00	\$ 245.00	\$ 250.00	\$ 225.00	\$ 200.00	\$ 175.00	\$ 160.00	\$ 145.00	\$ 130.00	\$ 115.00	\$ 135.00	\$ 115.00	\$ 95.00	\$ 100.00			
A	Project Management																		
1.	Project Management	20	400	60													480		\$ 99,700.00
2.	Monthly Project Status Meetings		12	4													16		\$ 3,380.00
3.	Kick-off Meetings	2	12	10		16	16										56	\$ 240.00	\$ 12,150.00
	Deliverables																0		\$ -
	Monthly status reports		12	10							10					10	42		\$ 7,150.00
	Project work plan (Develop and Udpate)		16	4							8		8			2	38		\$ 6,500.00
	Project Schedule		6	2													8		\$ 1,690.00
	QA/QC Plan (Develop & Implement)		16	16	8												40		\$ 9,120.00
	HOURS/EXPENSES SUB-TOTALS	22	474	106	8	16	16	0	0	0	18	0	8	0	0	12	680	\$ 240.00	
	TOTAL LABOR COSTS	\$ 5,500.00	\$ 94,800.00	\$ 25,970.00	\$ 2,000.00	\$ 3,600.00	\$ 3,200.00	\$ -	\$ -	\$ -	\$ 2,340.00	\$ -	\$ 1,080.00	\$ -	\$ -	\$ 1,200.00			
	% DISTRIBUTION OF STAFF HOURS	3.2%	69.7%	15.6%	1.2%	2.4%	2.4%	0.0%	0.0%	0.0%	2.6%	0.0%	1.2%	0.0%	0.0%	1.8%			
	SUBTOTAL																	\$ 240.00	\$ 139,690.00
B	Phase 1 Design																		
B.1	30% Design																		
1.	Meetings																0		\$ -
a	Stakeholder Input Meetings																0		\$ -
i	City stakeholder meeting		4	4			4				2						14	\$ 120.00	\$ 2,840.00
ii	Advisory committee meeting		4	4			4				2						14	\$ 120.00	\$ 2,840.00
iii	ADA Community open house		4	4			4				2						14	\$ 240.00	\$ 2,840.00
iv	Public meeting		4	4			4				2						14	\$ 240.00	\$ 2,840.00
b	Project coordination meetings																0		\$ -
i	Utility coordination		1	2					4								7	\$ 60.00	\$ 1,330.00
ii	Habitat conservation		1	2			4										7	\$ 60.00	\$ 1,490.00
iii	Parks department		1	2			4										7	\$ 60.00	\$ 1,490.00
iv	CPTED		1	2			2										5	\$ 60.00	\$ 1,090.00
c	Project review meeting	1	2	2			2										7	\$ 240.00	\$ 1,540.00
2.	Data Collection																0		\$ -
a	Survey		4	10			4				96		8	24			146		\$ 20,370.00
b	Geomorphic Assessment																0		\$ -
i	Desktop Data Analysis						16			40	20	40	8				124		\$ 17,280.00
ii	Field Reconnaissance						36				40	16					92	\$ 1,200.00	\$ 14,240.00
c	Landscape Assessment			4			4					4					12		\$ 2,240.00
d	Geotechnical Investigation			4			4					4					12		\$ 2,240.00
e	Environmental Investigation			4			2					4					10		\$ 1,840.00
f	Archeological Investigation			4								4					8		\$ 1,440.00
g	Geologic Assessment			4			2					4					10		\$ 1,840.00
3.	Project Funding Evaluation and Coordination						16										16	\$ 240.00	\$ 3,200.00
4.	Purgatory Creek Natural Channel Design																0		\$ -
a	Schematic design			2			16				32			12			62		\$ 9,230.00
b	Natural channel design workshop		9	9			12										30		\$ 6,405.00
c	Initial pilot channel design			4			20				20	30		16			90		\$ 12,870.00
d	Purgatory creek sediment transport analysis			4			10	10			20	50		16			110		\$ 14,920.00
e	Channel plans, profiles, and typical cross-sections			8		2	20	20			40	30	12	120			252		\$ 33,980.00
5.	Landscape & Illumination Design			8	20	40	20				60	54					202		\$ 33,970.00
6.	Purgatory Channel Flood Mitigation Design																0		\$ -
a	NOAA Atlas 14 Rainfall Evaluation			24			40	16		52	72	40	16				260		\$ 40,340.00
b	Phase 1 Hydrologic Analysis			8			12			12	40	40					112		\$ 15,900.00
c	Hydraulic Model Development			6			6				40	40		6			98		\$ 13,760.00
d	Phase 1 Hydraulic Analysis			16			24				20	40		60			220		\$ 30,620.00
e	Phase 2 Preliminary Channel and Storage Area Design			12			24		20		20	40		40			156		\$ 23,040.00
f	30% Drainage Tech Memo			8			20				32	12		10			82		\$ 12,650.00
7.	Purgatory Channel utility conflict resolution and design			4					70			140			140		354		\$ 41,580.00
8.	Roadway and Traffic Design			4		12					24			40			80		\$ 11,400.00
9.	Purgatory Channel trail, sidewalk, and pedestrian connectivity design			4		16					32			60			112		\$ 15,640.00
10.	Property requirements evaluation			4		4			20			80					108		\$ 14,280.00
11.	Purgatory Channel Structures Design																0		\$ -
a	Vehicular Bridges			2	8	20			219			269	82	200			800		\$ 107,035.00
b	Pedestrian Bridges			2	2	10			96			162	24	100			396		\$ 51,970.00
c	Retaining Walls			2	2	4			12			20		24			64		\$ 8,870.00
d	Weir and Spillway			2	4		36							24			66		\$ 11,450.00
12.	UPRR Design Deliverables		2	4	16	4					20		8	40			94		\$ 14,560.00
13.	TXDOT Coordination		2	4		8											14		\$ 3,180.00
14.	Deliverables																0	\$ 1,000.00	\$ -
a	30% Plans and Estimates		2	4	4								8	24			42		\$ 6,220.00
b	Survey Drawings		1	2							4			20			27		\$ 3,510.00
c	30% Drainage Tech Memo (hours included above)																0		\$ -
d	30% Engineering Report			4	2		12				80						98		\$ 14,280.00
15.	Permitting																0		\$ -
a	USACE		8	12													20		\$ 4,540.00
b	TPWD		12	16			4										32	\$ 120.00	\$ 7,120.00
c	Record of Agency Coordination		1														1		\$ 200.00
d	Archeologic Curation																0		\$ -
	HOURS/EXPENSES SUB-TOTALS	1	63	235	58	120	388	46	441	184	680	1143	166	836	140	0	4501	\$ 3,948.00	
	TOTAL LABOR COSTS	\$ 250.00	\$ 12,600.00	\$ 57,575.00	\$ 14,500.00	\$ 27,000.00	\$ 77,600.00	\$ 8,050.00	\$ 70,560.00	\$ 26,680.00	\$ 88,400.00	\$ 131,445.00	\$ 22,410.00	\$ 96,140.00	\$ 13,300.00	\$ -			
	% DISTRIBUTION OF STAFF HOURS	0.0%	1.4%	5.2%	1.3%	2.7%	8.6%	1.0%	9.8%	4.1%	15.1%	25.4%	3.7%	18.6%	3.1%	0.0%			
	SUBTOTAL																		\$ 646,510.00
	Expenses (including 5% markup)																		\$ 4,188.00
	TOTAL LAN PROJECT COST																		\$ 790,388.00
	Estimates for Additional Services																		
	Approved Jurisdictional Determination		2														2	\$ 4,644.99	\$ 5,044.99
	Finish Floor Elevation Survey		2	4							12						18	\$ 49,758.45	\$ 52,698.45
	Bridge Aesthetic Design			1		15			15			30		30			91		\$ 12,920.00



ATTACHMENT 2 - Fee Estimate

2019 Standard Rate Schedule

The following professional and support service rates have been established for the Lockwood, Andrews, & Newnam, Inc. (LAN) in calendar year 2019.

Classification	Rate
Project Principal	\$225 - \$300
Quality Manager/Technical Manager	\$225 - \$275
Senior Project Manager	\$200 - \$280
Project Manager	\$160 - \$225
Senior Project Engineer	\$200 - \$275
Project Engineer	\$145 - \$225
Engineer In Training	\$100 - \$160
CAD/GIS Professional	\$90 - \$135
Administrative Assistant	\$80 - \$100

Travel and Subsistence:

All travel and subsistence expenses will be invoiced at actual cost plus five (5) percent. Cost of mileage for private and company vehicles is computed at the prevailing rate designated by the U.S. Internal Revenue Service.

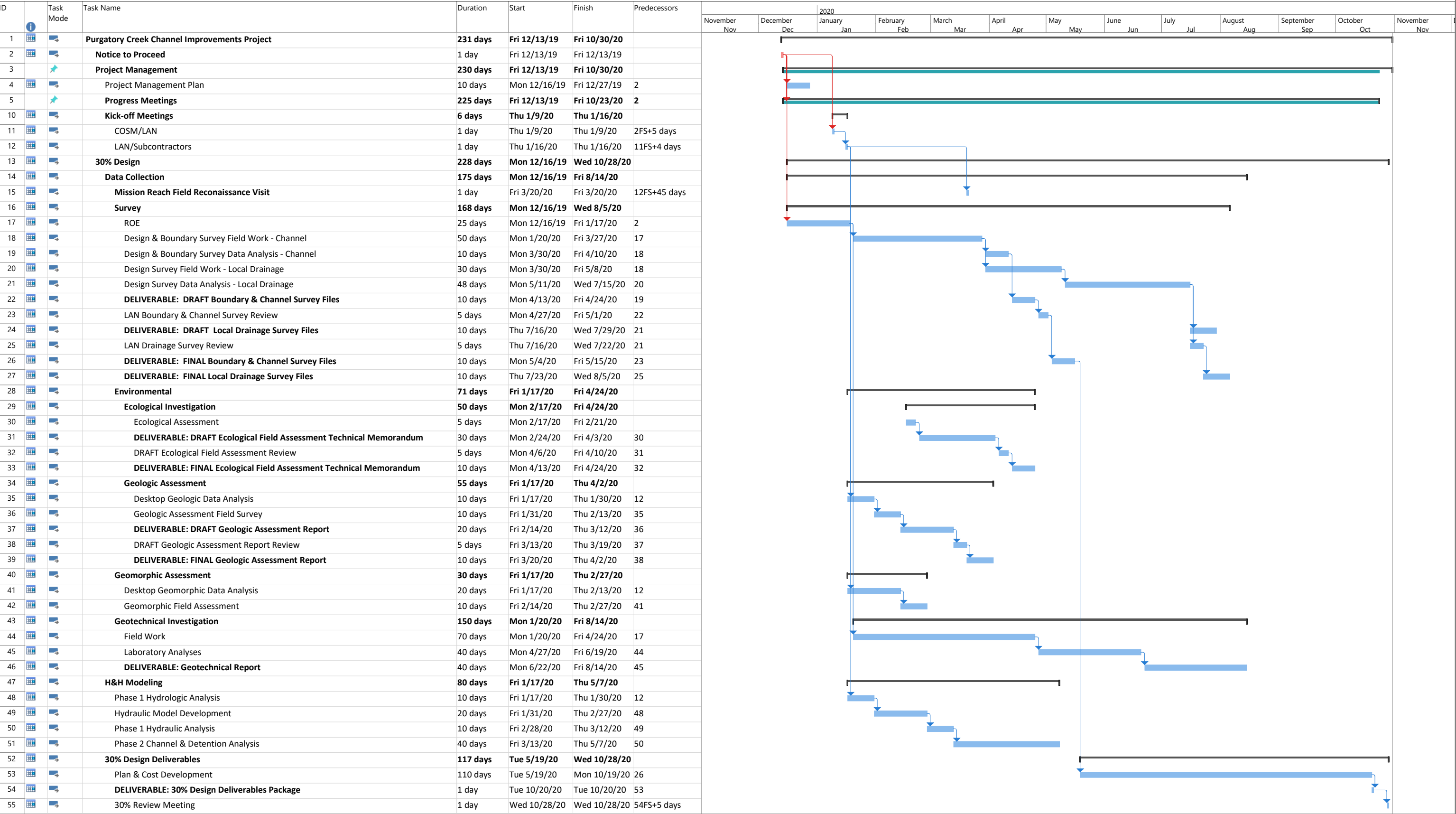
Purchased Services:

All purchased services are invoiced at actual cost plus five (5) percent. These include but are not limited to reproduction, rented or leased equipment, etc.

Subconsultant Services:

All subconsultant services (survey, geotechnical, landscape architecture, etc.) are invoiced at cost plus five (5) percent.

ATTACHMENT 3 - ESTIMATED PROJECT SCHEDULE





Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Project: Purgatory Channel Improvements
30% Design

Task		Summary		Inactive Milestone		Duration-only		Start-only		External Milestone		Critical Split	
Split		Project Summary		Inactive Summary		Manual Summary Rollup		Finish-only		Deadline		Progress	
Milestone		Inactive Task		Manual Task		Manual Summary		External Tasks		Critical		Manual Progress	

Attachment 4 – Statement of Qualifications

STATEMENT OF QUALIFICATIONS FOR

Purgatory Creek Channel Improvements Final Design Proposal



Prepared for:
City of San Marcos



**Lockwood, Andrews
& Newnam, Inc.**
A LEO A DALY COMPANY

The City of San Marcos (City) has a holistic vision for the design of the Purgatory Creek Channel Improvements, incorporating ecological function and human interactivity into the base flood mitigation project. The LAN team is committed and well-suited to the development of this vision. LAN's extensive in-house resources are bolstered by the expertise of our subconsultants Hicks & Co., Asakura Robinson, Jeffrey L. Bruce & Co., The Lady Bird Johnson Wildflower Center, McGray & McGray, and Balcones Geotechnical. These firms will serve as extensions of our staff, forming a team that will build on established knowledge of the project area, stakeholder objectives, and the complex nature of the combined project elements to drive this project to a successful completion. Together, the LAN team seeks to provide a functional and sustainable design that the San Marcos community can be proud of.

LAN will act as the Prime firm for the Purgatory Creek project, providing:

- ✓ Project Management
- ✓ Project Funding Solutions
- ✓ Geomorphic Assessment
- ✓ City of San Marcos Permitting
- ✓ TxDOT Coordination
- ✓ Natural Channel Design
- ✓ Vehicular Bridge Design
- ✓ Pedestrian Bridge Design
- ✓ Retaining Walls Design
- ✓ Scour Analysis
- ✓ Storm Sewer Design
- ✓ Drainage Improvement Projects
- ✓ Spillway Design
- ✓ Trails, Sidewalks, and Pedestrian Connectivity
- ✓ Utility Relocations
- ✓ Property Requirements Evaluation
- ✓ E&S Controls
- ✓ Roadway Design
- ✓ Traffic Controls
- ✓ Full PS&E Development
- ✓ H&H Modeling

LAN Experience in Similar Projects

The LAN team has significant experience taking flood risk reduction projects from problem definition through construction, operation, and maintenance. Our ability is demonstrated through projects such as the Cottonmouth Creek Riparian Restoration, the Plum Creek Goforth Rd. Crossing, and the IH45/IH10 Drainage Study (pp. 6-8)

Coordinated Team

Jennifer Miller, PE will act as Project Manager, keeping the team on schedule and on budget, and incorporating subconsultant work into the design. She will maintain a risk register to stay on top of potential issues affecting deliverables, and will lead client and stakeholder communications. This allows the technical team, led by Thomas Mountz, PE, D.WRE, CFM, to fully focus on the technical requirements of the project. Tom brings 46 years of experience leading flood mitigation and stream restoration projects. Previously Project Manager for the San Marcos Watershed Master Plan, Tom has extensive knowledge of the project area.

Permitting Expertise

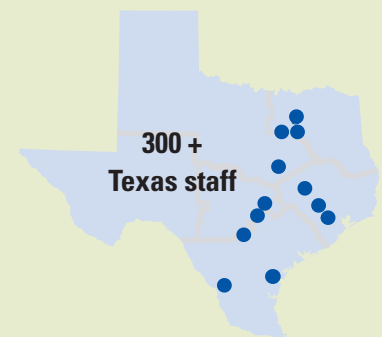
The project team understands that stakeholder coordination and permitting requirements are critical elements of this project. Our team has an extensive background of work and coordination with the USACE, UPRR, TxDOT, and TPWD.

Local Address

Lockwood, Andrews & Newnam, Inc.
407 S. Stagecoach
Suite 207
San Marcos, TX 78666

Staffing

- ▶ 350+ total full time personnel
- ▶ 117 Professional Engineers
- ▶ 35 Stormwater Management Professionals



The following pages display our proposed Organization Chart, summaries of our subconsultants, example project experience, and resumes of the relevant team members.

Team Snapshot



600+ Years

of combined key team member experience



Local Team

Local Office staff know the area and have Purgatory Creek experience



Expertise

Team members include experts in hydrology, ecological design, and stream restoration



Team Organization & Background



Firm Key

LAN (LAN)	Asakura Robinson (AR)
Lady Bird Johnson	McGray & McGray (M&M)
Wildflower Center (LBWC)	Balcones Geotechnical (BG)
Jeffrey L. Bruce & Company (JLB)	Hicks & Co. (HC)

Project Principal

Travis Michel, PE (LAN)

Project Manager

Jennifer Miller, PE (LAN)

Technical Management

Thomas Mountz, PE, D.WRE, CFM (LAN)

Project Engineer

Laura Casset, PE, CFM, CPESC (LAN)

Analysis & Assessments

H&H Analysis

Laura Casset, PE, CFM, CPESC (LAN)

Geomorphic Assessment

Laura Casset, PE, CFM, CPESC (LAN)

Water Quality Analysis

Dr. Ka-Leung Lee, PE, CFM, CPSWQ (LAN)

Sediment Transport Analysis

Yu-Chun Su, Ph.D, PE, CFM, CPESC, CPSWQ (LAN)

Scour Analysis

Laura Casset, PE, CFM, CPESC (LAN)

Design

Natural Channel

Laura Casset, PE, CFM, CPESC (LAN)

Water Quality

Justin Murray, PE (LAN)
Dr. Ka-Leung Lee, PE, CFM, CPSWQ (LAN)

Vehicular & Pedestrian Bridge

Jason Martwig, PE (LAN)

Storm Sewer & Drainage

Justin Murray, PE (LAN)

Retaining Wall & Spillway

Jennifer Savage, PE (LAN)

Roadway & Traffic Control

Scott Harris, PE (LAN)

Erosion & Sedimentation Controls

Dr. Yu-Chun Su, PE, CFM, CPESC, CPSWQ (LAN)

Trail & Sidewalk

Pat Acker, PE (LAN)

Illumination

Denney Howard, PE, LEED Green Assoc (LAN)

Support Services

Project Funding Solutions

Laura Casset, PE, CFM, CPESC (LAN)

Utility Relocations

Will Chandler, PE (LAN)

UPRR Design Review

Dave Clary, PE (LAN)

TxDOT Coordination

Jason Martwig, PE (LAN)

USACE & TPWD Permitting

Hicks and Company

Project Lead

Roy Frye

Environmental Lead

Jim Herrington, PWS

Cultural Resources Lead

Brandon Young, RPA

Landscape Architecture/ Placemaking/Wayfinding

Asakura Robinson

Project Lead

Claire Eddleman-Heath, PLA, LEED AP BC+C

Ecology Lead

Katie Coyne, AICP, ESA

Soil Design

Jeffrey L Bruce & Company

Project Lead

David Stokes, PSA, ASLA

Soil Science Lead

Chuck Dixon

Engineered Soils

Jeffrey Bruce, FASLA, FASIC, LEEP, GRP

Upland, Creek, and Wetland Restoration

Lady Bird Johnson Wildflower Center

Project Lead

John Hart Asher, MLA

Ecology Lead

Michelle Bertelsen

Survey

McGray & McGray

Project Lead

Chris Conrad, RPLS

Geotechnical Engineering

Balcones Geotechnical

Project Lead

Rebecca Russo, PE

Hicks & Company



Pictured: Marshall Biological Survey

Providing:

- ✓ USACE & TPWD Permitting
- ✓ TXRAM Score Evaluation
- ✓ Compensatory Mitigation Plan
- ✓ Riparian Vegetation Management Plan
- ✓ Biologic & Geologic Assessments

Hicks & Company is an environmental consulting firm that provides a full range of environmental management and planning services for development projects. Staffed by expert ecologists, geologists, archeologists, planners, cartographers, noise and air quality specialists, and an environmental attorney, the firm supports the studies and documentation required to comply with relevant acts and programs. Hicks & Company has an established relationship with LAN, having supported over 20 water, wastewater, civil and transportation projects.

Jim Herrington will act as Permitting Environmental Lead for Purgatory Creek, heading USACE-related work. A certified Professional Wetland Scientist, Jim served the USACE for eight years as Regulatory Project Manager, and has further experience with the USEPA, USDA, and USFS.

Asakura Robinson



Pictured: Landa Park & Arboretum Master Plan Concept

Providing:

- ✓ Landscape Architecture PS&E
- ✓ Trail Layout
- ✓ Wayfinding
- ✓ Place Making
- ✓ Renderings

Asakura Robinson is a planning, urban design, and landscape architecture firm which seeks to strengthen environments and positively impact communities through innovation, engagement, and an integrated design process. The firm is dedicated to the protection and restoration of the ecological and economic vitality of native landscapes. Having completed 50+ LEED Certified/ LID projects, they are exceptionally experienced in providing a sustainable, context-sensitive project approach that marries utilities and amenities.

Asakura Robinson has been a partner of LAN on numerous projects including the Harris County Flood Control District's Phase 1 Lauder Stormwater Detention Basin along Greens Bayou, for which they provided a conceptual layout design that was effectively integrated into the H&H modeling and improvement concept.

Jeffrey L. Bruce & Company



Pictured: Boulder Creek Civic Area

Providing:

- ✓ Engineered Soils
- ✓ Soil Mapping
- ✓ Soil Profile Design PS&E
- ✓ Microbiological Analysis of soil

Jeffrey L. Bruce & Company (JBC) is a nationally-recognized landscape architecture firm. Past projects have included engineered and biological soil components, urban agronomy, green roof technology, soil and plant fertility, maintenance programming, and irrigation engineering. This work has spanned areas including 100-year floodplains, public and urban spaces, restorative landscape ecologies, and areas of storm sewer concern.

JBC builds on a background of work in the notoriously difficult agronomic systems of engineered soils for high performance sports, as well as in Integrated Water Management techniques. This enables a creative, sustainable perspective that understands the landscape as both a science and a stage for human-scale interaction and reflection.

The Lady Bird Johnson Wildflower Center



Pictured: Bluestem Park at Alliance Town Center

Providing:

- ✓ Innovative Restoration
- ✓ Riparian Vegetation Maintenance Plan
- ✓ Maintenance Workshops (optional)

The Lady Bird Johnson Wildflower Center (LBJWC) is an Organized Research Unit of the University of Texas at Austin. A leader in sustainable landscape practices and ecosystem design for over 30 years, the mission of the Center is to conserve, restore and create healthy landscapes; increasing the sustainable use and conservation of native wildflowers and plants.

The LBJWC will work with the design team to assist in the creation of an integrated plan that works to enhance ecological performance and efficiency, while adhering to the main goals of hydrologic function. This includes optimizing ecosystem services (i.e. stormwater management, air and water quality improvement, carbon sequestration, landscape restoration and conservation) while maintaining construction and maintenance realities.

McGray & McGray



Pictured: FEMA Flood Studies

Providing:

- ✓ Right-of-Entries (ROE)
- ✓ Topographic and Tree Survey (1-ft Contours)
- ✓ ROW Survey

McGray & McGray has a proven record of working with design engineers on a wide range of projects. The firm specializes in topographic design and boundary surveys of all sizes, right-of-way acquisition, water/wastewater/stormwater, drainage and flood studies, streambank stabilization projects, tree surveys, park projects, asbuilt surveys, and aerial mapping control.

McGray & McGray ensure that field crew chiefs are not just data collectors, but capable of onsite calculations and an understanding of the end product. Support is provided by RPLSs with 175+ years of combined experience, CST and SIT technicians, and dedicated QA/QC staff. Historically, the firm has proven capable of surveying 42 miles of creek bed with 100+ structures in just seven weeks, and has worked with LAN on projects including City of Austin Corridor Engineering at South Lamar – an estimated \$40M project.

Balcones Geotechnical



Providing:

- ✓ Geotechnical Engineering (Retaining walls, bridge/culverts, utility, channel/slope, spillway)
- ✓ Soil Sieve Analysis for Sediment Transport
- ✓ Scour Analysis Support

Balcones Geotechnical (Balcones) was formed on the back of John A. Wooley's 40+ years of experience in geotechnical studies. The firm has worked on a multitude of geotechnical projects, with expertise in shallow foundation investigations, retaining wall design, earthen embankments and levees, and dams. Headed by Rebecca Russo, PE as President, Balcones is particularly well-versed in optimizing design of foundations for the specific soil conditions of Texas, and in advanced analytical modeling for design of geotechnical structures.

Experience working with LAN includes the provision of geotechnical support for the repair of a flood-damaged segment of channel bank of the San Marcos River at the Palmetto State Park. The team provided preliminary engineering including data collection and review, permitting, and repair method recommendations, going on to provide design- and construction-phase services.

Office Locations

Hicks & Company
1504 West 5th Street
Austin, Texas 78703

Asakura Robinson
816 Congress Ave
Austin, Texas 78701

Jeffrey L. Bruce & Co.
1907 Swift Street, Suite 204
North Kansas City, Missouri 64116

Lady Bird Johnson Wildflower Center
4801 La Crosse Avenue
Austin, Texas 78739-1702

McGray & McGray
Land Surveyors, Inc.
3301 Hancock Drive, Suite 6
Austin, Texas 78731

Balcones Geotechnical
5926 Balcones Drive, Suite 230
Austin, TX 78731





Cottonmouth Creek Riparian Restoration Austin, Texas

Firm

LAN

Client

Brookfield Residential Properties

Cost

\$4M (estimated)

Contact

Luke Gosda
Development Manager
512.391.1345

Team Members Involved

Laura Casset
Will Chandler

Project Description

LAN led the design and construction oversight for this riparian restoration project on an impaired portion of Cottonmouth Creek – an ephemeral headwater stream in Austin that flows into Onion Creek. The pre-project creek corridor displayed typical characteristics of an agricultural history that now lies dormant. There were very few native grasses, and, due to the absence of natural disturbance, low-quality herbaceous annuals and opportunistic woody plants. Other conditions included channel erosion with head-cutting/channel incision, likely accelerated by the 2015 Halloween floods.

LAN's design included restoring a headwater Blackland Prairie creek corridor through grading modifications and strategic planting schemes, as well as vegetative stabilization and permanent stormwater controls. Extension of adjacent pedestrian trail networks and four pedestrian low water crossings were also incorporated. Ecological restoration objectives included: improving floodplain health by increasing its complexity and hydrologic connectivity; diversifying habitat types to support riparian forest, moist meadow, and upland grassland; establishing species diversity within habitat types; enhancing water quality benefits and groundwater recharge; and addressing erosion.

Permanent stormwater infrastructure included four detention basins which integrate with the storm drain networks of adjacent subdivisions, and four infiltration basins to improve the quality of runoff to the creek. The landscaping works comprise iterative herbicide application and hand-removal of invasive species, no-till seed drilling to establish improved ground cover for long-term stabilization, and installation of stand-plant groupings for substantial and strategic near-term stabilization. Through extensive coordination with City of Austin Development Services Department reviewers, LAN designed pragmatic site erosion and sedimentation controls to minimize the impact of construction on Cottonmouth Creek. These include prohibiting equipment access within the critical water quality zone, establishing a network of temporary mulch paths for limited equipment access within the remainder of construction limits, and aligning filtration measures to delineate planting extents prohibit impacts to Waters of the U.S.

Project Highlights

- ▶ Extensive dewatering
- ▶ Phased erosion and sedimentation control solutions.
- ▶ Adherence to City guidelines
- ▶ Utilization of planting schemes and Waters of the U.S. and natural boundaries for proposed control measures.



Plum Creek Crossing at Goforth Road

Kyle, Texas

Firm

LAN

Client

City of Kyle

Cost

\$6.9M

Contact

Jo Ann Garcia, PE
City of Kyle Project Manager
512.293.5597

Team Members Involved

Dr. Ka Leung Lee
Travis Michel

Project Description

LAN designed 1.4 miles of roadway reconstruction for Goforth Road, widening the existing 2-lane roadway section to a curb and gutter 3-lane, with a center two-way left turn lane within the southern section. Additionally, the 4-lane roadway section was widened to utilize two lanes in each direction within the northern section. The project also included a bridge over Plum Creek, sidewalks and shared use paths (SUP), utility relocations, floodplain coordination, geotechnical engineering, intersection design, drainage, traffic control, ADA facilities, signing and pavement marking, and illumination.

The Plum Creek bridge replaced existing culverts and required the development of HEC-RAS and HEC-HMS models to understand drainage impacts. LAN's hydraulic analysis found that significant vegetation along the Plum Creek Channel increased the water surface elevation. Rather than accepting this condition and the resultant necessity to lengthen the bridge, LAN developed a tree limb trimming task within the plans, trimming all limbs below the 100-year water surface elevation up and downstream of the bridge. By reducing the Manning's n-value within Plum Creek, water can pass under the bridge slightly quicker with a lower water surface elevation, but with velocities still less than 6 feet per second. This allowed for a 100-foot 3-span bridge instead of a 120-foot span bridge, saving the City of Kyle more than \$50,000.

Additional construction cost savings were built in to the bridge's design. The typical section through the bridge was minimized, and the bridge itself was shortened as much as was hydraulically feasible. Additionally, bridge bents were skewed in line with the Plum Creek flow to increase hydraulic efficiency. Since the storm drain was located under the roadway and there was limited ROW to outfall outside the bridge limits, the storm drain was carried underneath the bridge abutments with outfall into the creek through the stone protection riprap. This required re-spacing of abutment drilled shafts in order to provide clearance between structures.



It's inevitable when an existing roadway is being reconstructed that development challenges will be encountered and as these issues arose, [the LAN] team were there providing guidance and resolving issues. Construction change orders total less than 2% on our project."

— Jo Ann Garcia, PE, City of Kyle
Project Manager



Firm
LAN

Client
Texas Department of Transportation

Cost
\$95.4M

Contact
Elie Alkhoury, PE
Transportation Supervising Engineer
713.802.5000

Team Members Involved

Dr. Ka Leung Lee
Jason Martwig
Justin Murray

Project Highlights

- ▶ Calibrated a complex unsteady hydraulic model consisting of multiple bayous
- ▶ Developed mitigation scenarios involving different combinations of canal bypasses, regional detention, and channel improvements

TxDOT: Seg3-IH45/IH10 Drainage Study Houston, Texas

Project Description

The Texas Department of Transportation (TxDOT) Houston District is proposing to improve the existing Interstate Highway 45 (IH-45) to address the traffic capacity limitations and obsolete functionality of certain aspects of the corridor, as a part of the North Houston Highway Improvement Project (NHHIP). TxDOT contracted LAN for the preparation of a preliminary drainage analysis for Segment 3D of NHHIP. The scope of services included the following elements:

- ▶ Open channel hydraulic analysis of White Oak Bayou and Buffalo Bayou to evaluate the effect of proposed roadway and channel improvements.
- ▶ Preliminary drainage analysis and design for Segment 3D roadway reconstruction. The analysis involved estimating the runoff impacts due to increase in impervious cover and hydraulic system improvements and mitigating increased runoff.
- ▶ Mitigation measures for fill placed within the FEMA 100-year floodplain related to Segment 3D reconstruction.

Project Description

LAN produced a detailed drainage impact study, building on assessment of existing drainage infrastructures to provide mitigation measures for the site and form the basis of the proposed drainage design. An unsteady HEC-RAS model was developed to evaluate the effect of the proposed roadway and channel improvements. The model consisted of White Oak, Little White Oak, and Buffalo Bayous, and was based on existing effective models provided by the Harris County Flood Control District (HCFCD).

The model was calibrated with data of three historic storm events: Memorial Day (May 25th to 26th, 2015), Tax Day (April 18th, 2016) and Harvey (August 26th to 29th, 2017), with part of the calibration process including evaluation of the reliability of observed data. The rainfall, peak stages recorded at USGS gages, and high-water marks were observed, and the Memorial Day high-water marks on White Oak Bayou were found to be highly questionable since they were inconsistent with the rest of the data. By removing these results from the calibration and honing the remaining data, the model was calibrated within one foot differences between computed and observed water levels.

After calibration, the model was used to evaluate benefits and impacts for the project. Roadway improvements of the project included realignment, widening, profile adjustments, bridge addition and removal. The related changes in HEC-RAS geometry were incorporated in an unmitigated proposed condition model. LAN analyzed many proposed mitigation scenarios involving different combinations of canal bypasses, regional detention, and channel improvements.



Landa Park & Arboretum Master Plan New Braunfels, Texas

Firm

Asakura Robinson

Client

City of New Braunfels

Cost

\$10M-15M (estimated construction)

Contact

Stacey Laird Dicke, *Director of Parks & Recreation*
830.221.4350

Situated close to downtown New Braunfels and on the Comal River, Landa Park & Arboretum is a 50-acre park that combines an impressive array of features from a natural swimming pool fed by the Comal Springs – the largest springs in Texas – to walking paths, picnic areas, play areas, a lake and boathouse, many historic sites, and of course the arboretum itself which includes 54 species of trees dispersed throughout the park.

To address the park's age and heavy use, Asakura Robinson's master planning work focused on several core themes including improving accessibility, circulation, wayfinding, programming, parking, and site management, as well as a facilities assessment – all driven by a rigorous 12-month community-led process. The project encompassed conservation areas, riparian zones, and existing stormwater infrastructure. The resulting Master Plan was the first for one of Texas' oldest and most beloved city parks.

Mission Reach Restoration San Antonio, Texas

Firm

The Lady Bird Johnson Wildflower Center (LBJWC)

Client

San Antonio River Authority (SARA)

Cost

\$271M (total Mission Reach project)

Contact

Charissa A. Kelly, *Biologist, USACE*
817.886.1759

The LBJWC rehabilitated and enhanced the hydrological and ecological function of eight miles of the San Antonio River through urban San Antonio for this project — part of the nation's largest urban ecosystem restoration. The resulting landscape provides stability and maintainable flood control, while returning sections of the river to their natural meanders and adding amenities and recreational opportunities along the way. The river and accompanying pathway also offer cultural opportunities by connecting four historic missions.

Working with the USACE, the LBJWC developed the native plant community composition to maximize habitat performance within the hydrological design. The project's 334-acre riparian woodland represents nearly 100 native tree, flower, and grass species, employed due to their natural suitability and attributes including strong holding on steep river banks. Restoration efforts included improving previously deteriorated soils to bolster native growth, and custom forb and grass seed mixes for specific ecosystem typologies. LBJWC designers also helped develop a manual to guide SARA in their efforts to sustain and grow the habitat.





Laguna Gloria Sculpture Garden

Austin, Texas

Firm

Jeffrey L. Bruce & Company

Client

Reed Hilderbrand LLC

Cost

\$4.7M

Contact

John Hart Asher, MLA
512.232.0109

Laguna Gloria, formerly known as the AMOA-Arthouse at Laguna Gloria, is the former home of Clara Driscoll and site of a 1916 Italianate-style villa on the shores of Lake Austin in Austin, Texas. It was the original home of the Austin Museum of Art and still houses some of its collections.

Reed Hilderbrand was charged with reconceiving the entire 18-acre estate, including the woods, meadow, waterfront and Italianate 1916 Driscoll Villa to create an unparalleled art-in-nature experience, including the new Betty and Edward Marcus Sculpture Park. Working with Reed Hilderbrand and the Ladybird Johnson Wildflower Center, JBC is tasked with agronomic assessment of native soil and water management in support of the ongoing ecological restoration and invasive species removal phase. The project is multi-phased, with Phase 1 documents focusing on the visitor's experience via the Betty and Edward Marcus Sculpture Park arrival pavilion and entry court.

SH 130 EIS, Mitigation and Monitoring, and Compliance

Various Locations, Texas

Firm

Hicks & Company

Client

Texas Department of Transportation

Cost

\$1.3B (total SH 130 project)

Contact

Scott Yardas, PE, CRC
scott.yardas@crc183.com

Hicks & Company (H&C) had multi-faceted involvement with the design and construction of the 91-mile SH 130 new location toll road in Williamson, Travis, Caldwell, and Guadalupe Counties. In addition to leading the development and preparation of an Environmental Impact Statement for the project, the firm also led efforts to ensure environmental compliance of the project with Section 404 of the Clean Water Act, requiring the issuance of an individual permit. H&C led implementation of the permit conditions, preparing a detailed compensatory mitigation plan to offset unavoidable adverse impacts to waters of the US and riparian buffers.

Substantial coordination occurred between H&C, TxDOT, the design/build developer, and Lone Star Infrastructure to ensure compliance with the conditions of the Individual Section 404 Permit, which ultimately led to multiple design submittals. H&C prepared a detailed Compensatory Mitigation Plan, describing measures for the acquisition, development, operation, and monitoring of a 265-acre tract along Plum Creek, and establishing 175 acres of numerous categories of wetlands and riparian buffers. Recommendations of species planting were approved by the USACE and included in project construction.





17 Years of
Experience

Jennifer Miller, PE

Project Manager

Experience

Purgatory Creek Channel Improvements – City of San Marcos, Texas: Deputy Project Manager/Project Engineer for preliminary engineering phase of the Purgatory Creek Channel Improvements Project. Jennifer developed the preliminary engineering report and was responsible for managing stakeholder input, property and utility evaluation; determining permitting requirements at the federal, state, and local levels; and leading junior engineers in preparation of report exhibits. Jennifer developed and presented project presentations at the City's public meetings, taking up the project management role and leading the project to completion following the departure of the original Project Manager.

Mercury and Hazardous Air Pollutant Emission Reduction Project – Lower Colorado River Authority: Project Manager for a full-scale demonstration of mercury and air toxics (MATS) compliance technologies. Jennifer developed the technology evaluation test plan for two coal-fired units with different unit operations – a program that evaluated multiple technologies and balance of plant effects to determine impacts to byproduct sales and existing air pollution control systems. Jennifer was on-site during the entire three-month test program to lead the 20+ engineers, subconsultants, and scientists on execution of the program, including operation of technologies and sampling, and measurement of process streams (gas, liquid, and solid phases). She analyzed test results on the spot and provided test direction that adapted to changing site conditions. After testing, Jennifer created a comprehensive report that detailed important findings and provided recommendations for LCRA's CIP. She was awarded a follow-on contract to be an on-call subject matter expert for MATS compliance.

MATS Compliance – Lower Colorado River Authority, Austin, Texas: Project Manager for this engineering consulting project to help LCRA achieve MATS compliance for three coal-fired units. During this project, Jennifer participated in and led a team of technical experts to review deliverables from LCRA's A&E contractor and subcontractors. She provided timely guidance to help LCRA make business decisions regarding CIP projects involving installation of control technologies and measurement devices, and developed additions to the existing environmental quality control plan, as well as a chemical selection test plan for determining the best commercially available products for LCRA to use. Jennifer also evaluated data from LCRA's measurement and testing subcontractors, and evaluated the balance of plant effects from selected control technologies.

Fallwell Lane Improvements – City of Austin, Texas: Deputy Project Manager/Senior Engineer for development of preliminary engineering designs for streambank stabilization of a stretch of 2,000 feet of the Colorado River bank located near SH 130. Jennifer evaluated options for restoring a water intake structure located in the Colorado River for the Sand Hill Energy Center after damage from extreme flooding events in 2013 and 2015. She developed exhibits and construction cost estimates for three streambank stabilization options ranging from soft (vegetative) to hard (retaining wall) engineering designs.

Education

Bachelor of Science | Chemical Engineering | The University of Texas at Austin | 2002

License/Certifications

Texas Professional Engineer No. 134951

Background

Jennifer has 17 years of experience as a Process Engineer, with 14 years of project management experience. She excels at organizing and leading teams of multidisciplinary engineers, scientists, and subcontractors to execute complex tasks, driving projects to completion and acceptance. Jennifer thoughtfully plans project critical paths and leads project teams with clear communication of goals. She knows how to build consensus on critical initiatives and has the situational awareness to adapt management style to changing circumstances.

Jennifer is experienced in the areas of water and wastewater engineering, technology evaluation and development, and process engineering. Her project management experience has included team development, critical path evaluations, risk analysis and management, communication planning, QA/QC planning, and project controls.

Time at LAN (Years)

1.2





18 Years of
Experience

Travis Michel, PE

Project Principal

Experience

Purgatory Creek Channel Improvements – City of San Marcos, Texas: Project Principal for the watershed scale drainage study, modeling, and improvement evaluation of Purgatory Creek. The project also included a PER with design recommendations for reducing flood risk for approximately 6,100 LF of the Creek, and reductions in downstream water surface elevations. Travis was responsible for reviewing overall project scope and quality plan, directing quality reviews, and coordinating staff resources among numerous offices.

Coers Drive Drainage Improvements – City of San Marcos, Texas: Opportunity Manager for this assessment of flooding conditions with a 2D hydraulic model, identifying solutions to have the roadway meet City stormwater criteria. The project also included sidewalk design within the right-of-way, replacement and relocation of conflicting water/wastewater lines, prioritizing cost estimated solutions, development of a full set of construction documents, bidding services, and management of all construction activities.

Colorado River Streambank Stabilization at Caldwell Lane – USACE, Garfield, Texas: Project Manager for 500 LF of stream bank stabilization located on the south bank of the Colorado River near Garfield in southeast Travis County. The improvements included a combination of fill material (large diameter stone riprap) along the subject stretch of bank within an existing cut or notch, protecting the Garfield Water Supply Corporation property and Caldwell Lane from erosion of the river bank.

Shoal Creek Ridgelea Bank Stabilization – City of Austin, Texas: Design Engineer and Project Manager for 700 LF of creek bank stabilization measures along Shoal Creek, which is an urban watershed. Improvements within the central Austin neighborhood included a mix of limestone rock protection which fit into the existing character of the creek, and mechanically stabilized earthen slopes. The project included two new storm drain outfalls as well as incorporation of new wastewater infrastructure into the design. Travis later served as Project Principal and oversaw coordination of the design team with the USACE under the Nationwide Permit Program.

South Creek Channel Improvements – City of Round Rock, Texas: Project Professional for 3,600 LF of channel grading and slope protection. Travis provided construction phase services for the City as engineer, and for a time as the City's Project Manager. Travis designed eight new storm drain outfalls, a permanent maintenance access path into the creek, and prepared exhibits for a USACE Section 404 Permit.

Channel Restoration and Stabilization Downstream from Hester's Crossing – City of Round Rock, Texas: Project Professional for approximately 500 LF of channel improvements for an unnamed tributary just downstream of Hester's Crossing Road, which had suffered heavy erosion during storm events. Restoration included the design of a rock boulder along the toe of the channel combined with an erosion control mat. Travis provided hydraulic modeling calculations and prepared construction plan drawings. He also prepared a Water Pollution Abatement Plan as part of this project.

Education

Master of Science | Engineering Management | The University of Texas at Austin | 2014

Bachelor of Science | Civil Engineering | Louisiana State University | 2000

License/Certifications

Texas Professional Engineer No. 95085

Background

Travis has 18 years of experience with analysis, design, permitting, project management, and construction management in the areas of stormwater collection systems, hydrology, hydraulics, erosion and sedimentation control, erosion hazard zone determination, creek bank stabilization, and floodplain delineation and mapping. He has been intimately involved with public works programs and urban restoration and rehabilitation projects, as well as more than 10 watershed-related and urban flooding projects with the City of Austin, within both urban and suburban watersheds.

Travis is a leader in the engineering industry in Central Texas, as evidenced by his involvement in local leadership roles including Commissioner of Austin Water & Wastewater Commission, Past President of ASCE Austin Branch, Past Chair of ASCE Technical Stakeholder Committee, and Former Commissioner of Austin Urban Renewal Board.

Time at LAN (Years)

5.4





46 Years of
Experience

Thomas Mountz, PE, D.WRE, CFM

Technical Manager

Experience

San Marcos Watershed Master Plan – City of San Marcos, Texas: As Project Manager, Thomas served as primary contact with the City. He managed and prepared all project documents including status reports, invoices, and schedules, and managed all subconsultants. He also prepared Preliminary and final WMP reports, exhibits, maps, models, City Council presentations, and other appendices. A secondary report, QA/QC, and modeling efforts were prepared for Purgatory Creek to determine existing floodplain characteristics and design alternatives for floodplain and channel improvements.

Wonder World Drive Drainage Improvements – San Marcos, Texas: Thomas directed the Preliminary Design Drainage Report for this roadway extension project. The report included a flood study of bridge crossings of Purgatory Creek and the NRCS Dam #5 Spillway, as well as culvert and water quality pond design analysis to ensure compliance with the Edwards Aquifer regulations. Following this, Thomas managed construction plans for proposed drainage improvements, and prepared a Water Pollution Abatement Plan and Erosion Control Plans for the project.

TxDOT Hydrology & Hydraulics Statewide Evergreen, WA#1 – San Marcos, Texas: Thomas completed a hydrology and hydraulics study on a portion of the San Marcos River to analyze stream geomorphology and bank erosion issues, providing the means to control river migration impacting the existing bridge. He prepared an interim control measures report and construction plans showing proposed bank stabilization measures, and presented his findings to the Hydraulics Section and the District Engineer. The final report outlined the selected alternative measures for river “training” and/or bridge replacement including estimated construction and permitting costs.

San Antonio River Improvements Project, Mission Reach Flood Study, San Antonio River Authority – San Antonio, Texas: Thomas prepared flood study evaluations of existing conditions and multiple preliminary design alternatives for this 9-mile river restoration channel plan project, aiming to restore riverine form, function, vegetation, and recreational facilities to the existing Corps flood channel without an increase to the flood potential of adjacent properties. The project was funded by SARA, the City, and Bexar County, with oversight from the USACE. Thomas coordinated and reviewed subconsultant studies of sediment transport and geomorphology, and designed proposed channel improvements to meet the project geomorphic design objectives. He also served as Chief Hydrologist through the 60% design stage for the preparation of Construction Plans on the USACE Mission Reach Phase One project, where his primary task was to ensure the 100-year storm conditions zero rise criteria.

Additional Creek Projects Include:

- Zacate Creek Canal Street Improvements – Laredo, TX
- Chacon Creek Stream Restoration Demonstration Project – Laredo, TX
- Mountain Creek Flood Protection Plan – Grand Prairie, TX
- Gaines Tributary H&H Barton Creek Oak Acres – Austin, TX
- Town Creek West Channel Improvements – Cibolo, TX

Education

Bachelor of Science, Civil Engineering |
The University of Texas at Austin | 1973

License/Certifications

Texas Professional Engineer No. 80364

Diplomate, American Academy of Water
Resources Engineers

Certified Floodplain Manager No. 0329-
01N

Background

Thomas has more than 46 years of experience as an engineer and project manager at the local, county, and federal levels. He has expertise in areas including: water resources management, master planning, floodplain and dam breach modeling, stormwater quality analysis, design, stormwater management ordinance development, FEMA map revisions and studies, fluvial geomorphology, stream restoration, land development design, benefit-cost analyses, grant applications, municipal criteria and regulations, and construction inspection and oversight. His past experience includes acting as Project Manager for the San Marcos Watershed Master Plan.

Thomas is a recognized expert witness in stormwater management, having provided reports for clients in numerous Texas counties. He has served as Region 5 Director and is currently Treasurer for the Texas Floodplain Managers Association Board of Directors.

Time at LAN (Years)

0.1





16 Years of
Experience

Laura Casset, PE, CFM, CPESC

Project Engineer; H&H/Scour Analysis; Geomorphic Assessment; Natural Channel Design; Project Funding Solutions

Experience

Education

Bachelor of Science | Civil Engineering |
The University of Texas at Austin | 2003

License/Certifications

Texas Professional Engineer No. 99387

Certified Floodplain Manager No. 0996-06N

Certified Professional in Erosion &
Sediment Control No. 5639

Background

With more than 16 years of experience serving public clients in stormwater and floodplain management, Laura's background includes civil engineering design of flood mitigation projects, surface water hydrology/hydraulics, and FEMA map revisions and studies, as well as site development, utility relocation, and transportation drainage projects throughout Central and South Texas. She also specializes in identifying project funding opportunities and grant application development, having secured over \$360,000 in FPPG and local funding as Grand Task Lead for the City of Beaumont Master Drainage Plan.

Laura has a working knowledge of hydrologic and hydraulic analysis programs, including HEC-HMS, HEC-RAS, StormCAD, InfoWorks RS, and Pond Pack; and mapping protocols, including AutoCAD and ArcGIS. She is familiar with FEMA analysis guidelines and Letter of Map Revision procedures.

Time at LAN (Years)

3.3

Purgatory Creek Channel Improvements – City of San Marcos, Texas: Laura oversaw the combination of 2D ICM hydraulic modeling and regulatory 1D modeling used to better define flood risk, overflows, and braided stream interaction between Purgatory and Willow Creek. She led the regulatory HEC-HMS and HEC-RAS modeling effort that was refined with 2D results to characterize the split flow regime between watersheds, and prepared delineations of the existing and proposed floodplains for the preliminary engineering report, defining potential flood risk reduction benefits.

Mission Reach Ecosystem and Recreation, San Antonio Channel Improvement – San Antonio River Authority, Texas: Laura was Project Engineer for hydraulic modeling and reporting for this project, which included the redesign of an 8-mile portion of the San Antonio River to improve ecosystem habitat. She was responsible for ensuring the report and overall project met SARA, USACE, and FEMA requirements.

Erosion Hazard Zone Mapping & Geomorphic Assessment of Eastern Watersheds – City of Austin, Texas: Project Manager for an assessment of the East Austin stream systems within the Gilleland, Harris Branch, Decker, and Elm watersheds, as well as delineation of erosion hazard zones (EHZ) and geomorphic assessments for 185 stream miles. Laura oversaw the mapping of delineated EHZs which were provided in this study as an assessment of risk of potential erosion to future development.

Cottonmouth Creek Riparian Restoration – Brookfield Residential, Austin, Texas: Laura acted as Lead Engineer for the design and construction oversight for riparian restoration of 1.1 stream miles on an impaired portion of Cottonmouth Creek. Design included restoring a headwater creek corridor through grading modifications and strategic planting schemes, vegetative stabilization, permanent stormwater controls, and extension of pedestrian trail networks and four low water creek crossings.

Shoal Creek Restoration – City of Austin, Texas: As Project Engineer, Laura performed field data collection for stream and riparian restoration, water quality enhancement, and trail improvement. The project included stabilization of 3,000 LF of creek bank, relocation of wastewater lines, public meetings, and construction oversight.

Riverfront Park Riverbank Stabilization and Disaster Recovery Grants – City of Beaumont, Texas: As Project Engineer, Laura coordinated funding/partnership solutions with USACE and FEMA to address significant streambank failure and land loss along the Neches River following Hurricane Harvey. Laura supported the development of streambank stabilization solutions, and led coordination meetings with involved parties.

Chacon Creek Streambank Stabilization – City of Laredo, Texas: Laura acted as Deputy Project Manager responsible for the design, permitting, production of construction plans, project presentation, and construction oversight for this streambank stabilization project. The project served as the field exercise for a Streambank Soil Bioengineering Technical Training Workshop.





18 Years of
Experience

Justin Murray, PE

Storm Sewer & Drainage Design; Water Quality Design

Experience

IH35 Schematic Roadway Design – TxDOT, San Marcos: Drainage Task Lead for this project, which extends from Posey Lane on the southside of the city to SH 123 on the northern side. The project involves eight cross culvert designs which vary in size and complexity. Unique to the analysis is the presence of regulatory floodplain along the southbound frontage road, requiring a 1D/2D XPSWMM analysis of existing and proposed conditions. This detailed hydraulic study coincides with the floodplain generated by Cottonwood Creek and two of its major tributaries. The proposed system analysis is based on a preliminary corridor model of frontage and main lane grading combined with storm drainage improvements. LAN is also working with the City, TxDOT, and US Fish & Wildlife Service protection measures to identify needed mitigation measures and funding in cooperation with TxDOTs reconstruction of the roadways and cross culverts. LAN is providing preliminary BMP siting and sizing analysis to completely define the scope of right-of-way, financial, and social impacts of the roadway widening.

Hot Wells Bexar County Park – Bexar County, San Antonio, Texas: Project Manager who led the design of site improvements to transform the ruins of the historic Hot Wells Hotel and Bathhouse into a public park. Justin worked closely with Bexar County, SARA, UPRR, AT&T, CPS Energy, and elected officials to ensure the feasibility of the project. Project scope included utility coordination, UPRR At-Grade Highway Crossing Agreement, UPRR Encroachment Permit, UPRR Utility Permit, SARA drainage easement, extension of roadway improvements, LID BMPs, sidewalks, storm drainage, domestic waterline, sanitary sewer line extensions and existing manhole rehabilitation.

Woodlawn at 36th Street Drainage Improvements – Bexar County, San Antonio, Texas: Drainage Task Lead for this \$30M drainage project which removes 143 homes and one low water crossing from the floodplain. The unique design includes underground storage and a bypass system which adds capacity to the area. The project required an intensive 1D/2D XPSWMM analysis of the project area. Further complexity is added by the up to 40-foot depth of construction and existing utility relocation.

2018 Drainage Maintenance Projects – City of Schertz, Texas: Project Manager for hydraulic and hydrologic analysis for eight drainage areas within the City that experienced deterioration due to erosion and sedimentation. Justin oversaw the development of Technical Memorandums that summarized the problem statement, goals, analysis, and alternatives analysis.

Aldine Mail Route Road – Harris County, Houston, Texas: Drainage Task Lead for this study to remedy Severe Repetitive Loss and Repetitive Loss properties in the Western Homes Subdivision, with focus on how identified solutions would affect the design of the near term Aldine Mail Route roadway improvements. An Existing Conditions Model and three optional Proposed Conditions models were developed using a combination of “rain-on-mesh” InfoWorks ICM models for flow pattern determination, and a detailed XPSWMM 1D/2D analysis for design and analysis. Design solutions were estimated and preliminary storm drainage profiles and corridor models were developed to further verify the feasibility of the proposed solutions.

Education

Bachelor of Science | Civil Engineering |
The University of Texas at San Antonio

License/Certifications

Texas Professional Engineer No. 107586

SARA Certified LID BMP Construction
Inspector

Background

Justin has over 18 years of design experience. His background includes sustainable design, hydraulic and hydrologic analyses, and master planning. He has worked on highly visible and high-profile sustainability projects including the Lackland ACC which is slated to become the 2nd LEED Platinum hospital, Verano, and Hemisfair.

Justin's unique designs meet sustainability goals and address environmentally sensitive concerns without affecting budget and/or schedule. He was one of the first 100 certified as an Envision Sustainability Professional (ENV SP) in the Envision Sustainability Rating System, developed primarily as a tool to address the gap in Green Infrastructure rating that did not address horizontal projects.

Time at LAN (Years)

1.9





21 Years of
Experience

Education

PhD | Civil Engineering | University of Texas at Austin | 1997

Master of Science | Civil Engineering | University of Texas at Austin | 1992

Bachelor of Science | Economics | University of London | 1989

Bachelor of Science | Civil Engineering | University of Hong Kong | 1985

License/Certifications

Texas Professional Engineer No. 88558

Certified Flood Plain Manager No. 0581-04

Certified Professional in Storm Water Quality No. 108

Background

Dr. Lee has over 21 years of experience with water quality modeling, data analysis, and H&H analyses. He has conducted hydrodynamic and salinity modeling of bays, water quality study and design, and thermal modeling of freshwater systems, as well as numerous statistical analyses of water quality data. Dr. Lee is proficient in a variety of software programs for WQ and H&H modeling such as CE-QUAL-W2, QUAL-TX, TxBLEND, WASP, HSPF, XPSWMM, HEC-1, HEC-2, HEC-RAS, HEC-HMS, StormCAD, MDFATE, FLDWAV, HMR52, SMS, and ArcGIS.

Time at LAN (Years)

4.8

Dr. Ka Leung Lee, PE, CFM, CPSWQ

Water Quality Design; Water Quality Analysis

Experience

Phase II Water Quality Master Planning and Modeling, Salado Creek, Leon Creek, and Upper San Antonio River Watershed Master Plan – San Antonio River Authority, San Antonio, Texas:

Lead Engineer for the development and calibration of HSPF and EPDRiv1 models of the Salado Creek, Leon Creek, and Upper San Antonio River Watersheds. Dr. Lee compared the model results with screening levels from the Texas Clean River Program to identify water quality damage centers to support master planning of the watersheds.

San Antonio River Basin Modeling Project – San Antonio River Authority, San Antonio, Texas:

Project Engineer for the development of a regional watershed modeling system framework for the 4,000-square-mile San Antonio River Basin. This was the initial phase of a 5-year program focused on the development of a GIS-based watershed modeling system. Dr. Lee was involved in the water quality data and inventory efforts.

Development of Water Quality Modeling Tools for BMP Simulation and Prioritization – San Antonio River Authority, San Antonio, Texas:

Lead Engineer for the development of several tools and enhancement to HSPF and EPDRiv1 model code to support water quality modeling for BMP simulation. The tools include Timeseries Utility Tool, Load Reduction Tool, CEV Utility Tool, Enhanced BMP Tool, BMP Reporter, BMP Tool Batch Run Tool, Simulation Manager, GSSHA Converter, BMDUtil Tool and Enhanced EPDRiv1 modeling tools.

Nutrient Study in the Martinez Creek Watershed – San Antonio River Authority, Bexar County, Texas:

Lead Engineer for studying the levels of nutrients in major creeks in the Martinez Creek Watershed, understanding the dynamics of effluent nutrient concentrations in the receiving creeks downstream of the wastewater treatment plants, evaluating the dominant contributors of nutrients in the creeks, and prioritizing management strategies for preserving/improving the health of the creeks. Dr. Lee re-calibrated an existing QUAL-TX model, developed and calibrated a HSPF model, and used these modeling tools to provide information to support the project objectives.

Water Quality Retrofit at Reznicek Field and Nearby Improvements – City of Austin, Texas:

Lead Engineer for preliminary engineering design of a multi-purpose regional biofiltration water quality and flood detention facility at Reznicek Field in the upper Waller Creek Watershed. Using StormCAD, Dr. Lee also evaluated an existing storm sewer system draining to Reznicek Field and proposed improvements of the system to meet current City of Austin criteria and standards.

Pease Park Water Quality and Stream Restoration – City of Austin, Texas:

Project Professional who conducted channel stability analysis, hydraulic analysis, and preliminary design of a number of water quality improvements using rain garden and biofiltration. This project involved stream rehabilitation, water quality enhancements using riparian zone restoration, and low-impact development stormwater treatment techniques.





19 Years of
Experience

Education

Bachelor of Science | Civil Engineering |
Texas Tech University | 1999

License/Certifications

Texas Professional Engineer No. 99295

Background

Jason is a Senior Bridge Engineer with 19 years of experience designing new bridges and bridge replacement projects throughout Texas. He has a thorough knowledge of AASHTO (LRFD and Std Spec), TxDOT, AREMA, and FWTa design practices and specifications.

Jason's experience includes the design of minor off-system bridges; major highway bridges; major railroad bridges; and multi-level, fully directional highway interchanges. These projects have encompassed a wide variety of structural elements including: drilled shaft and spread footing foundations; drilled shaft, cantilevered and MSE retaining walls; prestressed concrete I-beam & U-beam girders; simple-span steel plate girders, continuous-span steel plate girders, simple-span trapezoidal steel box girders, and simple-span steel through plate girders.

Time at LAN (Years)

1

Jason Martwig, PE

Vehicular & Pedestrian Bridge Design; TxDOT Coordination

Experience

Fallls County Bridge Replacements – TxDOT, Waco, Texas: As Bridge lead, Jason designed five off-system bridge replacements. At the project kick-off meeting and site visit, Jason coordinated with the District Bridge Engineer to establish the site-specific design requirements for each bridge location. He verified that each site had sufficient detour routes to close the roadways for construction, which allowed the use of the TxDOT Standard Designs for a 24ft roadway which saved on design fee. It also eliminated phased construction which significantly reduced construction cost. Jason coordinated with the district to prepare the bridge layout plan sheets to Waco district preferences and submitted them early in the plan preparation process to obtain approval from the State.

Annual Structural On-Call Engineering Services – City of Irving, Texas: As structures lead, Jason was tasked to design a pedestrian bridge for the Campion Trail improvement project. The original concept plan was for a prefabricated steel truss bridge, but hydraulic analysis showed that the single span truss did not meet the freeboard requirements established by the City Floodplain Manager. Jason modeled different span configurations and coordinated the trail modifications for the various bridge options. This collaboration resulted in a more cost-effective bridge alternative than the original concept plan. Jason designed a 300ft long, 4-span bridge with prestressed concrete girders, which satisfied the hydraulic impact limitations without altering the channel cross section.

FM 373 at Dry Elm Creek – TxDOT, Wichita Falls, Texas: As Bridge Lead, Jason designed a 110 ft single span bridge replacement for the 2-lane FM 373 Bridge at Dry Elm Creek. This was a fast-tracked project with a total design schedule of 60 days from NTP to final PS&E. Based on the traffic volumes, Jason coordinated with TxDOT to develop the final concept for the phased construction using temporary signals for one-way traffic control. By raising the roadway profile at the bridge, the proposed superstructure was designed to pass over the top of the existing substructure with only partial demolition of the existing pan girder bridge superstructure. This allowed the bridge to be constructed in two phases instead of three and eliminated the need for temporary widenings.

IH10 Frontage Road Reconstruction – TxDOT, El Paso, Texas: Jason was the Deputy PM and Bridge Lead responsible for the design of the reconstruction of I-10 frontage roads from Loop 375 to Spur 37. The project included the design of a shared use trail adjacent to the NB and SB frontage roads with pedestrian bridges crossing the drainage channel that runs parallel to Loop 375. Jason lead the design effort for the two pedestrian bridges. The bridges were designed as 180ft long, 3-span, prestressed concrete I-girder structures. Jason coordinated the bridge design with TxDOT and the hydraulic design engineer to accommodate the potential scour at the columns due to the sandy soils in flash flood storm events.





26 Years of
Experience

Dr. Yu-Chun Su, PE, CFM, CPESC, CPSWQ

Erosion and Sedimentation Controls Design; Sediment Transport Analysis

Experience

Education

PhD | Environmental & Water Resources Engineering | The University of Texas at Austin | 1991

Master of Civil Engineering | Water Resources Engineering | The University of Texas at Austin | 1986

Bachelor of Science | Civil Engineering | National Chiao Tung University | 1984
Associate of Applied Science | Civil Engineering | National Kaohsiung Institute of Technology, Taiwan | 1979

License/Certifications

Texas Professional Engineer No. 80302

Certified Flood Plain Manager No. 0573-04

Certified Professional in Erosion and Sediment Control No. 2298

Certified Professional in Storm Water Quality No. 0029

Background

Dr. Su has been conducting hydrodynamic and water quality (WQ) modeling to address engineering problems for more than 26 years. A nationally-renowned hydrodynamic and water quality modeler, his experience includes stormwater quality management and modeling, including BMPs and LIDs, complex hydrodynamic modeling, hydraulics and hydrology, GIS-based tool development, and erosion and sediment controls.

Time at LAN (Years)

5.1

Highway Drainage Design and Impact Studies, Bridge Hydraulics, and Scour Analysis, Various Locations: Dr. Su has conducted several highway projects involving schematic and/or PS&E design. His work has involved roadway drainage analysis and design (inlets, roadside ditches, and storm sewers); H&H modeling including major river channels and bridges; hydraulic modeling and design of cross culverts; scour analysis; stormwater erosion and sediment controls and development of SWPPP; and preparation of drainage sheets including subwatershed delineation, hydraulic data sheets, bridge layout, cross culvert layout, plan and profiles, and other detail sheets.

Perry R Bass Fisheries Research Station – TPWD, Palacios, Texas: Dr. Su acted as Coastal Engineer, conducting 2D hydrodynamic and sediment transport modeling with the CMS-Flow program. He and his team performed data collection and review including historical shoreline changes, wind, water levels, freshwater discharge, soil data, bathymetric survey, and sediment and water quality sampling. Dr. Su coordinated on AD-CIRC runs and conducted CMS-Flow model quadtree development, calibration, and verification. He also calibrated the model to conduct continuous simulations of both hydrodynamics and sediment transports. The CMS-Flow outputs were used by the design team to support the design of an intake structure for the Research Station.

2-D Hydrodynamic and Sediment Transport Modeling of Dredged Disposal Materials Near Sabine Pass, LA: The construction of a new natural gas terminal required the removal of approximately 4.5 million cubic yards of mostly virgin soil from the project site. Louisiana regulations require that such large quantities be used beneficially. A plan was proposed to utilize the material for beach nourishment, with the discharged material expected to provide wave buffers and increased wildlife and aquatic habitat, and to act as a barrier to protect the existing shoreline from continued erosion. Dr. Su conducted a 2-D hydrodynamic and sediment transport modeling exercise to investigate the transport of the material and its potential effect on the environment. A 2-D model, RMA2, and sediment transport model were developed for the study area. Following presentation of the results, the project received its necessary permits, going on to create a shallow-water habitat within the beneficial-use area.

HCFC D W140 Channel Scour Analysis and Preliminary Engineering, Harris County, Texas: Following significant scour and erosion of the channel banks, a preliminary engineering report was prepared to evaluate alternatives to repair and maintain this channel. The effort included a survey of the channel geometry, gathering of geotechnical and environmental data, identification of existing utilities, determination of potential causes of scour and channel failures, and the development and evaluation of alternatives to repair the channel. Dr. Su's hydraulic analysis performed using the USACE HEC-RAS model indicated high flow velocity and shear stress at several locations, contraction of the channel causing high velocities and erosion near the Memorial Drive Bridge, and potential for severe scouring for high flow events. Channel restabilization alternatives were evaluated based on their hydraulic impact, geotechnical stability, constructability, aesthetics, and maintenance and operation cost.





25 Years of
Experience

Scott Harris, PE

Roadway and Traffic Design

Experience

Ayers Street Pedestrian Improvements & Turn Lane – City of Corpus Christi, Texas: Project Manager for review of the planning and design criteria for the addition of ADA-compliant pedestrian routes and ramps along Ayers Street from SPID to Gollihar. After investigating the existing conditions along the project limits, LAN recommended the widening of approximately 2,600 LF of roadway to accommodate a continuous turn lane, and the addition of curb and gutter along the proposed west side of the street to accommodate drainage and a continuous, ADA-compliant sidewalk.

Bond 2014 Alameda Street Improvements (Kinney to Lipan) – City of Corpus Christi, Texas: Project Manager for 1,500 LF of full-depth roadway reconstruction of an existing, two-lane minor collector roadway which serves as economic link between City Hall and areas in the Central Business District. The roadway parallels a major arterial street, and provides selected relief for commercial traffic north and southbound into the uptown areas of the City. Improvements include curb and gutter, standard sidewalks, ADA curb ramps, pavement markings, signage, stormwater drainage, and utilities.

Bond 2012 Leopard Street Improvements – City of Corpus Christi, Texas: Project Manager for this 3,000 LF full-depth street reconstruction project. Scott provided recommendations to the city for pavement design, roadway design, ADA, pedestrian and bicycle considerations, and utilities improvements. His project management duties included budget, schedule, and client collaboration oversight.

Rodd Field Road/Yorktown Intersection Improvements – Corpus Christi, Texas: Project Engineer for improvements to the Roddfield Road and Yorktown intersection, which consisted of upgrading the existing two-lane rural road without shoulders to a five-lane urban road. The project also included utility upgrades and repairs (water, wastewater, gas) and stormwater improvements, and traffic signalization.

Airline Road Improvements – City of Corpus Christi, Texas: Project Engineer for construction phase services. This project includes improvements to Airline Road between Saratoga Boulevard and Rodd Field Road and consists of upgrading the existing two-lane rural road without shoulders to a five-lane urban road with curb, gutter, and sidewalks. Included with this project are utility upgrades and repairs (water, wastewater, gas) and significant stormwater improvements, as well as traffic signalization and area lighting improvements.

2nd Street, 5th Street & Petronila Road Improvements – City of Robstown, Texas: Principal-in-Charge for design, bid, and construction phases for 11,300 LF of full depth reconstruction of three heavily deteriorated roads. Recommendations for each roadway includes 8-inches of lime stabilized subgrade, 8-inches of crushed limestone base material (TxDOT Item 247 Type A, Grade 1), and 2-inches of Hot Mix Asphaltic Concrete (HMAC).

Education

Bachelor of Science | Civil Engineering
| Texas A&M University, Prairie View |
1999

License/Certifications

Texas Professional Engineer No. 9926

Background

Scott has served in multiple roles for private and public sector engineering projects for more than 25 years, granting experience as a project engineer and intimate knowledge of roadway improvement projects. Scott has extensive experience with Bond projects, and understands the standards and considerations with evaluating and designing roadway projects.

Additionally, he has 12 years of construction and boundary surveying experience. Scott is a Lieutenant Commander and Civil Engineer Corp Officer in the Navy Reserves where he recently served as the Operations Officer for a Navy Mobile Construction Battalion (NMCB), managing the engineering and construction operations, resources, and readiness of a 500-man construction force.

Time at LAN (Years)

5.8





11 Years of
Experience

Jennifer Savage, PE

Spillway, Retaining Wall, and Lighting Foundation Design

Experience

On-Call Channel Restoration and Rehabilitation – Harris County Flood Control District, Houston, Texas: Lead Structural Engineer for the design and detailing of the structural aspects of this channel rehabilitation project. Jennifer designed a cast-in-place concrete drop-structure, 180 feet of retaining wall, headwall, and wingwalls.

East Bouldin-Euclid-Wilson Storm Drain Improvements – City of Austin, Texas: Structural Engineer who designed a custom cast-in-place concrete junction box that also served as a retaining wall and a cast-in-place concrete trench drain. Jennifer prepared the structural engineering design and analysis, assisted in the development of the construction documents, coordinated with discipline leads, and developed the technical specifications associated with the structural systems and components.

180-Acre Detention Pond Tract – Clear Lake City Water Authority, Houston, Texas: Lead Structural Project Engineer and Engineer of Record, providing structural engineering expertise for this project. Jennifer designed a cast-in-place concrete outfall structure and other miscellaneous structural requirements. The project includes backslope interceptor structures, preparing seed bed in all areas within the filter fabric fencing to the normal water surface elevation except, placing native grass seed mix and/or wildflower mix in the area within the filter fabric fencing to the top of the wetland area, hydro mulching of seeded areas, and site cleanup.

Bayou Trail – TIRZ 21 Central Houston Civic Improvement, Houston, Texas: Lead Structural Project Engineer and Engineer of Record who designed cast-in-place concrete retaining walls, headwalls, wingwalls, light pole foundations, and other miscellaneous structural requirements to connect recent trail projects to adjacent neighborhoods.

Briar Branch Detention Basin – Memorial City Redevelopment Authority, TIRZ 17, Houston, Texas: Lead Structural Project Engineer and Engineer of Record for design of a new 44-acre-foot regional detention basin. She designed a sheet pile weir wall, cast-in-place concrete headwall, and other miscellaneous structural requirements. Jennifer also provided construction phase services for the duration of the project, reviewing submittals and responding to RFIs.

Lexington/Highlands Drainage Improvements – City of Sugar Land, Texas: Lead Structural Engineer and Engineer of Record for drainage improvements along Lexington Boulevard which included 1,500 LF of 8- by 7-foot and 7- by 6-foot reinforced concrete box culverts, nine new or extended inlets, and an 8- by 7-foot flap gate to prevent backflow from Oyster Creek and reduce flooding throughout the Highlands neighborhood. Jennifer designed five custom cast-in-place junction boxes, some of which also served as a roadway surface. She also designed a large custom cast-in-place headwall/wingwall structure.

Education

Bachelor of Science | Civil Engineering |
Texas Tech University | 2007

License/Certifications

Texas Professional Engineer No. 111686

Background

Jennifer has 11 years of experience specializing in structural engineering. She has designed complex structural components for a variety of project types and has also assisted in the design of aerial crossing structures, retaining walls, water/wastewater treatment plants, port container yards, and miscellaneous civil structures. Jennifer's background includes concrete and steel design.

Time at LAN (Years)

11.4





37 Years of
Experience

Pat Acker, PE

Trail & Sidewalk Design

Experience

Santa Fe Trestle Trail – City of Dallas, Texas: Principal-in-Charge for a hike and bike trail utilizing the Santa Fe Railroad ROW over the Trinity River. This project included historical restoration of the historic Pratt Truss Bridge built by the Santa Fe Railroad in 1903 and is the oldest remaining railroad bridge spanning the Trinity River in Dallas. The project includes over 1,500-ft of new bridges, connection to the Trinity Levee Trails, and provides a key link in a trail for Dallas that will connect Fair Park with the Dallas Zoo. This complex project required coordination with multiple public agencies including the city of Dallas, USACE, NTTA, DART, and the Texas Historical Commission.

Grapevine Hike and Bike Trail, Phase I & II – Grapevine, Texas: Deputy Project Manager responsible for design of 1.8-mi long ISTE funded trail, and 100% plans including construction specifications and contract documents for approximately 6,100 LF concrete trail with retaining walls, drainage structures, two parking lots, and a 50-ft and a 100-ft prefabricated bridge. The trail alignment was determined so as to preserve trees and to serve as an enhancement to the surrounding. The trail design included retaining walls and low water crossings.

Big Bear Creek Hike and Bike Trail – Grapevine, Texas: Principal-in-Charge for the design of approximately 6,100 LF of concrete trail. The coordination and permitting of crossings at State Highways 121 and 360 was a primary challenge of this project. At grade crossing at the SH 121 south bound service road was not possible due to the proximity to the existing highway off ramp and high speeds, and the location of the grade separated crossing had to be changed mid-project to a crossing along the edge of Big Bear Creek, below the existing 121 bridge. This required additional Right of Way, retaining walls and bank stabilization of Big Bear creek.

Parker Square Trail Connector and Timber Creek Sidewalk – Town of Flower Mound, Texas: Project Manager for 2,600 LF of trail and sidewalk including drainage, retaining wall, pedestrian bridge, and vehicular bridge modifications to add walk and railing. This project was finalized connectivity from Parker Square to Timber Creek Park and the adjoining neighborhood, and included multi use trail and sidewalk.

Denton Branch Rail Trail – Denton, Texas: Project Manager responsible for design of 8-mi ISTE funded trail. The trail utilized an abandoned rail ROW. To provide cyclists with not only a visible but physical warning of the approaching crossings, Pat introduced an “S” curve leading into each crossing. To maintain the history and character of the rail trail, existing wood trestles to bike and pedestrian bridges were rehabilitated and re-purposed. Resurfacing of the existing rail embankment with decomposed granite provided concrete approaches at the intersections, while reducing capital costs.

Hike and Bike Trails and Crossings – Plano, Texas: Project Manager for paving, grading, repair, and replacement of approximately 8,500 LF of multi-use, in-service concrete trail and 40 to 100 LF prefabricated bridges throughout Plano.

Education

Bachelor of Science | Civil Engineering |
Texas A&M University | 1981

License/Certifications

Texas Professional Engineer No. 60941

Texas Professional Land Surveyor No.
4662

TxDOT Sequence #9654

Background

Pat has 37 years of pipeline planning, analysis, and design experience throughout North Texas. Beginning in land and site development, he has designed a wide variety of private and municipal projects during his career. He is passionate about the walk-ability of his projects, having worked on outdoor spaces ranging from recreational hike and bike trails to complete facilities of state park areas.

With a background including hundreds of thousands of linear feet of water transmission, sanitary sewer design, and commercial property development, Pat is deeply familiar with all manner of design and construction issues and concerns. He is experienced in utility coordination, creek crossings, construction in rural/undeveloped areas, limited access, permitting, and facility decommissioning.

Time at LAN (Years)

0.3





37 Years of
Experience

Education

Bachelor of Science | Electrical
Engineering | Texas Tech University 1981

Registrations/Certifications

Texas Professional Engineer #60234

LEED Green Associate #10982169

National Council of Engineering
Examiners #16-990-43

TxDOT Sequence #9913

IES Member

Background

Denney is LAN's Chief Electrical Engineer and Senior Project Manager. Highly experienced in the engineering design fields of illumination, electrical, controls, communications and ITS systems, his broad range of responsibilities has encompassed the roles of chief electrical engineer, senior project manager, electrical task leader and construction manager.

For illumination projects, Denney regularly uses IES, AASHTO, and TxDOT guidelines to establish horizontal and vertical illumination and uniformity levels. Denney is also adept with coordination of utility services for illumination systems.

Time at LAN (Years)

14.4

Denney Howard, PE, LEED Green Assoc.

Illumination Design

Experience

Solar-Powered Flow & Pressure Sensor Design – Gulf Coast Water Authority, Texas City, Texas: Design Engineer for preparation of construction bid documents for installation of flow meters and pressure sensors with remote monitoring capability at four locations along 36-and 42-inch industrial water transmission lines to Dow Chemical and BP Refinery, and Marathon Oil Refinery. Denney designed stand-alone pole-mounted solar power systems, with each system including solar panels, a charging controller, and batteries. The controller and batteries were installed in corrosion resistant stainless steel enclosures mounted below the solar panels.

Solar-Powered Lighting Standard – City of Fort Worth, Texas: Design Engineer for Illumination IDIQ. Denney designed a stand-alone solar-powered illumination standard for arterial and residential street lighting, working with Acuity Lighting and Clear World Solar to integrate their products into a design solution that met the needs of the City. Each fixture's light output can be individually trimmed locally and dimmed remotely to achieve precise lighting levels needed based on schedule.

SH 71 Toll Lanes – TxDOT Austin District, Texas: Task Leader for the illumination systems of Toll Road SH 71, which included managed toll lanes near Austin Bergstrom Airport. Denney was responsible for the shared use path adjacent to the highway, and the safety illumination along the toll road intersections and interchanges. The illumination design utilized computer generated calculations to model the illumination performance and locate the illumination standards. The shared use path lighting within the glideslope of the airport utilized bollard lighting while areas outside the glideslope utilized 14-foot LED pedestrian lighting. Vertical illumination was critical so that cyclists and pedestrians could utilize the path safely at the same time.

I-35 North Loop 363 to N. Troy & I-35 Hillsboro – TxDOT Waco District, Texas: LAN was selected by the TxDOT Waco District to prepare PS&E on approximately 6.4 miles of IH 35 in Bell County from just north of LP 363 in Temple to just north of the City of Troy, as well as a segment just south of Hillsboro. The project increased mobility along the corridor to meet rapidly increasing transportation demand. It also updated the infrastructure as most of this section has had little rehabilitation since its original construction in the 1950's. Denney was responsible for the safety illumination design at the road intersections and interchanges. He used the recommendations from AASHTO and TxDOT guidelines to establish illumination and uniformity levels for the project.

Brushy Creek Road Improvements – City of Cedar Park, Texas: Denney was Electrical Engineer for this project to produce the construction drawings, technical specifications, probable construction cost estimate, and bid- and construction-phase services for the improvement of Brushy Creek to a boulevard section with four lanes, a raised median and curb and gutter. The project was designed to improve safety and mobility in a rapidly growing area, with improvements also including continuous illumination for the roadway and a 10-foot hike & bike trail, which itself included an illuminated covered crossing under the roadway.





45 Years of Experience

Dave Clary, PE

UPRR Design Review

Education

Bachelor of Science | Civil Engineering |
Texas A&M University | 1973

License/Certifications

Texas Professional Engineer No. 44046

Background

Dave Clary is a senior transportation engineer with 45 years of experience in planning, design, and project management for rail, transit, and highway. He conducts rail feasibility and alternatives studies requiring knowledge of economic, environmental, engineering, construction, operations, and maintenance requirements. Dave has coordinated complex rail design and construction projects with operations, real estate, environmental, legal, public agencies, and the public. In addition, he has comprehensive experience preparing agreements and exhibits for multi-agency projects involving TxDOT, UPRR, BNSF, and KCS.

Time at LAN (Years)

10.7

University Boulevard Grade Separation and UPRR Relocation – Sugar Land, TX:

Dave served as Rail Task Manager for the UPRR Nalco Spur relocation, which included diagnostic review and coordination with UPRR, FRA and TxDOT for the proposed at-grade crossing; traffic signal preemption calculations; Exhibit A preparation for the proposed rail crossing; and plans and specifications for the rail relocation. Dave led design coordination with UPRR to gain approval of the vertical clearance above top of rail and the horizontal clearance necessary to preserve rail corridor capacity.

Ennis Avenue Grade Separation, UP Safety Zone Project – Ennis, TX: Project Lead. The UPRR Safety Zone project is a critical component of the City's Downtown Master Plan to revitalize economic growth in its downtown business district. Dave led the design team to develop modifications to Ennis Avenue, railroad profiles and Main Street, and create a new grade-separated crossing. The project includes features such as railroad bridges, roadway bridges, street modifications, walls, drainage and improved connectivity throughout the downtown district. Design introduced an iconic gateway feature to serve as a threshold into the city's center of commerce, coordinated with the City of Ennis Downtown Master Plan.

Bayport Rail Spur, Phase 1 – Port of Houston Authority, Houston, TX: Project Lead for design of a new 7,000-ft rail line to provide rail service to the Bayport Terminal. Dave met with UPRR and PolyOne Corporation to develop the PolyOne track layout construction sequence, minimizing impacts to UPRR and PolyOne. He managed the rail alignment design, coordination and/or design for numerous utility crossings, modifications to rail service for a major industrial customer, and design of switches for two new industries. He assisted PHA with planning and layout of the future rail corridor to optimize the track layout within the proposed rail corridor to maximize the corridor capacity and benefit to the future rail yard. The alignment of this rail expansion would cross the existing SH 146 roadway at-grade, adversely impacting the flow of vehicular, pedestrian and bicycle traffic. Through coordination with TxDOT, a grade separation design was developed to bring SH 146 over the future UPRR.

Belt Line to Story Road Grade Separation Project – Trinity Railway Express:

Project Lead for this Grade Separation Project serving Trinity Railway Express, BNSF, and UPRR. The project included 11,750 ft of double track including 8,200 ft of double track bridge, structure of which was constructed in two phases to maintain service on the existing track. Three streets were grade separated as a result. The project was also part of an overall quiet zone project for the City of Irving, and included further coordination with DART, TRE, BNSF, and TxDOT.

Silicon Valley Berryessa Extension – Valley Transit Authority, CA: As track Lead, Dave was responsible for the design of a 1,094-ft shoofly for the UPRR Milpitas Industrial Lead 3,371-ft relocation and grade separation over the BART line. Horizontal curvature was negotiated with UPRR to minimize the length of bridge structure required at the BART crossing. Vertical alignment was optimized to avoid higher T-wall retaining walls and to meet an adjacent at-grade crossing.



06 Years of
Experience

Education

Bachelor of Science | Environmental Engineering | University of Vermont | 2013

License/Certifications

Texas Professional Engineer No. 129392

Background

Will is experienced in full project delivery from conceptual evaluation through construction close-out. He specializes in the design of municipal utilities including potable water distribution networks, stormwater collection and management utilities, wastewater infrastructure, and roadways.

Will is typically responsible for both detailed engineering design and production management. Detailed design responsibilities include utility coordination with relevant public and private utility owners; hydraulic calculations and modelling for water, wastewater, and stormwater applications; production coordination with internal and external team members and discipline leads; leading permitting processes with relevant authorities; and construction-phase oversight and coordination with contractors. He has provided detailed utility coordination services for many of the projects that he has worked on – particularly projects for or within the City of Austin and Travis County jurisdictions.

Time at LAN (Years)

3.8

Will Chandler, PE

Utility Relocations

Experience

Purgatory Creek Channel Improvements – City of San Marcos, Texas: Project Engineer responsible for preliminary utility coordination associated with major improvements proposed for approximately 5,400 LF of the Purgatory Creek channel in San Marcos. The proposed scope of work comprises channel stabilization, ecological restoration, pedestrian trail improvements, replacement of five bridge-crossings, installation of a new reinforced spillway, suspended utility relocations, and more.

Bullick Hollow Bicycle Safety Project – Travis County, Texas: Project Engineer for improvements to this stretch of Bullick Hollow Road, frequented by cyclists. As part of the preliminary design, six segments of road were selected to strategically improve the safety of the road for use by the cyclists. These segments were chosen to alleviate risks due to restrictions in sight distance as well as locations of substantial incline where cyclists typically decelerate. The project scope included detailed design of widened shoulders at these six locations as well as drainage evaluation and infrastructure improvements to accommodate the revised road design.

Easton Park Major Wastewater Infrastructure Projects – Brookfield Residential, Austin, Texas: Project Engineer for the design of approximately 15,000 LF of 30-inch diameter gravity sewer for this 10,000 LUE planned residential development. Project scope comprises: conceptual alignment evaluation including extensive evaluation of property requirements and effect on the proposed work; detailed design of sewer infrastructure; detailed utility coordination with public and private utilities, including coordination with the Austin Utility Location and Coordination Committee; permitting coordination with City of Austin and Travis County; and construction phase services, including contractor liaising and construction oversight.

Guadalupe Street Storm Drain Improvements Project – City of Austin, Texas: Project Engineer for the design of storm drain infrastructure to improve drainage for this segment of Guadalupe Street. The project expands a section of high-capacity storm sewer with proposed sewer infrastructure ranging from 48-inch diameter to 10x10-ft concrete box culvert. Adjacent to the historic Hyde Park and North University neighborhoods, the street nears some of the oldest public utility infrastructure in the City. Extensive utility coordination of public and private infrastructure was required to determine the optimal alignment for the proposed infrastructure.

Oak Knoll Storm Drain Improvements Project – City of Austin, Texas: Project Engineer for the design of 4,490 LF of storm drain (ranging from 30-inch diameter to 3x5-ft concrete box culvert), including installation of a stormwater detention pond in a flood-prone historic residential neighborhood in Northwest Austin. The project scope comprised: conceptual alternative evaluations to reduce impacts and mitigate downstream rise; detailed utility coordination evaluations to identify optimal alignments for proposed stormwater infrastructure through the dense network of aging public and private utilities; and detailed design for the recommended improvements alternative.





20 Years of
Experience

Education

Bachelor of Landscape Architecture |
Iowa State University | 1998

Iowa State University Extension Program
Design Studio | Harvard University of
Design | 1998

License/Certifications

Registered Landscape Architect:
Missouri

Background

David is a senior landscape architect and project coordinator at JBC with 20 years of experience collaborating extensively with highly complex irrigation systems ranging from sportsfield and parks to large-scale commercial systems. His professional experience remains focused on central control irrigation systems, integrated water resource management and master planning, sportsfield and landscape master planning, sustainability master planning, resilient urban landscapes, conceptual site design, integrated green infrastructure design, agronomic soils design, drainage and stormwater best management practice design, and net-zero site water design from the schematic design phase through to the construction administration phase of the project.

David has led the design and implementation of many of award-winning irrigation projects.

David Stokes, PLA, ASLA

Soil Design – Project Lead

Experience

Bill & Melinda Gates Foundation Headquarters, Soils & Irrigation, Seattle,

Washington: JBC provided water resource management, complex irrigation system engineering, subsurface drainage, and soils engineering as a subconsultant for this high-profile project. David headed design of the LEED irrigation system based on 100% non-potable water use and a 55% reduction of total water use. The irrigation system is centrally controlled from a dedicated workstation and utilizes weather station sensors and soil moisture sensing devices, which allows the irrigation system to deliver water to the landscape assets and operate in an efficient manner based on Evapotranspiration and Volumetric Soil Moisture Content. Water being used for the landscape irrigation system is harvested from both rainwater and recycled on-site features.

Jefferson City Federal Courthouse, Landscape Maintenance Programming,

Jefferson City, Missouri: David provided soil engineering and agronomic consulting for the public green roof on the new courthouse, which includes a one acre landscaped public plaza running the full length of the Seventh Avenue side. A new structural soil was engineered by JBC to provide stability to the paving, while allowing the trees to thrive in the local climate. Beneath the birch trees, a softer paving of irregular stone in a field of grass is in keeping with the Pacific Northwest regional climate.

Nelson Atkins Museum of Art, Rooftop Soils, Landscape & Irrigation, Kansas

City, Missouri: JBC engineered a narrow 8 inch profile of lightweight soil supporting turf panels between the above-ground glass lenses of this \$240 million below-ground addition to the 1933 museum building. Working to criteria of the existing sculpture garden and surrounding landscape fabric, David's innovative approach provided context and contrast for the striking architecture, blending the rooftop into the site.

Seapointe Village Deck Restoration Rooftop Soils, Landscape & Irrigation,

Wildwood, New Jersey: JBC was selected to restore the landscape and amenity areas of the deck of this 5.5-acre green roof site, including complete replacement of all pavement, agronomic, drainage, irrigation, and planter structural systems. Originally plagued by water proofing and leakage problems, JBC also re-designed all pool, lagoon, and waterfall features including significant artificial rockwork sections, replicating original design elements while adding a 6" topping slab and further water proofing systems. Complex construction and pavement adjacency to the existing buildings required very precise construction and contractor coordination.

Navy Pier – Phase 2 Polk Brothers Park – Navy Pier Incorporated, Chicago,

Illinois: JBC designed irrigation and soils for this renovation of the Welcome Pavilion and Polk Brothers Park, providing a reinforced lawn for high-program used spaces. A complex system was designed for proper water management of the plant material hydrozones, with the use of soil moisture sensing to set parameters of volumetric soil moisture to operate an automated irrigation system. The web-based irrigation central control allows the irrigation manager to operate and maintain the system from anywhere a mobile signal or wireless connection is accessed, giving flexibility in management, and provides maintenance cost savings.



34 Years of
Experience

Chuck Dixon

Soil Science Lead

Experience

City Garden Turf & Engineered Soils Consulting – St. Louis, Missouri: JBC provided engineered soil mixes, subsurface drainage, rain garden and high performance turf design in a restorative solution for the landscape infrastructure of this project. Part of the 19-square block Gateway Mall, the design accommodates heavy visitor usage while minimizing investment of maintenance resources. Storm water from planting and turf areas moves through the engineered soils and subsurface drainage systems to six separate “bioretention areas” covering more than 5,000 square feet, which collect and filter stormwater from two-thirds of the site’s surfaces. The site has the capacity of maintaining a 4” rainfall event, and passively deep waters the more than 200 hundred large trees on site, without mechanical equipment.

Nasher Sculpture Garden Assessment Study, Dallas, Texas: JBC was responsible for designing the engineered soil and irrigation systems for this site – an outdoor “roof-less” public art space. Soil mixture in the garden is a three-layer, sports field technology system designed to support heavy sculpture without foundations and to quickly drain heavy rain. The design considered aesthetic elements, including a variety of foliage.

George W. Bush Presidential Center, Soils & Turf, Irrigation, Water Mgmt. – Dallas, Texas: JBC is providing water resource management, irrigation engineering, subsurface drainage, high performance turf and soils engineering for this highly disturbed and sterile 25 acre site. Soils design is based on self-sustaining biological processes and efficient microbes to compliment the complex palette of highly adapted native vegetation. JBC is also designing an innovative water management strategy through the implementation of a “smart” irrigation system that is automated and regulated through soil moisture sensing and monthly evapotranspiration rates. Work is being completed in part alongside the Lady Bird Johnson Wildflower Center.

Duke University - West Quadrangle, Turf Renovation Study, Raleigh, North Carolina: JBC provided restoration of the lawns and agronomic systems of this historic Quad, which is used for daily social activities as well as periodic large events. A significant challenge was preservation of the historic oak trees, many of which were starting to die out due in part to soil compaction. Extensive work to the soils has improved the planting medium for both the lawns and planting beds, creating a favorable ecological environment for the roots of the trees. The comprehensive renewal also includes new infrastructure to manage stormwater and nourish soil biology.

Repentance Park, Balton Rouge, Louisiana: Repentance Park is a two-acre public urban park with high-programmed lawn and interactive water features. JBC provided smart irrigation design, engineered soil mixes, subsurface drainage, and high-performance turf design integrated into the landscape infrastructure, while accommodating heavy visitor usage. Stormwater management occurs through the engineered soils design of the turf lawn and landscape planting areas – part of a subsurface landscape system that collects and filters stormwater from the site’s impervious surfaces, reducing stormwater runoff produced by Louisiana storm events.

Education

Post-Masters Agronomy, Soil Microbiology, and Forage Production | Texas A&M | 1985

Master of Science | Agronomy and Soil Microbiology | University of Arkansas | 1982

Bachelor of Science | Agronomy and Soil Science | University of Arkansas | 1978

Background

Chuck is nationally recognized expert in turf agronomy and soil science. Since 1985, he has provided consulting services for over 300 high performance sports facilities and 200 landscape assessments. For fifteen years he directed physical testing labs servicing the golf and sports industry. During that time, he developed testing protocols to enhance material selection processes in design and construction of systems for sports, golf, thoroughbred racing and landscape.

In association with various Landscape Architect professionals, knowledge acquired in the testing services has been applied to construction specifications. New test methods provide a technical basis for developing effective low cost high performance soil systems. Chuck has utilized new technologies to support maintenance personnel in managing resources for soil, water, and fertility management for many types of systems.



40 Years of
Experience

Education

Master of Architectural Management |
University of Kansas | 1996

Bachelor of Landscape Architecture |
Iowa State University | 1978

License/Certifications

Registered Landscape Architect: Iowa,
32 other states.

Certified Commercial Irrigation Designer
– Irrigation Association

EPA Certified WaterSense Professional

Background

Founder of Jeffrey L. Bruce & Company (JBC), Jeffrey is responsible for the coordination and leadership of all design activities of the firm. He brings over 40 years of experience in all phases of irrigation system design, landscape architecture, green infrastructure, urban agronomy, campus planning, high performance sportsturf, and water harvesting. Jeffrey has worked with several hundred national clients on large-scale landscape assessment and performance projects, many of which are on a long-term basis. As a firm, JBC has worked on over 70 high use public realm projects.

Jeffrey is Past President and a well-respected member of the American Society of Irrigation Consultants, and has served as an invited lecturer, visiting critic, and speaker at over 185 conferences and trade shows.

Jeffrey Bruce, FASLA, FASIC, LEEP, GRP

Engineered Soils Consulting

Experience

Boulder Creek Civic Park, Soil Assessment and Management Plan – Boulder, Colorado:

The Boulder Civic Area Phase 1 Improvements provides an innovative and restorative plan for 27 acres along Boulder Creek, the principle waterway of Boulder. The site is located within the 100-year floodplain, and much of the land lies within the High Hazard Zone (HHZ) and Conveyance Zone. JBC provided soil consulting services to resolve problematic soil chemistry and material sourcing. This resulted in enhanced agronomic performance for the corridor, making up part of the proactive effort to restore open space allowing for “room for creek” flooding. The restored flood plain “washes” are modeled to provide resilient pedestrian connections, structures and native planting eco-tones, while enhancing the experience and safety of the community.

Kauffman Center for the Performing Arts Landscape & Green Infrastructure, Kansas City, Missouri:

JBC was selected to provide preliminary consulting services to assist with the conceptual design of the north site soils, irrigation, and landscape details for the Center. Conceptual design development and documents were developed alongside preliminary budget estimates for the irrigation and soil systems costs, preparation of landscape/system drawings to define the intent and scope of the design, and preparation of final construction documents for inclusion in the bid set as directed. JBC also provided design and construction administration services for the Performing Arts Garage Rooftop Park and Community Space to support the Performing Arts Center.

Kingman Islands Soils Consulting – Lee & Associates, Washington, DC:

JBC was requested to analyze and review existing soil conditions of the site, which was utilized for decades as a dump for street sweeping litter. Analysis included the suitability of waste biomass from street sweeping as mass grading material, soil for native plants, and as a base course for pathways. JBC’s comprehensive fieldwork, performance data for lab testing, and analysis describes the multiple soil types located on the site. The report includes best uses for each soil type, methods to ensure proper drainage, amendments to improve long-term soil vitality, and approximate cubic yards of available on-site material for cost estimating. The conclusions drawn from the field report supply vital information on best utilizing existing materials, greatly reducing import costs and providing a novel, sustainable solution to a common problem.

Laguna Gloria Sculpture Park, Soils Assessment and Management Plan – Austin, Texas:

Working with Reed Hilderbrand and the Ladybird Johnson Wildflower Center, JBC is tasked with agronomic assessment of native soil and water management as an ecological restoration and invasive removal phase is underway. Phase 1 focuses on the Betty and Edward Marcus Sculpture Park arrival pavilion and entry court.

Millennium Park Green Roof Turf, Engineered Soils & Irrigation – Chicago, Illinois:

Working with local landscape architect Terry Guen Design Associates based in Chicago, JBC designed a 2.2 acre high performance reinforced natural turf lawn which experiences thousands of users on summer nights. The design work included soils, irrigation, and turf specification, as well as construction administration services.



10 Years of
Experience

John Hart Asher, MLA

Upland, Creek, and Wetland Restoration – Project Lead

Experience

Education

Master of Landscape Architecture |
University of Texas at Austin

Bachelor of Liberal Arts | University of
Mississippi

Background

John is a Senior Environmental Designer in the Wildflower Center's Department of Ecological Research and Design. He has worked on numerous award-winning projects including the Blanco River Design Guidelines, which received an award in 2016 from the National Association of Flood and Stormwater Management Agencies for excellence in communications; and green roof design and implementation for Bercy Chen Studio's Edgeland House, which was featured in Dwell and Texas Architect magazines and has won several awards, including Architizer's A+ Jury and Popular Choice Awards, the 2016 Design Award of Excellence from Green Roofs for Healthy Cities and the Texas Society of Architects 2016 Design Award.

John is also a lecturer for The University of Texas at Austin's School of Architecture. His research interests include green roof design, urban prairies and ecology, riparian restoration, sustainable water quality and detention practices, soil restoration/conservation practices, compost for restoration purposes, invasive species treatment and removal plans, and native plant species selection.

Headwaters at the Comal– New Braunfels, Texas: John made up part of the Ecological Research Team that participated in the initial master plan effort, final design, and first construction phase of this landscape design, which includes the restoration of the Comal Springs headwaters and the transformation of more than 16 acres of former asphalt into an immersive restoration of native landscape. Phase 1 involved revealing the previously “capped” headwaters spring, building a trail system, and contouring the property for stormwater retention and visual interest. The result is an undulating trail lined with limestone gabions and interpretive stations, with plans for purposed utility buildings.

Working with the USACE and US Fish and Wildlife, the Wildflower Center was able to clearly demonstrate the benefit of restoring the site so that surface runoff was held and cleansed by Headwaters before slowly making its way to the spring run. Connectivity between the upland prairie and adjacent riparian corridor was stressed by the Center due to the presence of four endangered invertebrates and their consumption of organic material.

Blanco River Design Guidelines and Restoration Demonstration – Wimberley, Texas: John worked in conjunction with the Texas Parks & Wildlife Department (TPWD) to develop the Blanco River Design Guidelines, following the 2015 floods along the Blanco River. This collaboration was initiated to address the conflicting information landowners were receiving on best practices and the perceived tension between human use of land and sound ecological stewardship, and provided a complete set of design drawings that provide information to landowners. The design set includes information on commonly found environments along the River, and give landowners options and suggestions for dealing with rainwater runoff, plantings, soil profiles, plant lists, invasive management techniques, and installation and maintenance.

Additional Related Projects Include:

- San Antonio River Restoration at Mission Reach – San Antonio, TX
- Atlanta Beltline Arboretum – Atlanta, GA
- Shoreline Stabilization at Laguna Gloria – Austin, TX
- Bush Presidential Center Prairie – Dallas, TX
- Edgeland Green Roof – Austin, TX
- Blanco River Design Guidelines – Wimberley, TX
- Sustainable Roadsides – Williamson County, TX



13 Years of Experience

Education

Master of Science Candidate in Recreation Parks and Tourism | Texas A&M University

Bachelor of Science | Ecology, Evolution and Conservation Biology | University of Texas at Austin

Background

Michelle Bertelsen oversees the Center's on-site land management research program and provides project management and ecological support to consulting projects. She has experience in ecological restoration; geospatial analysis including trail suitability analysis, facilitation, ecological assessment of vegetation and soils; invasive species management; and prescribed fire implementation. She has received training in interpretation, land management, water resources, recreation resources, user experience, and marketing and financing in parks, recreation and conservation.

Michelle leads ecological assessments including vegetative and soil analysis and is capable of coordinating Sustainable Sites Assessment. She provides expertise to design teams in the integration of human use and ecological function, helping to set measurable ecological function and human use goals, as well as providing expertise on building ecological function through traditional wildland restoration and integration of ecological principles into designed environments.

Michelle Bertelsen

Upland, Creek, and Wetland Restoration – Ecology Lead

Experience

Mission Reach Restoration – San Antonio, Texas: The Mission Reach Ecosystem Restoration and Recreation Project — part of the nation's largest urban ecosystem restoration project — rehabilitated and enhanced the hydrological and ecological function of eight miles of the San Antonio River through urban San Antonio. The resulting landscape provides stability and maintainable flood control while returning sections of the river to their natural meanders and adding amenities and recreational opportunities along the way. The river and accompanying pathway also offer cultural opportunities by connecting four historic missions.

Working with the USACE and Jacobs Engineering Group, the Wildflower Center developed the native woody and herbaceous plant community composition to maximize habitat performance within the hydrological design. This 334-acre riparian woodland represents nearly 100 species of native trees, grasses and wildflowers. Wildflower Center environmental designers also helped develop an operation and maintenance manual to help guide the San Antonio River Authority in their efforts to sustain native growth and healthy habitat while protecting the site from invasive plant species.

Bluestem Park at Alliance Town Center – Fort Worth, Texas: The Wildflower Center acted as an ecological consultant on this project, joining a multidisciplinary team of engineers, biologist, agronomists, landscape architects and planners. The role included site assessment and analysis, recommendations on the designed restoration, including soil modification, suites of different prairie grass and wildflower assemblages, instruction on installing and establishing all plant materials, construction oversight, establishment oversight, and periodic maintenance inspections. A major innovation in this project has been the ecological training of Hillwood's Alliance Landscape Company on how to maintain and care for these native systems over the long term so that the novel landscape strategies used on this project can be replicated throughout Hillwood Property lands, expanding the restoration of native Texas landscapes. The park showcases over 50 species of native plants with 500 trees and shrubs planted and over 550 pounds of grass and wildflower seed installed. Compared to more conventional park designs Bluestem Park conserves 14 million gallons of water annually.

Additional Related Projects Include:

- Water Quality Protection Land Management Plan – Travis and Hays Counties, TX
- WQPL Violet Crown Trail Suitability Analysis and Karst Survey – Travis and Hays Counties, TX
- Waller Creek Framework Plan – Austin, TX
- Longview Arboretum & Nature Center Master Plan – Longview, TX
- City of Austin, Trail Impact Assessment – Austin, TX
- Blue Hole Master Plan – Wimberley, TX
- AMD Master Plan and Restoration Plan – Austin, TX
- Oak Point Nature Preserve – Plano, TX
- City of Austin Invasive Management Plan—Austin, TX



HICKS &
COMPANY

40 Years of
Experience

Education

Master of Science | Wildlife Ecology |
Oklahoma State University | 1973

Bachelor of Science | Zoology |
Oklahoma State University | 1969

License/Certifications

Wildlife Biologist Certification,
The Wildlife Society, 1979

Member, Austin Community College
Environmental Science and Technology
Advisory Committee

TxDOT Sequence #12207

Background

Roy is a Certified Wildlife Biologist with over 40 years of experience in the field of wildlife ecology, conservation, and management. His experience includes coordinating the development of numerous position statements, response letters, and interagency agreements concerning the protection of habitat in Texas to assure regulatory compliance. He is knowledgeable of compliance requirements of the National Environmental Policy Act, Clean Water Act, Endangered Species Act, Migratory Bird Treaty Act, and the Fish and Wildlife Coordination Act, in addition to state regulations involving the Texas Parks and Wildlife and Water Codes.

Roy has coordinated extensively with organizations including the USACE and the TPWD, for whom he worked for 25 years. His wildlife habitat appraisal procedure was utilized by TPWD to evaluate impacts and estimate mitigation requirements of 44 proposed Texas reservoir projects.

Roy Frye

USACE & TPWD Permitting – Project Lead

Experience

Stream Restoration of Waller Creek-Reilly Pond & Austin ISD Pond – City of Austin, Texas:

Roy provided environmental services to identify potential environmental constraints associated with detention pond capacity modifications, including delineation of jurisdictional waters including wetlands subject to federal regulation under Section 404 of the Clean Water Act; and development of a riparian restoration plan to remove invasive giant cane and restore native trees, shrubs, grasses, and forbs along 1,100 feet of the riparian corridor. Services included a Technical Report summarizing the results of the evaluation; a riparian corridor vegetation restoration plan, an associated irrigation plan, and agency coordination with the TPWD, the THC, and the USACE.

Barton Springs/Edwards Aquifer Conservation District Habitat Conservation Plan and Environmental Impact Statement (EIS) Document – Travis County, Texas:

Roy managed updates to the draft EIS to account for revisions involving additional scientific data, the formal listing of an endangered candidate species, and implementation of aquifer management strategies designed to protect flows of Barton Springs. A Draft EIS was submitted to the USFWS and developed into an FEIS.

Environmental Constraints Evaluation and TWDB Environmental Data for the Kyle-Buda Water Transmission Line and Pump Station, Phase 1A – Alliance Regional Water Authority (ARWA), Hays County, Texas:

An environmental constraints evaluation was completed for a 5.5-mile long water transmission line, which included determination of impacts and associated permitting requirements to Waters of the U.S., endangered and threatened species, and archeological resources protected under the Antiquities Code of Texas. A Phase 1 hazardous materials assessment was also conducted for a pump station site, and a Texas Water Development Board Environmental Data Report was prepared in support of state funding for the project.

Expanded Carrizo Well Field Environmental Constraints Evaluation – San Antonio Water System (SAWS), Bexar County, Texas:

Environmental constraints assessments were performed for this multi-project evaluation to determine environmental permitting requirements and identify measures to ensure regulatory compliance for well sites and collection pipeline alignments. Evaluations included wetland determinations and associated permit requirements; determination of the potential occurrence of rare, threatened, or endangered species; and potential occurrence of cultural resources.

City of New Braunfels Landa Municipal Park Riparian Corridor Restoration:

Roy managed the development of a riparian restoration and enhancement plan in support of proposed renovations. This plan summarized field investigations and ecological evaluations, identifying goals, objectives, and recommended measures for restoring and enhancing the riparian corridor along the edge of the Comal River, which flows through a golf course. Measures included methodology for control of invasive species, and restoring vegetation to increase the structure and function of the riparian corridor. Design specifications and associated graphics for control of invasive species and the planting of desirable tree and shrub species were included in the plan.



**HICKS &
COMPANY**

41 Years of
Experience

Education

Bachelor of Science | Range Science |
Texas A&M University | 1979

Associate in Arts | Biology | Temple
College | 2014

License/Certifications

Professional Wetland Scientist, 2014

TxDOT Sequence #24964

Background

Jim Herrington is a certified professional wetland scientist (PWS) with 27 years of regulatory training and experience related to Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act (CWA), the National Environmental Policy Act (NEPA), Section 106 of the National Historic Preservation Act (NHPA), and Section 7 of the Endangered Species Act (ESA). Further, Jim has 13 previous years of training and experience in natural resources restoration and management with numerous state and federal agencies. He previously served as the U.S. Environmental Protection Agency (EPA) Wetlands Program technical contact for federally recognized tribal governments, councils of governments, and state and local agencies, and served as a point of contact for the USACE, having worked for the agency as a Regulatory Project Manager.

At Hicks & Company, Jim's services also include wetland delineation, stream restoration, preliminary jurisdictional determinations, development of wetland mitigation plans, and permitting.

Jim Herrington, PWS

Permitting Environmental Lead

Phase IB Raw Water Infrastructure – Alliance Regional Water Authority (ARWA), Caldwell County, Texas:

Jim managed jurisdictional determinations of waters of the U.S. including wetlands, field investigations and quantifications involving soil characteristics, plant composition, and wetland hydrology for four proposed water well sites and associated infrastructure within the planned ARWA Well Field on the Baker Ranch. The well sites were each 1.6 acres in size and infrastructure included 10,123 linear feet of 12- to 42-inch collection pipelines and 8,650 linear feet of access roads. Services included a Texas Water Development Board data form, an environmental constraints analysis, and a Phase I Environmental Site Assessment.

Preliminary Jurisdictional Determination and Wetland Delineation –

William Lyon Homes, Hutto, Texas: Jim managed jurisdictional determinations of waters of the U.S. including wetlands for this environmental studies project in support of proposed roadway and wastewater line crossings. He also performed field investigations requiring completion of wetland determination data forms and associated quantifications including applicable USACE regulatory requirements. Jim assisted in the preliminary review of proposed construction plans for compliance with the Clean Water Act, an onsite wetland and ordinary high-water mark delineation, and preparation of the technical memorandum for the client to present WOTUS constraints for the site.

Loop 390 From IH 20 to US 80 – TxDOT Atlanta District, Harrison County,

Texas: Hicks & Company is currently providing environmental services for this new-location roadway project around Marshall, Texas. Jim has conducted jurisdictional determinations of waters of the U.S. including wetlands for the proposed project, and is responsible for completion of wetland determination data forms and associated quantifications involving soil characteristics, plant composition, and wetland hydrology.

FM 1463 Detention Pond – TxDOT Houston District, Fort Bend County, Texas:

Jim is managing jurisdictional determinations of waters of the U.S. including wetlands for this environmental services and documentation project for the planned construction of a detention pond between the intersection of the Willow Fork of Buffalo Bayou and FM 1463. He also performed field investigations with completion of wetland determination data forms, and associated quantifications.

SH 276 from FM 549 to CR 2472 – TxDOT Dallas District:

Hicks & Company is currently providing environmental services for proposed improvements to SH 276 in Rockwall and Hunt Counties. The project includes three major stream crossings including Brushy Creek, Hackberry Creek and Klutts Branch, and their associated tributaries. Jim is managing jurisdictional determinations of waters of the U.S. including wetlands, and has performed field investigations and associated quantifications involving soil characteristics, plant composition, and wetland hydrology.

SH 42 from IH 20 to US 80 – TxDOT Tyler District: Jim is managing jurisdictional determinations of waters of the U.S. including wetlands for this environmental services improvements project, including a major crossing of the Sabine River. He performed field investigations and associated quantifications involving soil characteristics, plant composition, and wetland hydrology.



25 Years of
Experience

Education

Master of Arts | Anthropology | The University of Texas at San Antonio | 2002

Bachelor of Arts | Anthropology | The University of Texas at Austin | 1994

License/Certifications

Registered Professional Archeologist (RPA) #28578776

TxDOT Sequence #15362

Background

Brandon serves as the Archeology Program Manager at Hicks & Company. With 25 years of regional expertise, he has conducted extensive cultural resources investigations for complex transportation, oil and gas, water/wastewater infrastructure, renewable energy, local and state construction, and private development projects in Texas and adjacent states.

His current duties include managing all phases of archeological investigations, laboratory analysis, the curation of artifacts, technical reports, and consulting with state and federal agencies. Brandon's work with federal agencies has consisted of archeological work and other NEPA-related contributions in support of Environmental Impact Statements, Environmental Assessments, and Cultural Resource Management Plans. He also manages coordination with agencies including the USACE, the Federal Energy Regulatory Commission, the APA, the Texas Historical Commission, and the USDA.

Brandon Young, RPA

Permitting Cultural Resources Lead

Great Divide Drive at Little Barton Creek Drainage Improvements – City of Austin (COA), Texas: Brandon is currently overseeing agency coordination with the Texas Historical Commission (THC) on behalf of the COA for drainage improvements and the replacement of existing culverts near and under a road crossing that has become vulnerable to flooding. An archeological survey was performed following THC coordination. Brandon is currently preparing the necessary scope of work and Texas Antiquities Permit application for submittal to the THC to authorize field investigations.

SH 42 from IH 20 to US 80 – TxDOT Tyler District: Brandon is currently supervising and co-authoring the archeological resources study for proposed improvements to this state highway. The background study will be used to assess the potential for the presence of significant archeological resources within the area of potential effects (APE) with the goal of determining whether the proposed project warrants archeological field investigations prior to construction. Coordination with TxDOT is ongoing.

North Walnut Creek Trail (NWCT) Phase 3 Project – COA, Texas: Brandon is co-authoring an environmental assessment (EA) for the final phase of the NWCT, having developed the archeological survey scope of work to accompany the Texas Antiquities permit application to the THC.

International Boundary and Water Commission (IBWC), US Section – Zapata County, Texas: Brandon provided oversight of an intensive cultural resources survey of 416 acres to assist the agency with inventorying the cultural resources on lands within their jurisdiction. He was responsible for the development of the scope of work, agency coordination, and general oversight of the project.

Additional Principal Investigator Archeological Survey Projects Include:

- State Loop 82, San Marcos – TxDOT Austin District
- Schaefer Road Drainage – Bexar County Flood Control, TX
- Rosillo Creek NWWC (SC-15) Project – Bexar County Flood Control, TX
- Post-Review Discoveries, Del Rio Outer Loop – TxDOT Laredo District, TX
- Test Excavations, Alabama-Coushatta Indian Reservation – Polk County, TX
- Public Utility Reservoir and Pipeline Project – Hidalgo County, TX



**dSakura
robinson**

08 Years of
Experience

Claire Eddleman-Heath, PLA, LEED AP BD+C, SITES AP Landscape Architecture/Placemaking/Wayfinding – Project Lead

Experience

Education

Master of Landscape Architecture |
Harvard University Graduate School of
Design | 2011

Bachelor of Science | Architectural
Studies, Minor in Italian | The University
of Texas at Austin School of Architecture
| 2007

License/Certifications

Professional Landscape Architect, TX
#3201

LEED Accredited Professional BD+C

SITES Accredited Professional

Native Plants Society of Texas,
Certification in Native Plant Landscape
Maintenance - 2018 - Present

Background

Claire brings her passion for performative landscapes to each project, collaborating with multidisciplinary teams to integrate landscape systems thinking and awareness of locality. As a licensed landscape architect, LEED AP BD+C and SITES AP, Claire has contributed to and managed a variety of complex projects at a broad range of scales. Significant past projects include a net-zero nature center and preserve in Midland, Texas, a learning center designed to meet the Living Building Challenge, a strategic plan for the Lady Bird Johnson Wildflower Center, the multi-block Rebekah Baines Johnson Mixed-Use and Affordable Housing Development and multiple trail and park master plans including the Holly Shores/Edward Rendon Sr. Park at Festival Beach.

Ann and Roy Butler Trail at Southeast Shores – City of Austin, Texas: Project Manager for this landscape architect master plan that involved subconsultant team management and collaboration with non-profits and City of Austin Parks and Recreation department. Claire designed park and trail amenities, as well as low impact design features to accommodate stormwater and slow run-off before reaching Lady Bird Lake for the 31-acre park. The master plan was divided into phases based on probably cost developed by a consultant, need, and feasibility, and was adopted by City Council in 2013 to meet community, stakeholder, and city-wide goals.

Jenna Welch Nature Center Master Plan and Design – Austin, Texas: Project Manager for the design and project progress of a 2.5-acre site within an 87-acre preserve. Design included wayfinding, boardwalks, and viewing platforms, and necessitated close study of the unique lake ecosystem and criteria to meet Living Building Challenge Net Zero sustainability standards.

Comal River Recreation Feasibility Plan – City of Austin, Texas: As Landscape Architecture Project Manager, Claire performed precedent studies of recreation and environmental uses, aesthetic evaluation, and a site-wide accessibility assessment. The assessment reviewed public river recreation and access on the Comal River in the popular tubing area. Claire worked closely with the H&H engineer and City staff to prepare landscape architecture related analysis of the river site access and feasibility for future growth. Analysis included workshops and presentations where staff provided input and insights about the current and preferred future conditions for the site. Claire also researched and prepared case studies where master plans called for diverse river recreation types that also supported environmental health.

Lakeline Station Learning Center – Austin, TX: Project Manager and Lead Designer responsible for the landscape architecture concept design through implementation for the Learning Center. The center and its landscape were designed to meet the Living Building Challenge, and went on to win the Austin Green Awards project of the year in 2017. Claire designed an edible native plant garden, orchard and low-water-use raised beds for the community garden, and stormwater landscape features. She also prepared landscape architecture design, analysis, and construction documents, and coordinated with multiple disciplines including civil engineers, rainwater harvesting consultant, architect and Learning Center staff and educators.

The Lady Bird Johnson Wildflower Center Strategic Master Plan – Austin, Texas: Claire lead the landscape architecture site assessment and framework plan for the expanding visitor arrival area and rearranged site design functions of the Center, managing a subconsultant team including an architect, civil engineer, cost estimator, and O&M consultants. Claire researched and prepared site analysis, facilitated team and client meetings and workshops, and prepared project feasibility reports including an assessment of major site constraints and the projects ability to reach SITESv2 Platinum Certification.



Asakura
robinson

10 Years of
Experience

Education

Master of Science | Community and Regional Planning | University of Texas, Austin | 2015

Master of Science | Sustainable Design | University of Texas, Austin | 2015

Bachelor of Science | Wildlife Ecology | University of Florida, Gainesville | 2009

License/Certifications

American Institute of Certified Planners, AICP #30417

Certified Ecologist, Ecological Society of America

SITES Accredited Professional, 00001415-Sites

Texas Master Naturalist

Background

Katie leads the Urban Ecology Studio at Asakura Robinson, where she works on planning and design projects. She targets increased resiliency, restoring ecosystem function, conserving open space, and facilitation of sustainable public access. Katie's traditional training in ecology allows her to understand the ecological imperative and technical nuances in the Urban Ecology Studio's work while her training in community planning and sustainability has armed her with the tools to understand how economic, cultural, social, and ecological goals must be balanced. She serves on the City of Austin Environmental Commission, City of Austin Joint Sustainability Committee, and The Trail Foundation Ecological Restoration Committee.

Katie Coyne, AICP, Certified Ecologist, SITE AP Landscape Architecture/Placemaking/Wayfinding – Ecology Lead

Experience

Landa Park & Arboretum Master Plan – New Braunfels, Texas: Katie acted as Ecologist and Master Planner for the planning, Landscape Architecture, Urban Ecology, and Engagement of a 12-month community visioning process for one of the state's oldest and most beloved city parks.

San Antonio Trail Design Strategy – San Antonio, Texas: Project Manager for the development of baseline design strategies for the greenway system, with toolkit options to integrate green infrastructure, site furnishings, and other interventions into both trailhead and trail section work.

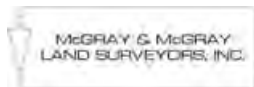
Dallas Water Gardens – Dallas, Texas: As AR Project Manager, Katie leads a project team balancing goals of treating stormwater, managing wildlife, providing public access and environmental education, and connecting the urban fabric of downtown to the nearby but disconnected Trinity River. The team applies a thoughtful ecological design of an innovative urban stormwater wetland.

Austin FC Stadium – Austin, Texas: As AR Project Manager, Katie is leading efforts related to sustainable and resilient design and operations for the stadium, including concerns of energy, water, waste, ecology, history and culture, food production, and others. The project is a multi-team effort, with Katie directing the consultant team, owner, and City stakeholders from various departments.

Willow Waterhole Public Access Plan – Houston, Texas: Planner for public engagement and consensus building, environmental planning, and development of the final plan of this project, which balances both a vulnerable ecosystem and community access concerns.

Additional Related Projects Include:

- TBC Healthy Parks Plan – Travis, Bastrop, and Caldwell Counties, TX
- Park-Smart Precinct 1 Plan – Harris County, TX
- Uplands Tract Open Space Concept Plan – Sunset Valley, TX
- Wetland Mitigation Park – Conroe, TX
- Zilker Botanical Garden Master Plan Phase 1 – Austin, TX
- San Antonio Trail Design Strategy – San Antonio, TX
- Dallas Water Gardens – Dallas, TX
- Westbury Community Garden Master Plan – Houston, TX
- Willow Waterhole Public Access Plan – Houston, TX
- Landa Park & Arboretum Master Plan – New Braunfels, TX
- Coastal Restoration Planning – Louisiana, Statewide
- National Marine Environmental Survey – Fiji
- Marine Protected Areas Management – Fiji



24 Years of
Experience

Christopher Conrad, RPLS

Survey – Project Lead

Experience

MLK TOD Storm Water Conveyance Improvements Freese and Nichols/

City of Austin: Topographic survey of Boggy Creek with 1' contours locating utilities, wastewater manhole and storm sewer/existing pond infrastructure data, trees, environmental features, and geotechnical boreholes, 10 easement plats and descriptions.

Buda 2014 Bond Program Drainage Master Plan – 4 Project Areas/Freese and Nichols/City of Buda:

Provided topographic surveying services in four areas: cross sections of dam, drainage swells, drainage channels, and outfall. Christopher also researched easements, located roadway ROW, surface features, utilities, culvert sizes, wastewater manhole rim, and flowlines.

Little Walnut Creek Flood Hazard Reduction Project/Brown & Gay/City of

Austin: Christopher headed this project to establish control; identify existing utilities; and perform a topographic survey with 1' contours locating waterlines, manholes, meters, valves, wastewater and stormwater manhole information, sidewalks, driveways, roadways, fences, curbs, etc. Geotechnical boreholes and high water marks were located, along 8 easement plats and descriptions.

Onion Creek Reclaimed Water Main/DAVCAR Engineering/City of Austin:

Established control, provided topographic survey locating surface evidence of all utilities, physical features that may be affected by construction, manhole, flowline, valve, inlet and outlet information for storm sewer infrastructure, geotechnical boreholes, and trees 2" and greater, for approximately 17,500 LF of water main.

Old Stagecoach Road Waterline Project/K.Friese/City of Kyle: Topographic survey with 1' contours locating natural and man-made features, visible utilities, manholes and culverts, invert elevations, and trees 6" and greater. At 50' interval cross sections, Christopher provided as built of newly constructed water utilities.

San Marcos Reuse Project/RPS/City of San Marcos: Established control and provided topographic survey with 1' contours for 8,300 LF and 97 acre tract. Christopher located natural and man-made features including boreholes, rock outcroppings, manholes, curb structures, and trees 8" and greater.

Kensington Place and Windy Park Tributary Hydrology and Hydraulic Study/

RPS/Round Rock, TX: Designed the topographic survey, providing cross sections, profiles, and details of structures and bridges; topographic data of inlets, swales, outfalls, and curbs, with control per FEMA guidelines and specifications.

FM110, San Marcos, TX/LJA/Hays County: Topographic survey of obscured areas, locating pavement, utilities, drainage structures, SUE marks, cross section, plats, description, and strip map for 20 parcels.

Education

Austin Community College, Austin, TX
TSPS Approved Seminars, Austin, TX

License/Certifications

Registered Professional Land Surveyors

Member of Texas Society of Professional Surveyors

Member of National Society of Professional Surveying

Background

Christopher has over 24 years of experience in land surveying, with 18 years in project management. His experience has included all phases of surveying work – field crew, party chief, office technician, and his current position as survey manager/project manager. He has experience in land title and boundary, right-of-way, route, locative, construction, engineering design, topographic, asbuilt, utility, tree, obstruction, aerial photography control, horizontal control, vertical control, hydrographic surveys, terrestrial LiDAR, and utility research.

Christopher's responsibilities include coordination of services connected with the project and supervision of field services, including data collection, GPS networks, and conventional or terrestrial LiDAR surveying. He also supervises office work and analysis, including data entry and reduction, computations, plotting and analysis of data, land title and boundary research, ALTA-ASCM surveys, plats, descriptions, right-of-surveys, reports, cut sheets, plats, descriptions and right-of-way maps.



**Balcones
Geotechnical**

25 Years of
Experience

Education

Master of Science | Civil Engineering |
Virginia Tech University | 1995

Bachelor of Science | Civil Engineering |
Virginia Tech University | 1993

License/Certifications

Texas Professional Engineer: No. 91271

Centralized Master Bidders List (CMBL)
with WO HUB status

TxDOT Precertifications: 14.1.1, 14.2.1,
14.3.1, 14.4.1, 14.5.1

Background

Rebecca has 25 years of experience conducting and managing geotechnical investigations, design, and construction phase projects with the past 16 years in central Texas.

Her experience includes deep and shallow foundation investigations; retaining wall design; earthen embankment and levee design; construction phase inspections; geologic and geophysical site characterization; specialty geotechnical field testing and instrumentation (cone penetrometer, dilatometer, vane shear, vibration monitoring, slope inclinometer, pressure meter, packer testing, piezometers); advanced geotechnical laboratory testing; geotechnical parameter synthesis; and advanced analytical modeling for design of geotechnical structures, tunnels, and pavements.

Rebecca Russo, PE

Geotechnical Engineering – Project Lead

Experience

Capitol Improvements Project – Texas Facilities Commission, Austin, Texas:

Geotechnical engineering consulting and reporting for planned improvements to the State Capitol complex, including two mid-rise office buildings with below grade construction and tunnel access/corridors. Reports were issued in a technical memo format as design progressed. Construction phase services include installation and oversight of instrumentation to monitor ground movements during construction.

Regional Detention Pond No. 2 – Veramendi Development, New Braunfels, Texas:

Geotechnical engineering services and Geotechnical Engineer of Record for the proposed earthen embankment flood control dam. Challenging site conditions include karst limestone foundation, and source of borrow.

Plum Creek Flood Structure No. 10 – Buda, Texas:

Geotechnical investigation and engineering report for an existing dam rehabilitation project, including rehabilitative lime treatment of new embankment fill. Site conditions include high plasticity clay.

SL 337 Improvements – New Braunfels, Texas: Project Manager for the widening of 6.3 miles of SL 337. The project included Wincore and LPILE analyses for sound walls and 7 multi-bridge crossings, with alignment areas underlain by karst limestone.

FM 1103 – Cibolo, Texas: Conducted the geotechnical investigation for sound wall, retaining wall, bridge, and culvert improvements along a 4.3-mile segment of FM 1103, with site conditions including numerous utilities and expansive clay soils.

SH 71 Expressway – Austin, Texas: Provided geotechnical analyses and design memoranda for MSE retaining and soil nail walls. Design included analysis of grade separation and direct connect at SH 130, and associated settlement analysis.

Upper Brushy Creek WCID Dam 8 Modernization – Austin, Texas: Geotechnical investigation, analysis, and design for existing dam raise and new principal spillway.

William Cannon Drive Overpass at Union Pacific Railroad – Austin, Texas:

Geotechnical evaluation for distressed Reinforced Earth abutment structures, including monitoring of vibrations and slope inclinometers. Final design includes consideration of various stabilization options, and phased construction for the busy urban roadway.

Water Treatment Plant and Treated Water Transmission Main – Brushy Creek Regional Utility Authority, Cedar Park, Texas:

Geotechnical investigation and reporting for new water treatment plant and 96-to 72-inch diameter treated water main.

Waller Creek Flood Control Tunnel – Austin, Texas: Geotechnical evaluation and design recommendations for the flood control tunnel and inlet/outlet structures, including deep and submerged chambers founded in expansive shale. Authored geotechnical baseline report for large diameter wastewater line relocation as part of master project, and provided construction phase testing and instrumentation services.

Purgatory Creek Channel Improvements Final Design Proposal

Headquarters

2925 Briarpark Drive
Suite 400
Houston, TX 77042
713.266.6900

info@lan-inc.com

Texas

Austin
College Station
Corpus Christi
Dallas
Fort Worth
Houston
Laredo
Montgomery County
San Antonio
San Marcos
Waco

California

Los Angeles
Milpitas
Oakland
Orange

Florida

Miami
Tampa Bay

Illinois

Chicago

Michigan

Lansing

Oklahoma

Norman



www.lan-inc.com



**Lockwood, Andrews
& Newnam, Inc.**
A LEO A DALY COMPANY

Attachment 5 – Subcontractor Proposals

McGray & McGray	Page 1-15
Balcones Geotechnical.....	Page 16-22
Hicks & Company.....	Page 23-38
Jeffrey L Bruce & Co.....	Page 39-46
Asakura Robinson.....	Page 47-55
Lady Bird Johnson Wildflower Center.....	Page 56-63



September 9, 2019

Jennifer Miller
LAN
407 S. Stagecoach Trail
Suite 207
San Marcos, TX 78666
(512) 214-6030

VIA EMAIL
JLMiller@lan-inc.com

**RE: Seventh Revised Proposal for Surveying Services for Purgatory Creek
Channel Improvement Project, City of San Marcos, Texas**

Dear Ms. Miller:

We appreciate the opportunity to present you with this seventh revised proposal for the above referenced project. The following represents our understanding of the area to survey, scope of services, and our fee proposal.

Area to Survey:

1. Exhibit "A": Limits of survey are right-of-way to right-of-way, as highlighted in "Red" for DMP# 15 and DMP# 25.
2. Exhibit "B": Limits of survey is a 200' wide corridor along the creek plus park areas, as highlighted in "Yellow".
3. Exhibit "C": Limits of survey are highlighted in "Green" for DMP# 25.
4. Exhibit "D": Limits of survey are highlighted in "Orange" for DMP# 15.
5. Exhibit "E": Limits of survey outlined in "Blue" (Phase 1).
6. Exhibit "F": Boundary for parcel acquisitions highlighted in "Red".
7. Exhibit "G": Boreholes

Survey Control:

- Perform GPS survey to establish horizontal and vertical control based on Texas State Plane, Central Zone NAD 83 (2011) and NAVD 88. Provide benchmarks along project corridor and sufficient horizontal control for use as construction baseline.

Scope of Services:

1. Design Topographic and Tree Survey (ROW to ROW) for future Drainage Improvements, as highlighted in "Red" and shown on Exhibit "A" for DMP# 15 and DMP# 25:

- Locate by actual on-the-ground survey visible and accessible on-grade and above-grade features, including but not limited to pavement marking, edge of pavement, curbs, gutters, driveways, ramps, sidewalks, signs, fences, utility valves, water meters, manholes, hydrants, clean-outs, inlets, utility poles, guy anchors, overhead lines and other surface utility features. LAN will coordinate with One Call to identify utilities within the project area and within the right-of-way boundaries.
- Surveys of trees will consider the following:
 1. Prior to conducting surveys of trees, coordinate with City staff to identify which trees will be surveyed.
 2. For trees considered as "stand alone" and having a tree diameter of 9-inches (9") or greater, identify the tree location, measure the diameter and tag the tree.
 3. For trees located in groups, identify the area and not each individual tree.
- Provide contours at one-foot interval. Elevations will be taken on an approximate 50'x 50' grid, at abrupt changes in grade and along drainage courses. Elevations of survey points will be on a separate layer and will not be part of the final plotted drawing.
- Provide spot elevations at top of accessible manhole and valve box covers. Provide invert elevation of manholes and elevation and size of pipes entering or exiting manholes of accessible sewer and storm drain structures. Provide top elevation of valve nut of accessible valves on main lines.

2. Design Topographic and Tree Survey (Drainage Area) as highlighted in "Yellow" and shown on Exhibit "B":

- Locate by actual on-the-ground survey visible and accessible on-grade and above-grade features, including but not limited to pavement marking, edge of pavement, curbs, gutters, driveways, ramps, sidewalks, signs, fences, utility valves, water meters, manholes, hydrants, clean-outs, inlets, utility poles, guy anchors, overhead lines and other surface utility features. LAN will coordinate with One Call to identify utilities within the project area and within the right-of-way boundaries.
- Surveys of trees will consider the following:
 1. Prior to conducting surveys of trees, coordinate with City staff to identify which trees will be surveyed.

2. For trees considered as "stand alone" and having a tree diameter of 9-inches (9") or greater, identify the tree location, measure the diameter and tag the tree.

3. For trees located in groups, identify the area and not each individual tree.

- Provide contours at one-foot interval. Elevations will be taken on an approximate 50'x 50' grid, at abrupt changes in grade and along drainage courses. Elevations of survey points will be on a separate layer and will not be part of the final plotted drawing.
- Provide spot elevations at top of accessible manhole and valve box covers. Provide invert elevation of manholes and elevation and size of pipes entering or exiting manholes of accessible sewer and storm drain structures. Provide top elevation of valve nut of accessible valves on main lines.

3. Design Topographic and Tree Survey (Drainage Area) as highlighted in "Green" and shown on Exhibit "C" for DMP# 25:

- Locate by actual on-the-ground survey visible and accessible on-grade and above-grade features, including but not limited to pavement marking, edge of pavement, curbs, gutters, driveways, ramps, sidewalks, signs, fences, utility valves, water meters, manholes, hydrants, clean-outs, inlets, utility poles, guy anchors, overhead lines and other surface utility features. LAN will coordinate with One Call to identify utilities within the project area and within the right-of-way boundaries.
- Surveys of trees will consider the following:
 1. Prior to conducting surveys of trees, coordinate with City staff to identify which trees will be surveyed.
 2. For trees considered as "stand alone" and having a tree diameter of 9-inches (9") or greater, identify the tree location, measure the diameter and tag the tree.
 3. For trees located in groups, identify the area and not each individual tree.
- Provide contours at one-foot interval. Elevations will be taken on an approximate 50'x 50' grid, at abrupt changes in grade and along drainage courses. Elevations of survey points will be on a separate layer and will not be part of the final plotted drawing.
- Provide spot elevations at top of accessible manhole and valve box covers. Provide invert elevation of manholes and elevation and size of pipes entering or exiting manholes of accessible sewer and storm drain structures. Provide top elevation of valve nut of accessible valves on main lines.

4. Design Topographic and Tree Survey (Drainage Area) as highlighted in "Orange" and shown on Exhibit "D" for DMP# 15:

- Locate by actual on-the-ground survey visible and accessible on-grade and above-grade features, including but not limited to pavement marking, edge of pavement, curbs, gutters, driveways, ramps, sidewalks, signs, fences, utility valves, water meters, manholes, hydrants, clean-outs, inlets, utility poles, guy anchors, overhead lines and other surface utility features. LAN will coordinate with One Call to identify utilities within the project area and within the right-of-way boundaries.
- Surveys of trees will consider the following:
 1. Prior to conducting surveys of trees, coordinate with City staff to identify which trees will be surveyed.
 2. For trees considered as "stand alone" and having a tree diameter of 9-inches (9") or greater, identify the tree location, measure the diameter and tag the tree.
 3. For trees located in groups, identify the area and not each individual tree.
- Provide contours at one-foot interval. Elevations will be taken on an approximate 50'x 50' grid, at abrupt changes in grade and along drainage courses. Elevations of survey points will be on a separate layer and will not be part of the final plotted drawing.
- Provide spot elevations at top of accessible manhole and valve box covers. Provide invert elevation of manholes and elevation and size of pipes entering or exiting manholes of accessible sewer and storm drain structures. Provide top elevation of valve nut of accessible valves on main lines.

5. Right-of-Entry (ROE) Letters:

- McGray & McGray will provide research to determine ownership of all landowners where access will be needed to perform the required survey services including geotechnical drilling, archaeological trenching, and environmental surveying and send a ROE letter to each. If access is denied, we will contact LAN.

6. Boundary Survey for proposed parcel acquisition/future easements as highlighted in "Red" - See Exhibit "F":

- Locate sufficient boundary monumentation, obtain and review available tax plats, subdivision plats, property deeds (for unplatted tracts) identified from Hays Central Appraisal District records and show approximate location of boundary/ROW lines. Show owner name, book and page information, subdivision name, lot and block number, HCAD parcel number, easements

adjoining survey area as shown on subdivision plats and physical address of each tract within or adjoining project limits. This item shall be limited to areas within existing easements.

The fees associated with the boundary of these lots is based on their location which is in a much older part of the City where monumentation is scarce. It is very likely that we will need to recover monumentation well outside the blocks from these lots.

7. Boreholes

- Field locate 26 proposed geotechnical bore holes along project corridor as shown on Exhibit "G".

Fees: (Non-taxable):

1. Drainage Improvements – Exhibit "A" (Non-Taxable):

2 Man Crew:	120 hrs @	\$150.00 /hr.= \$	18,000.00
2 Man RTK Crew:	40 hrs @	\$200.00 /hr.= \$	8,000.00
GPS Processing:	4 hrs @	\$108.00 /hr.= \$	432.00
Field Coordinator:	6 hrs @	\$98.00 /hr.= \$	588.00
Sr. Tech:	60 hrs @	\$96.00 /hr.= \$	5,760.00
Tech:	120 hrs @	\$82.00 /hr.= \$	9,840.00
Research:	8 hrs @	\$72.00 /hr.= \$	576.00
Administration/Clerical	4 hrs @	\$63.00 /hr.= \$	252.00
RPLS:	18 hrs @	\$145.00 /hr.= \$	2,610.00
Project Manager:	6 hrs @	\$165.00 /hr.= \$	990.00
TOTAL = \$			47,048.00

2. Design Topographic Survey of Drainage Area – Exhibit "B" (Non-Taxable):

2 Man Crew:	355 hrs @	\$150.00 /hr.= \$	53,250.00
2 Man RTK Crew:	55 hrs @	\$200.00 /hr.= \$	11,000.00
3 Man Crew:	50 hrs @	\$186.00 /hr.= \$	9,300.00
GPS Processing:	12 hrs @	\$108.00 /hr.= \$	1,296.00
Field Coordinator:	26 hrs @	\$98.00 /hr.= \$	2,548.00
Sr. Tech:	220 hrs @	\$96.00 /hr.= \$	21,120.00
Tech:	430 hrs @	\$82.00 /hr.= \$	35,260.00
RPLS:	24 hrs @	\$145.00 /hr.= \$	3,480.00
Project Manager:	12 hrs @	\$165.00 /hr.= \$	1,980.00
Terrestrial Scanner	12 hrs @	\$100.00 /hr.= \$	1,200.00
TOTAL = \$			140,434.00

3. Design Topographic Survey of Drainage Area – Exhibit “C” (Non-Taxable):

2 Man Crew:	70 hrs @	\$150.00 /hr.=	\$ 10,500.00
2 Man RTK Crew:	20 hrs @	\$200.00 /hr.=	\$ 4,000.00
GPS Processing:	4 hrs @	\$108.00 /hr.=	\$ 432.00
Field Coordinator:	4.5 hrs @	\$98.00 /hr.=	\$ 441.00
Sr. Tech:	45 hrs @	\$96.00 /hr.=	\$ 4,320.00
Tech:	90 hrs @	\$82.00 /hr.=	\$ 7,380.00
RPLS:	6 hrs @	\$145.00 /hr.=	\$ 870.00
Project Manager:	1 hrs @	\$165.00 /hr.=	\$ 165.00
TOTAL =			\$ 28,108.00

4. Design Topographic Survey of Drainage Area – Exhibit “D” (Non-Taxable):

2 Man Crew:	70 hrs @	\$150.00 /hr.=	\$ 10,500.00
2 Man RTK Crew:	20 hrs @	\$200.00 /hr.=	\$ 4,000.00
GPS Processing:	4 hrs @	\$108.00 /hr.=	\$ 432.00
Field Coordinator:	4.5 hrs @	\$98.00 /hr.=	\$ 441.00
Sr. Tech:	45 hrs @	\$96.00 /hr.=	\$ 4,320.00
Tech:	90 hrs @	\$82.00 /hr.=	\$ 7,380.00
RPLS:	6 hrs @	\$145.00 /hr.=	\$ 870.00
Project Manager:	1 hrs @	\$165.00 /hr.=	\$ 165.00
TOTAL =			\$ 28,108.00

5. Right-Of-Entry Letters (Non-taxable):

Tech:	40 hrs @	\$82.00 /hr.=	\$ 3,280.00
Research:	16 hrs @	\$72.00 /hr.=	\$ 1,152.00
Administration/Clerical	60 hrs @	\$63.00 /hr.=	\$ 3,780.00
Project Manager:	20 hrs @	\$165.00 /hr.=	\$ 3,300.00
TOTAL =			\$ 11,512.00

6. Boundary Surveys – Exhibit “F” (Taxable):

2 Man Crew:	300 hrs @	\$150.00 /hr.=	\$ 45,000.00
Field Coordinator:	21 hrs @	\$98.00 /hr.=	\$ 2,058.00
Sr. Tech:	200 hrs @	\$96.00 /hr.=	\$ 19,200.00
Tech:	700 hrs @	\$82.00 /hr.=	\$ 57,400.00
Research:	16 hrs @	\$72.00 /hr.=	\$ 1,152.00
RPLS:	16 hrs @	\$145.00 /hr.=	\$ 2,320.00
Project Manager:	4 hrs @	\$165.00 /hr.=	\$ 660.00
TOTAL =			\$ 127,790.00

7. Boreholes – Exhibit “G” (Non-Taxable):

2 Man Crew:	12 hrs @	\$150.00 /hr.=	\$	1,800.00
Field Coordinator:	0.5 hrs @	\$98.00 /hr.=	\$	49.00
Tech:	5 hrs @	\$82.00 /hr.=	\$	410.00
RPLS:	2 hrs @	\$145.00 /hr.=	\$	290.00
Project Manager:	0.5 hrs @	\$165.00 /hr.=	\$	82.50
TOTAL = \$				2,631.50

Summary:

1. Topographic Survey - Exhibit A red area:	\$	47,048.00
2. Topographic Survey - Exhibit B yellow area:	\$	140,434.00
3. Topographic Survey - Exhibit C green area:	\$	28,108.00
4. Topographic Survey - Exhibit D orange area:	\$	28,108.00
5. Right-of-Entry Letters:	\$	11,512.00
6.*Boundary Survey - Exhibit F red area:	\$	127,790.00
7. Boreholes - Exhibit G:	\$	2,631.50
LUMP SUM TOTAL:	\$	385,631.50

*Since this project includes taxable services, we will need to receive a Texas Sales and Use Tax Resale Certificate for those services prior to starting the project. If one is not available, sales tax will be charged.

Optional Grand Total (with 8.25% sales tax)*

Sales Tax on Boundary Surveying	\$	10,542.68
LUMP SUM TOTAL	\$	396,174.18

ADDITIONAL SERVICES UPON REQUEST:

A. Finished Floor Elevations in Phase 1 and shown on Exhibit “E”:

- Obtain the finished floor elevations for all buildings lying within the existing flood plain as defined on Exhibit “E”. (not to exceed 120 buildings)

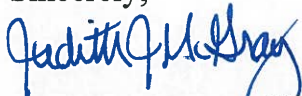
A. Finished Floor Elevations – Exhibit “E” (Non-Taxable):

2 Man Crew:	150 hrs @	\$150.00 /hr.= \$	22,500.00
2 Man RTK Crew:	30 hrs @	\$200.00 /hr.= \$	6,000.00
GPS Processing:	12 hrs @	\$108.00 /hr.= \$	1,296.00
Field Coordinator:	16 hrs @	\$98.00 /hr.= \$	1,568.00
Sr. Tech:	25 hrs @	\$96.00 /hr.= \$	2,400.00
Tech:	150 hrs @	\$82.00 /hr.= \$	12,300.00
RPLS:	8 hrs @	\$145.00 /hr.= \$	1,160.00
Project Manager:	1 hrs @	\$165.00 /hr.= \$	165.00
ADDITIONAL SERVICES LUMP SUM TOTAL \$			47,389.00

Once we receive notice to proceed, we will visit with you to establish a schedule for this project.

Thank you for including us on this project. We look forward to the opportunity to work with you. If you think we have omitted any service you require or misinterpreted your request, please let Chris Conrad or Joe Webber know.

Sincerely,



Judith J. McGray, RPLS
President
TBPLS Firm #10095500

JJM:CIC:pft
Encl.

Authorized to Proceed by:

Signature

Date

Print Name

Title

EXHIBIT 'A'

Google Earth

2018 Google

1000 ft

N

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The image is an aerial photograph from Google Earth showing a residential neighborhood. A red polygon is drawn on the map, enclosing a block bounded by Mead St, Faris St, S Mitchell St, and Johnson Ave. A red T-shape is drawn on the map, highlighting the intersection of S LBJ St and Cheatham St. Various street names are labeled on the map, including S Mitchell St, Mead St, Faris St, Johnson Ave, Roosevelt St, S Endicott St, Luck St, Joins St, Jackson St, Herndon St, Valley St, Centre St, Nicola Alley, N LBJ St, Cheatham St, McKie St, S LBJ St, E Grove St, Eisenhower St, and Travis St. A scale bar indicates 1000 feet, and a north arrow is present in the bottom left corner.

EXHIBIT 'A'

Google Earth

1000 ft

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EXHIBIT 'A'

Google Earth

1000 ft

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EXHIBIT 'A'

Google Earth

1000 ft

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EXHIBIT 'B'



EXHIBIT 'C'

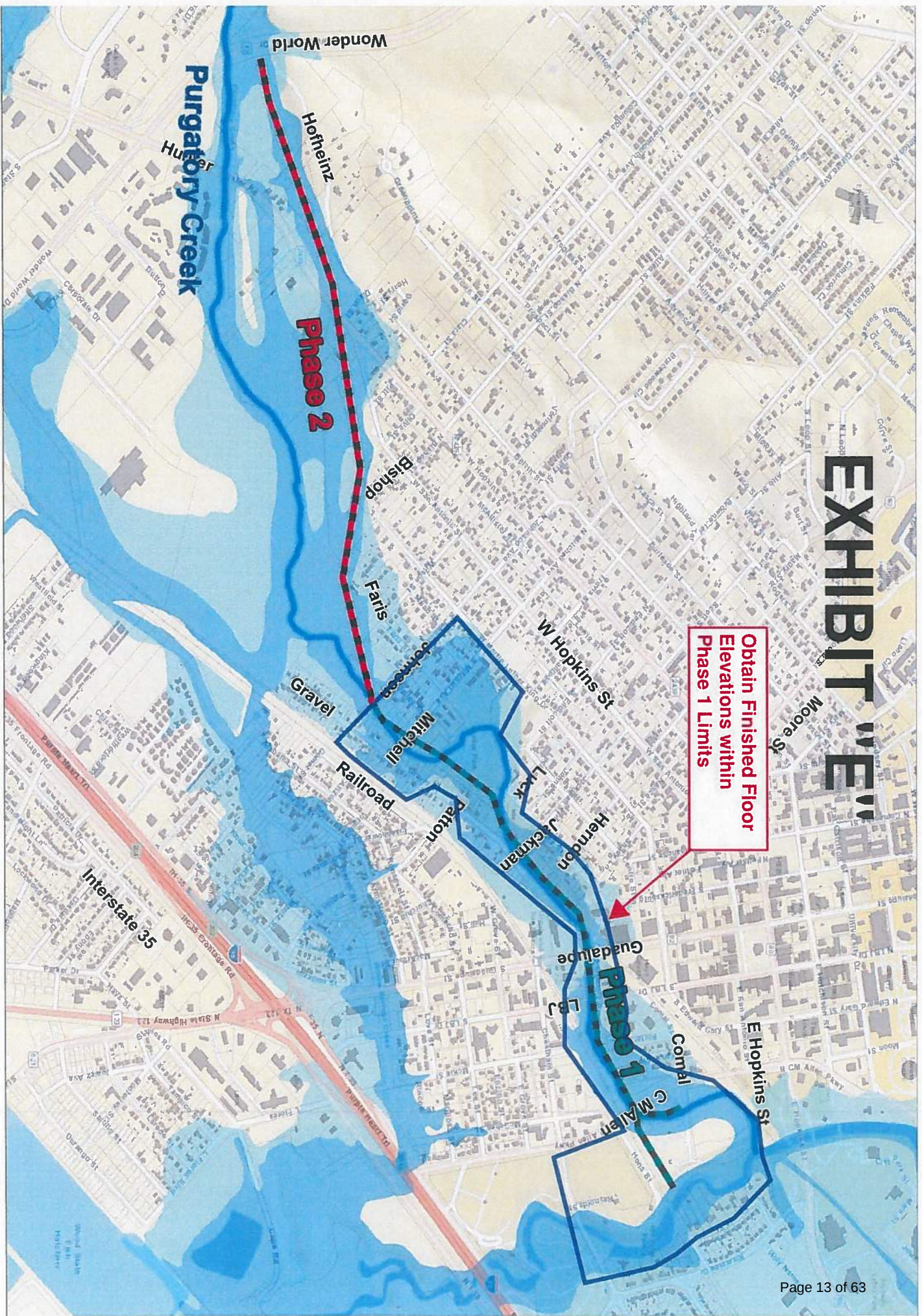


Google Earth



EXHIBIT 'E'

Obtain Finished Floor Elevations within Phase 1 Limits



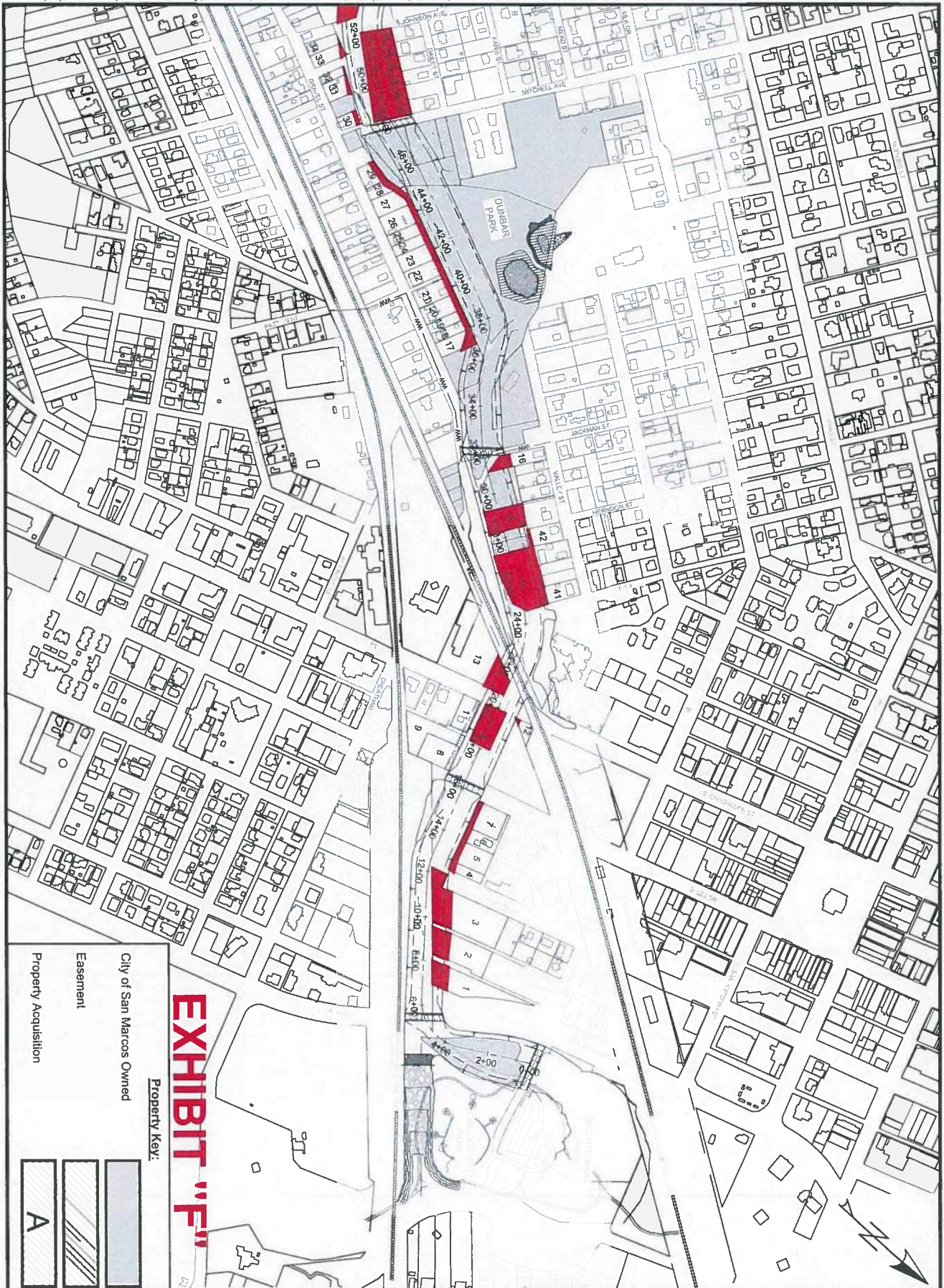


EXHIBIT "F"

Property Key:

City of San Marcos Owned

Easement

Property Acquisition

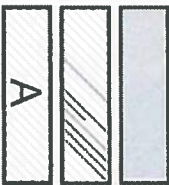


EXHIBIT A-2
 PURGATORY CREEK
 CHANNEL
 IMPROVEMENT
 PROJECT
 San Marcos, Texas

ISN
 International Sanitation
 & Sewer & Water Services
 407 S. Sanguinetti Trail
 Suite 207
 San Marcos, TX 78666
 Tel 512.386.4040
 www.isn-inc.com

KEY PLAN



REVISIONS

NO.	DATE	DESCRIPTION	BY
1	05/13/2019	ISSUED FOR PERMIT	ES

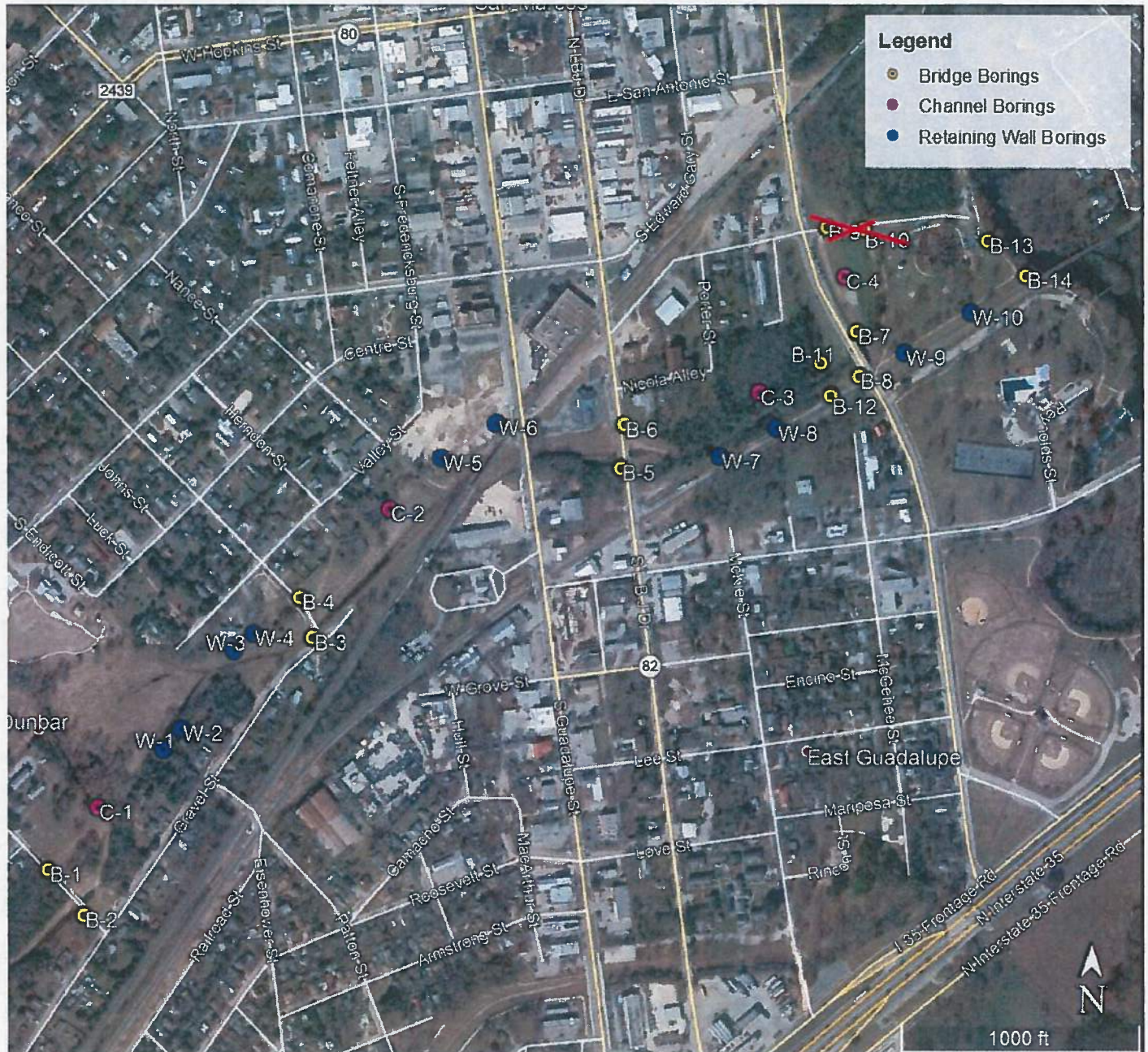
FILE LOG

DATE	BY	DESCRIPTION
05/13/2019	ES	ISSUED FOR PERMIT

Project No 120-12100-000
 Date MARCH, 2019

Scale 1"= 200' 300' 400'

PROPERTY MAP



Map Source: Google Earth Professional, Imagery Date 12/21/2018

EXHIBIT "G"

PROPOSED BORING PLAN

(excluding Boreholes B-9 & B-10)

Purgatory Creek Channel Improvements
San Marcos, Texas

**Balcones
Geotechnical**
Austin, TX 78731
512.380.9969

Attachment 1



Ms. Jennifer Miller, PE
Lockwood, Andrews & Newnam, Inc.
407 S. Stagecoach Trail, Ste. 207
San Marcos, TX 78666

Proposal No. 0118-009
August 7, 2019

**Proposal for Geotechnical Investigation
Purgatory Creek Channel Improvements
San Marcos, Texas**

Balcones Geotechnical, LLC (Balcones) is pleased to provide this proposal for geotechnical investigation for the above referenced project. Our understanding of the project is based on the information provided by you. We have received the site plan showing the proposed boring locations and requested scope. The project will include design of drainage channel and structure improvements along Purgatory Creek in San Marcos, Texas.

The geotechnical investigation and report for this project will include field, laboratory, and engineering phases. The following sections of this proposal include the scope of our services in three study phases, a cost estimate, an estimated schedule, and proposed terms and conditions.

Field Investigation

Based on published geologic mapping and our experience in the vicinity, the site is likely underlain by clay and sand alluvium, further underlain by clay and shale of the Pecan Gap formation. Based on our understanding of the proposed Purgatory Creek improvements, and that specifically requested on the provided exhibit, we propose the following drilling scope. A Proposed Boring Location Plan is presented on Attachment 1.

Structure	Boring Designation	Proposed Boring Depth (ft)	Total Drilling Footage (ft)
Bridges	B-1 – B-8 (roadways)	75	820 ft
	B-9 – B-12 (pedestrian)	55	
Retaining Walls	W-1 – W-10	35	350 ft
Channel	C-1 – C-4	15	60 ft
TOTAL Drilling Footage			1230 ft

Borings will be advanced using augering and sampling techniques. The shale or chalk stratum, if encountered, will be continuously core sampled. Soils will be sampled by either pushing a thin-walled tube (ASTM D 1587) or with a split barrel sampler while performing the Standard Penetration Test (ASTM D 1586). Rotary rock coring will be performed in general accordance with ASTM D2113.

If groundwater is encountered, the groundwater levels within the open borehole will be recorded at the time of drilling and immediately following drilling. Traffic control will be required for some of the borings. We understand that some of the samples collected will be split and send to another laboratory for their analysis. It should be noted that proposed drilling and sampling procedures presented herein do not include protocols for environmental sampling.

Laboratory Testing

Laboratory testing will be performed on recovered and auger samples selected by the geotechnical engineer to aid in soil classification and to measure engineering properties. Laboratory testing is expected to include moisture content, Atterberg limits, fines content (percent passing the No. 200 sieve), unconfined compression strength testing of clay and shale samples, hydrometers, and corrosion testing. The actual laboratory program will depend upon the type of soils and rock encountered. We understand that 3 soil samples will be submitted by LAN for grain size analysis testing with hydrometer as part of the geotechnical testing presented herein.

Engineering Report

Engineering analyses of the results of the field and laboratory data will be made to develop recommendations for bridge/culvert foundations, site retaining walls, and slope configurations. Our report(s) will include the following:

1. General subsurface conditions, including boring logs with descriptions of strata, summaries of laboratory test results, and water levels obtained at the time of drilling;
2. Boring location plan;
3. Soil boring logs with detailed descriptions and soil classifications based on the Unified Soil Classification System (ASTM D 2487);
4. Discussion of area geology, and subsurface information including stratigraphy and generalized subsurface conditions;
5. Depth to groundwater, if encountered, and comments regarding potential impact on construction;



6. Recommended foundation design for bridges and culverts including type, allowable bearing, and associated settlement;
7. Recommendations for below grade walls including equivalent fluid pressures, sliding coefficient, and provisions for drainage;
8. Global stability analysis for retaining walls taller than 6 ft, including sliding and overturning;
9. Slope stability analyses for 3 types of channel cross-sections with varying side slope configurations;
10. Support of scour and erosion analysis by others, including grainsize size analyses, recommended D50, and soil erosion characteristics;
11. General earthwork comments and excavation potential; and
12. General construction recommendations.

One electronic copy (PDF) will be submitted unless otherwise requested. The undersigned will manage this project. Reporting will likely consist a Geotechnical Data Report containing of all the field and laboratory data collected for the project, and Geotechnical Design Memoranda that provide specific recommendations for each portion of the project.

Cost Estimate

Based on the scope of work outlined herein, we have estimated the cost to perform geotechnical services for in Attachment 2. The cost estimate is based on the following assumptions:

1. Bridge (deep) borings will be drilled using a truck mounted drilling rig. Retaining wall and channel borings will be drilled using a track-mounted all-terrain drilling rig.
2. We will notify Texas 811, and coordinate with City of San Marcos personnel to clear the site of utilities. We request the assistance of the design team to ensure we have properly identified site issues.
3. Borings will be drilled during the normal workday, and normal work week. Weekend or nighttime drilling will require a surcharge fee.
4. We have included a contingency cost for both traffic control and site clearing of vegetation. We will only use budget if necessary, and will keep you informed of our site access and site safety needs.
5. Additional retaining wall borings, drilled to the 35 ft depth, will cost \$750 each (includes additional lab testing and incorporation into the report), assuming additional drill rig mobilizations are not needed.



6. Borings will be drilled in areas that can be accessed with the truck-mounted or ATV drilling equipment. Borings cannot be drilled on a slope. Boring locations will be staked using a hand-held GPS device and measuring distances from existing site features. Boring locations should be considered approximate.

The estimated fee may be exceeded if site conditions are significantly different than anticipated or changes in work are required or requested. However, the estimated fee will not be exceeded without the client's prior authorization. Required additions to the above scope of services would be invoiced in accordance with the attached fee schedule.

Schedule

Weather and site conditions permitting, field operations can start within 2 to 3 weeks after formal authorization to proceed. A project schedule is offered below.

Structure	Drilling Footage (ft)	Duration per Task	Total Duration
Bridges	820 ft	2 - 3 weeks to field stake, clear utilities 4 weeks to drill 2 - 3 weeks lab testing 2 - 4 weeks report	10 - 14 weeks
Retaining Walls	350 ft	2 weeks to field stake, clear utilities 1 - 2 weeks to drill 2 - 3 weeks lab testing 2 - 3 weeks report	7 - 10 weeks
Channel	60 ft	1 - 2 weeks to field stake, clear utilities 1 day to drill 1 - 2 weeks lab testing 2 - 3 weeks report	4 - 7 weeks
TOTAL	1230 ft	TOTAL DURATION	20 - 28 weeks (assuming overlap)

We suggest a project schedule of 20 to 28 weeks be established for the geotechnical investigation, laboratory testing, analyses, and engineering recommendation reports. Depending on design needs, we can prioritize the data and reporting. We will keep you verbally informed of our findings as they become available.

* * *



We appreciate the opportunity to submit this proposal and look forward to working with you on this project. Please call if we can answer any questions or if you would like to discuss this proposal.

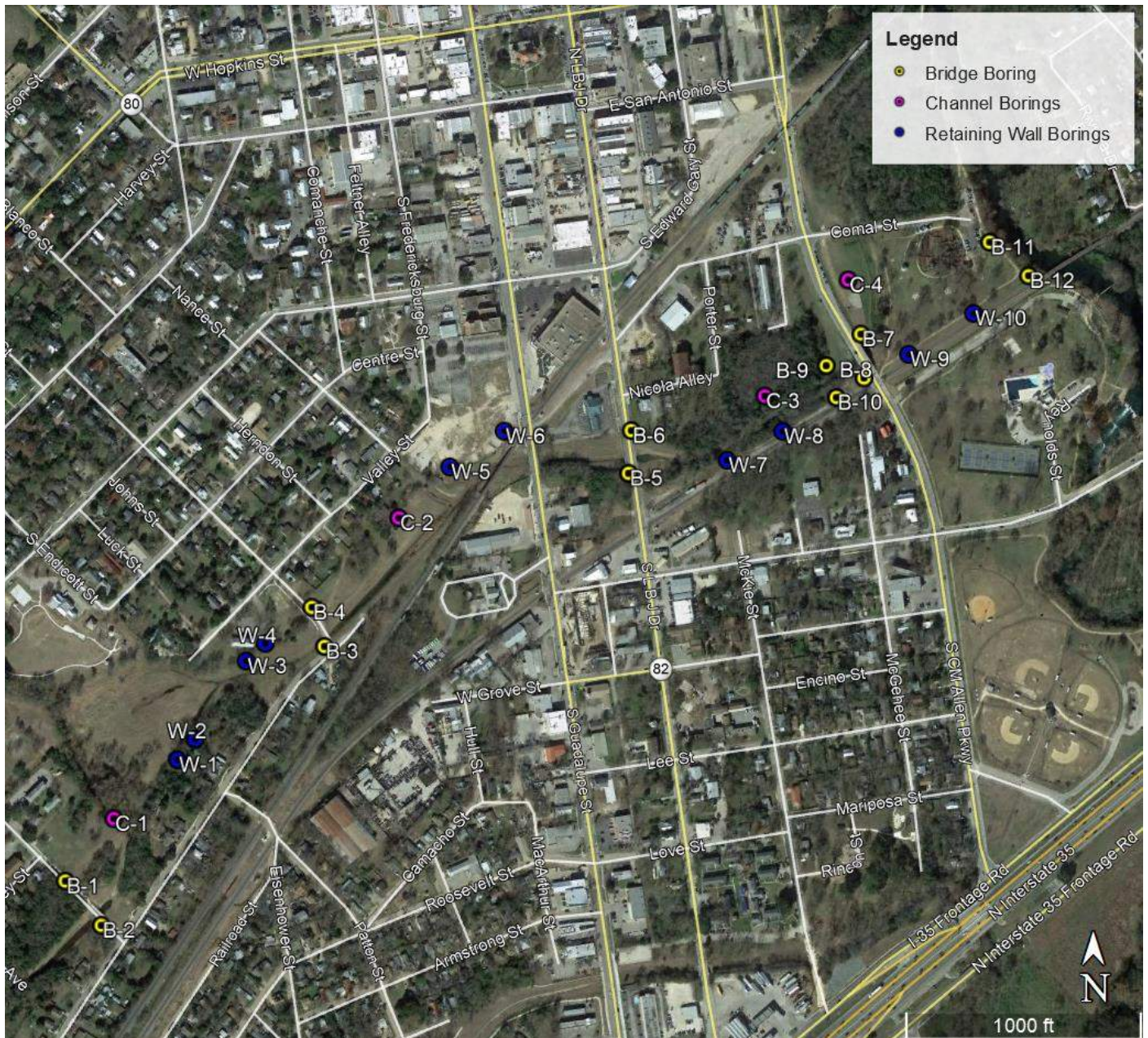
Sincerely,

Balcones Geotechnical, LLC
TBPE Firm Reg. F-15624

Rebecca A. Russo, P.E.
Senior Geotechnical Engineer

Attachments :

- Attachment 1 – Proposed Boring Plan
- Attachment 2 – Geotechnical Cost Estimate



Map Source: Google Earth Professional, Imagery Date 12/21/2018

PROPOSED BORING PLAN

Purgatory Creek Channel Improvements
San Marcos, Texas

**Balcones
Geotechnical**
Austin, TX 78731
512.380.9969

Attachment 1

**Attachment 2 - Geotechnical Cost Estimate
Purgatory Creek Improvements
San Marcos, TX**

Task	Item Description	Est. Qty.	Unit	Unit Price	Est. Total Price
1 Field Exploration					
1.1 Planning and Coordination					
	Field Coordination (Staking of Borings, One-Call, Drilling Assignment)	22	hr	\$ 65.00	\$ 1,430.00
	Transportation Cost - Trip Charge	2	trip	\$ 55.00	\$ 110.00
	Project Management (Senior Geotechnical Engineer)	4	hr	\$ 175.00	\$ 700.00
	1.1 Subtotal			\$	2,240.00
1.2 Drilling and Sampling					
	Mobilization (truck drill rig and support equipment)	2	ea	\$ 550.00	\$ 1,100.00
	Mobilization (ATV drill rig and support equipment)	2	ea	\$ 950.00	\$ 1,900.00
	Drilling and Sampling (Soil Boring)	720	ft	\$ 22.00	\$ 15,840.00
	Drilling and Sampling (Shale Coring)	510	ft	\$ 32.00	\$ 16,320.00
	Backfill boreholes (bentonite and cuttings)	1230	ft	\$ 8.00	\$ 9,840.00
	Logger	200	hr	\$ 65.00	\$ 13,000.00
	Transportation Cost - Trip Charge (Logger)	20	trip	\$ 55.00	\$ 1,100.00
	1.2 Subtotal			\$	59,100.00
1.3 Contingency					
	Traffic Control	5	ea	\$ 2,200.00	\$ 11,000.00
	Clearing of Vegetation	5	ea	\$ 2,850.00	\$ 14,250.00
	1.3 Subtotal			\$	25,250.00
	Field Exploration TOTAL:			\$	86,590.00
2 Laboratory Soil Testing					
	Atterberg Limits	26	ea	\$ 75.00	\$ 1,950.00
	Grain Size Analysis (Includes Percent Passing #200 Sieve)	14	ea	\$ 75.00	\$ 1,050.00
	Grain Size Analysis (Hydrometer)	12	ea	\$ 135.00	\$ 1,620.00
	Unconfined Compressive Strength	18	ea	\$ 75.00	\$ 1,350.00
	Corrosion Testing	0	ea	\$ 450.00	\$ -
	Crumb Dispersion Testing	15	ea	\$ 45.00	\$ 675.00
	Lab Manager/Graduate Engineer	8	ea	\$ 95.00	\$ 760.00
	Laboratory Testing TOTAL:			\$	7,405.00
3 Engineering and Reporting					
	Principal Review	10	hr	\$ 225.00	\$ 2,250.00
	Senior Geotechnical Engineer	40	hr	\$ 175.00	\$ 7,000.00
	Project Engineer	40	hr	\$ 125.00	\$ 5,000.00
	Graduate Engineer	40	hr	\$ 95.00	\$ 3,800.00
	Administrative	8	hr	\$ 55.00	\$ 440.00
	Engineering TOTAL:			\$	18,490.00
	PROJECT TOTAL			\$	112,485.00

May 13, 2019

Jennifer L. Miller, Technical Manager
Lockwood, Andrews & Newnam, Inc.
407 S. Stagecoach Trail, Ste. 207
San Marcos, Texas 78666

RE: Scope of Services (Revised) for the City of San Marcos Purgatory Creek Channel Improvement Project

Dear Ms. Miller,

This transmits a revised Scope of Services and attached fee estimate for work to be performed by Hicks & Company for the City of San Marcos Purgatory Creek Channel Improvement Project in San Marcos, Texas. This Scope of Services was revised based on your review of our original Scope of Services transmitted on April 29, 2019, and subsequent review comments received from you on May 8, 2019.

We hope this revised Scope of Services adequately addresses your concerns and comments. If you have any questions or need further assistance, please contact me at (512) 478-0858 or rfrye@hicksenv.com.

Sincerely,



Roy G. Frye
Senior Project Manager
Hicks & Company

Attachments

Scope of Services
Fee Estimate

SCOPE OF SERVICES (Revised)
City of San Marcos Purgatory Creek Channel Improvement Project
May 13 2019

PROJECT UNDERSTANDING

In an email dated April 10, 2019, and follow-up telephone conference call on April 17, 2019, Jennifer Miller of Lockwood, Andrews, and Newnam, Inc. (LAN) requested a scope of services and fee from Hicks & Company for completion of professional services to support environmental compliance requirements for Phase 1 of the proposed Purgatory Creek Channel Improvement Project. This Scope of Services was revised based on a review of the original Scope of Services transmitted on April 29, 2019, and subsequent review comments received made on May 8, 2019. Services requested include:

1. Provide assistance to the City of San Marcos (the project sponsor) with the identification of permitting requirements of Section 404 of the Clean Water Act and preparation of documentation and associated coordination with the U.S. Army Corps of Engineers (USACE) needed to satisfy these requirements (As the project sponsor, the City of San Marcos will be the Section 404 permit applicant);
2. Prepare a geological assessment;
3. Coordinate with the Texas Parks & Wildlife Department (TPWD) to obtain a Marl, Sand, Gravel, Shell, or Mudshell Permit, and preparation of an application and supporting documentation;
4. Coordinate with the Texas Historical Commission (THC) to comply with the Antiquities Code of Texas (ACT) and Section 106 of the National Historic Preservation Act (NHPA); and,
5. Prepare a riparian corridor vegetation management plan to include vegetation restoration, and control of invasive species.

This Scope of Services will involve the completion of Tasks and Subtasks listed below along with the inclusion of several assumptions. These Tasks and Subtasks conform to what is presently anticipated given the information that has been provided by LAN and the experience of Hicks & Company acquired with similar projects. Depending on the results of field investigations and resulting consultation with the USACE, modifications in project design, or the acquisition of presently unknown information, additional subtasks may be required or alternative approaches identified that may require modification to this Scope of Services or the need to perform supplemental services.

Services will also include project management, coordination, and communications to ensure overall project efficiency. Quality control/quality assurance reviews will take place for all deliverables prior to submitting to LAN or any of the regulating agencies.

PROJECT DESCRIPTION

The City of San Marcos has identified the need for improvements within and along the channel of lower Purgatory Creek to reduce the effects of flooding in areas adjacent to the creek and in street crossings within the city limits that are overtopped during storm events. Proposed improvements have been divided into two phases that will occur within the lower segment of Purgatory Creek between Wonder World Drive and its confluence with the San Marcos River, a distance of approximately two miles. According to a Preliminary Engineering Report (PER) prepared by LAN dated March 15, 2019, Phase 1

improvements will begin slightly upstream from South Johnson Avenue and end at the confluence of the San Marcos River. The Phase 1 improvements will include:

1. Modification of the existing stream channel and side slopes to include a 140-foot bottom width with 4:1 (horizontal to vertical) side slopes; however, the actual channel slopes may vary from 3:1 to 4:1 with some areas needing vertical walls for structural support of the bank or to minimize conflict with existing structures;
2. Incorporation of natural channel design features to include a meandering earthen pilot channel with riffle pool complexes to provide for aquatic habitat; low level flood bench to promote infiltration, slow flood water, and provide low maintenance native vegetation establishment zones; high-level flood benches allowing for native vegetation growth zone areas for wildlife refuge; streambank stability including toe protection; and diversion of high flows beginning downstream of the CM Allen Parkway and proceeding to the San Marcos River via a spillway that extends parallel along the railroad track;
3. Upgrade of road bridges, culverts, and storm drains; and
4. Hike and bike trail development consistent with stream channel and stream bank improvements.

Phase 2 improvements extend from near Johnson Avenue upstream to Wonder World Drive and include channelizing 100-year storm flows as well as incorporating in-line storage for attenuating flows to ensure conveyance downstream does not have an adverse impact on the Phase 1 channel area and ultimately the San Marcos River.

Proposed services will be limited to Phase 1 channel improvement features and are more fully described in the tasks listed below.

TASK 1. SECTION 404 PERMIT COMPLIANCE

Upon notice to proceed (NTP) from LAN, Hicks & Company will initiate a process that will lead to regulatory compliance of the proposed project under Section 404 of the Clean Water Act. This process will involve the completion of several subtasks listed below. See **Task 2** for USACE consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA) and **Task 3** for consultation under Section 106 of the NHPA.

1.1 Initial consultation with USACE. Hicks & Company will contact the assigned USACE project manager to introduce the company, provide information on the company's role in the project, and receive any information the USACE may provide concerning direction and guidance in pursuit of the Section 404 compliance process. LAN will be provided the opportunity to be included in this conference call at its discretion.

1.2 Review of previously collected data. A review of the previously performed preliminary delineation of waters of the U.S. (WOTUS) will be completed to determine accuracy of the investigation and utility for incorporation into additional compliance documentation.

- a) A review of the previously completed preliminary jurisdictional determination (PJD) of WOTUS will be conducted. This will include desktop review of forms, maps, photos, and any other pertinent documentation.
- b) A field investigation will be conducted to ground truth the preliminary delineation and determine if the wetland plots and Stream Assessment Reaches (SARS) are adequate. Any

inconsistencies will be corrected in the field and any changes in boundaries of WOTUS will be recorded using hand-held GPS instrumentation with sub-meter accuracy.

1.3 Stream and wetland functional assessment. As a part of field investigations, an assessment of stream and wetland ecological function will be conducted using the USACE Texas Rapid Assessment Method (TXRAM). Information collected from this assessment will be used to determine compensatory mitigation requirements for any wetland or stream impacts (see **Subtask 1.6** below).

1.4 Confirm need for an approved jurisdictional determination. Based on review of previously prepared SARS forms and ground truth information collection in **Subtask 1.2** above, coordination will be conducted with the USACE to determine if the previous PJD will suffice for further Section 404 compliance or whether the City of San Marcos will want an Approved Jurisdictional Determination (AJD), which would require substantially more time for administrative review and approval. For the purposes of this Scope of Services, it is assumed that the PJD will suffice for the completion of Section 404 compliance requirements; however, should an AJD be required, anticipated hours and associated cost are provided as a supplemental task, if needed or required (see supplemental **Task 8**).

1.5 Preparation of a Section 404 Individual Permit. Based on all information collected and updated from **Subtasks 1.1** through **1.4** above, and consultation with the USACE, Hicks & Company will determine the level of permitting that will be required for the project. For the purposes of this Subtask, it is assumed that an Individual Permit will be required. An application will be prepared and submitted; an on-site and off-site 401(b)(1) alternatives analysis will be completed; and the completed application along with all supporting documentation will be submitted to the USACE, after review by LAN and the City of San Marcos.

1.6 Preparation and submittal of a compensatory mitigation plan. If compensatory mitigation is required by the USACE to offset environmental losses from unavoidable temporary or permanent stream or wetland impacts, a compensatory mitigation plan will be developed in coordination with LAN and the City of San Marcos. For the purposes of this Scope of Services, it is assumed that the project will adversely impact some WOTUS that will require compensatory mitigation under current USACE regulations and policies. It also assumed that the project area is not within the service area of a USACE-approved mitigation bank and that the City of San Marcos will be required to have a Permittee Responsible Mitigation site and plan, which will require development of mitigation measures either on-site or within the same watershed as the project. Concurrently, with the completion of the Section 404 Individual Permit application and 401(b)(1) alternatives analysis, a compensatory mitigation plan will be developed based on projected TXRAM scores (**Subtask 1.3** above) for on-site and/or off-site mitigation pursuant to the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule effective June 9, 2008, and the Fort Worth District USACE policy. Components of a Permittee-Responsible Mitigation Plan will include the following:

- a) A mitigation work plan to establish the desired plant community and to control invasive species;
- b) A maintenance plan to ensure the continued viability of the incorporated mitigation measures;
- c) Ecologically based performance standards to determine the extent to which the mitigation objectives are met;
- d) A monitoring program to monitor specific parameters to determine if performance standards are being met. Monitoring will include a schedule and reporting to document results;

- e) A long-term management plan to describe how the compensatory mitigation project will be managed after all performance standards are met to ensure long-term sustainability;
- f) An adaptive management plan to address unforeseen changes in site or watershed conditions that may affect the mitigation project;
- g) Financial assures to be provided by the City of San Marcos to ensure a high level of confidence that the compensatory mitigation measures will be successfully completed in accordance with the performance standards; and
- h) Long-term protection will be provided by integrated natural resource management plans such as approved habitat conservation plans or conservation easements held by accredited land trusts.

To minimize the requirements for additional on-site or off-site in-kind compensatory mitigation and to facilitate the coordination of the Section 404 permit, it is strongly recommended that an experienced fluvial geomorphologist participate in the design of the bankfull channel to incorporate instream aquatic habitat restoration using natural channel design techniques (Hicks & Company does not provide this service). **Task 7** will further describe a riparian vegetation management plan that may become part of the permittee-responsible compensatory mitigation plan.

Tier I or Tier II 401 Certification. As required by an Individual Permit, and upon approval by the City of San Marcos, a Tier I checklist or a Tier II 401 Certification Questionnaire and water quality certification documentation will be prepared and submitted.

NEPA process and public interest Review. A public notice for the proposed project as required by the USACE for Individual Permits will be prepared and coordinated with the agency. Written responses to public comments (and/or public hearings) will be prepared and submitted along with responses to any USACE questions and comments.

Record of agency coordination and consultation. Hicks & Company will maintain an administrative record of consultation with the USACE, USFWS, TPWD, Texas Commission on Environmental Quality (TCEQ), and THC. This record will be provided to LAN and the City of San Marcos.

TASK 2. SERVICES PROVIDED TO ASSIST USACE CONSULTATION WITH THE USFWS UNDER SECTION 7 OF THE ESA

Issuance of a Section 404 Permit by the USACE for this project constitutes a federal action that may affect one or more endangered or threatened species listed by the ESA. Section 7 of the ESA requires that the USACE consult with the USFWS to determine potential impacts and identify associated mitigation measures for the potentially impacted species. To complete this consultation, a Biological Assessment (BA) report will be prepared for the USFWS as supporting documentation for a Biological Opinion (BO) issued by the USFWS that confirms the extent of impacts and lists required mitigation measures.

2.1 Pre-field ecological investigations and coordination. Upon NTP, coordination will be initiated with the USFWS, TPWD, and any other relevant entities. Hicks & Company will seek to obtain reports and data related to all available ecological investigations pertaining to threatened and endangered species previously conducted in the project vicinity. If agency meetings are necessary to be conducted in person, they will be scheduled for the same time that the field visit is conducted, if feasible. Shapefiles will be

obtained showing existing and proposed channel features and reasonable alternatives to be assessed. A request will be made to the TPWD Texas Natural Diversity Database (TXNDD) for any recorded sensitive species element occurrences for a search area that will include the watersheds of Purgatory Creek and the San Marcos River. This information will be portrayed on GIS-produced maps.

2.2 Field investigations. Field assessments and investigations will be conducted to assess the impact of all project alternatives on the ecological setting, vegetation, wildlife, and threatened and endangered species. Vegetation (species and physiognomy) will be listed, described and mapped in the field. Wildlife observed will be noted and the presence of any rare and/or listed species documented.

2.3 Biological assessment report preparation. Based on information obtained from **Subtask 2.1** and **Subtask 2.2** above, a BA will be prepared for the USFWS that will include the following tasks:

- a) Summarize investigations performed to date for projects in the vicinity;
- b) Incorporate data acquired from USFWS and TPWD regarding rare and listed species, known habitat on refuge lands, refuge boundary shape files, etc.;
- c) Acquire, describe, and map soils and geology data for ecological context;
- d) Perform regional and site-specific habitat assessment for listed plant species;
- e) Perform regional and site-specific habitat assessments for listed invertebrate, insect, and mollusk species as applicable;
- f) Perform regional and site-specific habitat assessment for listed fish species;
- g) Perform regional and site-specific habitat assessment for listed reptile and amphibian species;
- h) Perform regional and site-specific habitat assessment for endangered avian species;
- i) Perform regional and site-specific habitat assessment for endangered mammal species;
- j) Analyze data acquired; quantify direct, indirect and cumulative impacts (effects); analyze avoidance, minimization and mitigation strategies as appropriate, and include results in a BA for submission to and approval by the USFWS;
- k) Address comments, prepare comment response matrices (assume one round per agency), and submit final BA; and
- L) Assist USFWS in drafting BO, if necessary.

TASK 3. COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

Issuance of an individual permit by the USACE is subject to requirements of Section 106 of the NHPA. This legislation requires that federal agencies must take into account the effects of a federal undertaking (i.e., federal funding, permits, or approval) on historic resources (including archeological historic resources) listed or eligible for listing in the National Register of Historic Places (NRHP).

3.1 USACE Coordination. Hicks & Company will schedule a teleconference with the USACE to provide initial project coordination, discuss any specific agency concerns, and determine the appropriate level of

effort required for the field investigations. Information from this teleconference will guide the development of the area of potential effect (APE) and scope of work for archeological and historic standing structures investigations. Additionally, Hicks & Company will participate in on-going coordination (i.e., additional teleconferences and letters) with the USACE and the THC as necessary (i.e., discuss new and/or unexpected findings) to facilitate the successful completion of the project.

3.2 Research Design/Background Review – Standing Structures. It is anticipated that the USACE will require a historic resources survey for non-archeological standing structures within the APE to meet the requirements of Section 106 of the NHPA. Prior to initiating the field survey, Hicks & Company will prepare a research design that will include a desktop background and literature review to identify previously documented and designated historic resources within the project area and establish a historic context for the survey area. Hicks & Company will search the THC Historic Sites Atlas and TxDOT's Historic Districts & Properties Maps for properties listed in the NRHP, or as State Antiquities Landmarks (SALs), Recorded Texas Historic Landmarks (RTHLs), Official Texas Historical Markers (OTHMs), and cemeteries. Hicks & Company will also coordinate with the City of San Marcos for information on locally designated historic landmarks and districts, as applicable. A research design report will be prepared and submitted to the USACE and THC for review and concurrence.

3.3 Historic Resources Survey – Standing Structures. Upon approval of the research design, Hicks & Company will conduct a reconnaissance-level field survey of historic resources within the APE determined by the USACE and THC. It is anticipated that the APE, at a minimum, will include all parcels immediately adjacent to the proposed project area. All historic-age resources (45 years of age or older) within the APE will be photo-documented from the public right of way and evaluated for potential NRHP eligibility based on integrity and significance. For parcels not visible from the public right of way, right of entry will be coordinated to the extent possible. For resources that are recommended NRHP eligible, an assessment of project effects to the resources will be provided.

Much of the Phase 1 project area is within an area recently surveyed by Hicks & Company historians as part of a large-scale historic resources survey for the City of San Marcos Department of Planning and Development Services and the THC. The final survey report was adopted by the San Marcos City Council and approved by the Texas Historical Commission in September 2019. Hicks & Company will coordinate the use of this previous survey data for standing structures, as applicable, in the historic resources survey for Phase 1.

3.4 Historic Resources Survey Report – Standing Structures. Hicks & Company will prepare a historic resources survey report documenting the findings of the reconnaissance field survey. The report will include background research; previously documented and designated historic resources; an historic context statement; and NRHP eligibility recommendations, assessment of effects, and photographs and survey forms for all inventoried resources. A draft and final report will be provided to the USACE and the THC for review and concurrence.

TASK 4. COMPLIANCE WITH THE ANTIQUITIES CODE OF TEXAS

As the proposed construction will occur on public lands owned or administered by the City of San Marcos (a political subdivision of the State of Texas) the project is subject to the terms of the ACT. This legislation requires political subdivisions of the state to take into account the effects a proposed project will have on historical and archeological resources on public land.

In November 2018, on behalf of the City of San Marcos, archeologists from AmaTerra Environmental, Inc. (AmaTerra) conducted an intensive cultural resources survey of proposed Phase 1 channel improvements under Texas Antiquities Permit No. 8609. Fieldwork included a pedestrian survey, systematic shovel testing, and backhoe trenching. Archeologists excavated 45 shovel tests and nine backhoe trenches across accessible portions of the 26.5-acre study area; right of entry was not obtained for the entire proposed project. As a result of field investigations, AmaTerra archeologists revisited one previously recorded prehistoric site (41HY135) and discovered three historic-period sites (41HY551, 41HY552, and 41HY553) (Butler 2018). Sites 41HY551 and 41HY552 were recommended as not eligible for listing to the NRHP or as a SAL, and no additional work was recommended. Site 41HY553 was recommended as having undetermined eligibility and should be avoided by the planned project or additional investigations would be necessary. AmaTerra archeologists did not find any trace of site 41HY135; however, because the site is listed as a contributing element in the San Marcos River SAL group, it was recommended that archeological monitoring during construction at 41HY135 was warranted.

- Based on the results of the AmaTerra survey, Hicks & Company anticipates that THC will request the following tasks:
- Pedestrian survey with subsurface testing (shovel testing and/or backhoe trenching as necessary based on field conditions) for all portions of the proposed project where right of entry was not obtained in November 2018.
- Additional shovel testing and/or backhoe trenching within areas previously surveyed that may lack sufficient subsurface coverage.
- Additional surface survey and subsurface testing (shovel testing and backhoe trenching) at 41HY553 to determine site eligibility and site boundaries.
- Monitoring at 41HY135 during construction to ensure no SAL-eligible cultural materials are impacted.

4.1 THC Coordination. As with the USACE, Hicks & Company will schedule a teleconference with the THC to provide initial project coordination, discuss any specific agency concerns, and determine the appropriate level of effort required for the field investigations, in conjunction with guidance from the USACE. Information from this teleconference will also guide the development of the APE and scope of work for archeological investigations. Hicks & Company will participate in on-going coordination (i.e., additional teleconferences and letters) with the THC as necessary (i.e., discuss new and/or unexpected findings) to facilitate the successful completion of the project.

4.2 Desktop Background Archeological Literature and Records Review. To conduct the background review, Hicks & Company will search site files, records, and maps from the Texas Archeological Research Laboratory (TARL) and the THC, available on the THC's online Texas Archeological Sites Atlas and Historic Sites Atlas. The review will search the database for all previously recorded archeological surveys and prehistoric and historic sites located in or near the project area. Other resources to be reviewed in the database include properties listed in the NRHP, SALs, RTHLs, cemeteries, OTHMs, and historical maps to trace the development of the project area and help provide temporal data for historical archeological resources encountered during survey efforts.

4.3 Scope of Work and Texas Antiquities Permit Application. Hicks & Company will prepare an appropriate scope of work and a Texas Antiquities Permit (which authorizes archeological investigations on public land) application for submittal to THC for review. The scope of work will reflect the results of the coordination with the THC (and USACE), as well as include the results of the archeological resources background review, maps clearly depicting the project area, and any recommended areas of concern or recommendations made by previous investigations for additional work at known archeological sites. Additionally, the scope of work will discuss the environmental setting of the project, as it relates to the potential to discover intact archeological resources, and provide recommendations on the appropriate level of effort and methods for survey investigations based on the results of the background study and environmental factors.

4.4 Field Investigations. Surface investigations will involve an examination of the ground surface and any erosional exposures for evidence of archeological materials and cultural features. Subsurface investigations will involve the excavation of shovel tests to sample shallow (less than one meter deep) soils and backhoe trenches to test deep soils for deeply buried archeological materials. All newly discovered and revisited sites will be explored as much as possible with consideration to project limits. The sites will be assessed for significance so that recommendations can be made for proper management, such as avoidance or additional work. Hicks & Company will complete a Texas Archeological Site Data Form for all newly discovered archeological sites, as well as an updated Texas Archeological Site Data Form for revisited sites to supplement the existing site data originally recorded by AmaTerra. A detailed plan map of the sites will be produced, and their location will be plotted on U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps and relevant project maps. In addition, if potential historical buildings and/or standing structures are located within or immediately adjacent to the current project, such areas will be shovel tested as if an archeological site.

4.5 Reporting. Upon completion of the archeological survey, Hicks & Company will prepare a draft report of investigations for review by LAN and the City. The draft report will conform to the Council of Texas Archeologists and THC standards. The report will include the results of the background review and field survey. Specifically, the report will provide the methodology used in the investigations, the presence and condition of previously recorded sites located in and around the project area, a description of archeological/cultural resources encountered during the survey, recommendations for management of those cultural resources, and recommendations for additional investigations, if warranted.

Following review and comment by LAN and the City of San Marcos, Hicks & Company will address all appropriate edits and a draft report will be submitted to the THC and USACE for their review and concurrence. Once the agencies have reviewed the document and provided the results of those reviews to Hicks & Company, revisions will be included in the final report. Hicks & Company will submit copies of the final report to LAN, the City of San Marcos, the USACE, and the THC.

4.6 Curation. As per the requirements of the Texas Antiquities Permit, all paperwork and photographs generated during investigations must be curated at an approved facility. For this project, all materials will be curated at the Center for Archaeological Studies (CAS) in San Marcos, Texas.

TASK 5. GEOLOGIC ASSESSMENT

5.1 Pre-field geologic research. Published reports and maps of the area geology will be reviewed prior to performing the geologic assessment field survey. Aerial photography will also be examined for the presence of structural features that may require field verification. In addition, a literature and internet review will be conducted for the presence of documented caves or other karst features on or near the

property and a formal request will be submitted to the Texas Speleological Survey (TSS) for a review of the TSS database for the existence of any known caves or karst features that may occur within or adjacent to the project area.

5.2 Geologic assessment field survey. Hicks & Company proposes to conduct a geologic field assessment of the project area (roughly 45 acres in area and one mile in length, and includes Dunbar Park and Children’s Park) using the methods outlined in the TCEQ Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zones (TCEQ-0585-Instructions, Rev. 10-01-04). Field activities will focus on a survey of the ground surface for the presence of geologic and manmade features. The site will be surveyed on foot by walking the entire site on 50-foot spaced transects. The assessment will include the project area and approximately 50 feet beyond the estimated project boundary. Exploration of features identified during the assessment will be limited to probing and minor hand clearing or excavation as needed for proper classification and evaluation of each feature.

Geologic and manmade features identified during the survey will be evaluated in the field by our qualified project geologist licensed in the State of Texas. Features will be evaluated for sensitivity (i.e., the potential for hydraulic interconnectedness between the surface and the Edwards Aquifer), and the potential for rapid infiltration to the subsurface. Adequate information about the features identified in the field, and any features identified during pre-field research, will be collected so that appropriate Best Management Practices (BMPs) can be designed to protect the features.

5.3 Data evaluation and report production. The geologic assessment will be documented in accordance with the TCEQ’s Instructions to Geologists which will include a narrative description of site geology, a soils description, geologic site map, a soils map, a geologic assessment table, a stratigraphic column, and site photographs. The geologic assessment report will be signed and sealed by our project geologist. The geologic assessment will be summarized in the overall report and provided as an attachment.

TASK 6. COORDINATION WITH THE TEXAS PARKS AND WILDLIFE DEPARTMENT TO OBTAIN A MARL, SAND, GRAVEL, SHELL, AND MUDSHELL PERMIT.

The proposed project will include a diversion channel that will connect directly to the San Marcos River disturbing its bed and banks and could also potentially affect the San Marcos River bed and banks at the confluence of Purgatory Creek. Consequently, such disturbance will require a Marl, Sand, Gravel, Shell, and Mudshell Permit issued by the TPWD pursuant to Chapter 86.002 of the Parks and Wildlife Code. It is assumed that an Individual Permit will be required based on the project meeting either or both of the following criteria: disturbed bed and banks of the San Marcos River would exceed 1,000 cubic yards and/or the project is located in a hydrologically, ecologically, or otherwise sensitive area or may be potentially controversial as determined by the TPWD. Commission rule Texas Administrative Code (TAC) Title 31, §69.108(c) requires that new permit applications include a Sedimentation Impact Assessment study for the portion of the river proposed for sedimentation removal. This study must be approved by the Parks and Wildlife Commission and completed before a permit may be issued. This study is not included in this Scope of Services. Because of anticipated engineering evaluations, it is assumed that a sediment transport analysis to be completed by LAN will be sufficient to satisfy this requirement.

6.1 Application preparation and submission. An application for a Marl, Sand, Gravel, Shell, and Mudshell Permit will be completed and submitted to the TPWD. Information that will be required for the application will include applicant information, location of the proposed activity, description of the proposed activity, contact information for publishing a public notice in a local newspaper and providing a mailing list with pre-printed mailing labels of along-shore property owners for one-half river mile above and below the proposed area.

6.2 TPWD field reconnaissance visit. In response to an anticipated request by the TPWD as part of the application review process, a field reconnaissance visit will be conducted with officials of the TPWD and LAN on the proposed project.

TASK 7. DEVELOPMENT OF A RIPARIAN VEGETATION MANAGEMENT PLAN

A vegetation management plan will be developed for the riparian corridor including the high-level flood benches within the Phase 1 project area no later than the 60-Percent Design Stage. This plan will be based on the need for vegetation reestablishment associated with identified project design features with associated future management. This plan will also be developed with the intent that portions of designated vegetation management and restoration features will be applicable for credit to the mitigation plan required by the USACE Section 404 Permit (**Subtask 1.6**). The plan will also be consistent with City of San Marcos tree protection and vegetation establishment guidelines and with the goals and objectives of vegetation management and control as described in Section 5.3.8, Control of Non-native Plant Species, of the Edwards Aquifer Recovery Implementation Program (EARIP) Habitat Conservation Plan (HCP) (RECON et al. 2012), for which the City of San Marcos is a participant. This task will include three sub-tasks listed below and involve consultation with LAN design engineers, landscape architects, and wetland/streambank restoration consultants.

7.1 Collection of vegetation baseline information on existing conditions. Vegetation along the riparian corridors of Purgatory Creek and the San Marcos River within the Phase 1 project area will be evaluated by collecting and compiling information from **Tasks 2.1** and **2.3**, and conducting field reconnaissance and additional data collection as needed or required to determine species composition, habitat quality, and location of invading non-native noxious species.

7.2 Identification of vegetation management needs and goals. Based on results of field investigations conducted in **Subtask 7.1**, and meetings conducted with the LAN design engineers, landscape architects, and wetland/streambank restoration consultants, management recommendations and strategies will be developed for protecting existing high quality plant communities; enhancing lower quality communities through control of non-native noxious vegetation and selective vegetation plantings; and complete vegetation restoration in areas where needed or required. This task assumes attendance at two meetings, each two hours long, for consultation with LAN landscape architects, the City of San Marcos, and wetland/streambank restoration consultants.

7.3 Development of the vegetation management plan. Baseline information collected in **Task 7.1**, and recommendations and management strategies identified and developed in **Task 7.2**, will be incorporated into a plan document that will include the following:

- a) Identification of problems and needs;
- b) Description of existing conditions showing vegetation communities of high, medium, and low quality with illustrative maps and graphics;
- c) Identification of goals and strategies;
- d) Identification of specific restoration, enhancement, and management objectives to include noxious vegetation control and location of management treatments; and
- e) Procedures for monitoring management measures.

This plan will include a list of native vegetation species to be plant for streambank stabilization following construction of the bankfull channel, with planting to be implemented concurrently with construction of the bankfull channel. The plan will include maps displaying locations of proposed vegetation restoration and enhancement areas and also include locations recommended for irrigation with frequency and duration of irrigation to be applied. LAN, or other subconsultants, will determine engineering specifications for the irrigation system. Hicks & Company, in consultation with LAN and the City of San Marcos, will determine areas of riparian habitat restoration that can be managed for long-term protection under an approved conservation easement held by an accredited Texas Land Trust or conservation agency.

TASK 8 PREPARATION OF APPROVED JURISDICTIONAL DETERMINATION, IF NEEDED OR REQUIRED

It is assumed that a PJD for WOTUS based on information previously acquired and updated under **Subtask 1.2**, above will be confirmed for Section 404 compliance. However, if requested by the City of San Marcos, an AJD for WOTUS will be prepared and submitted to support Section 404 compliance. This task is listed in the attached fee estimate but is not included in the total cost.

DELIVERABLES

This Scope of Services includes the following deliverables:

- 1) **Subtask 1.2** Wetland determination data forms and maps/digital shapefiles of updated boundaries of WOTUS;
- 2) **Subtask 1.3** Wetland and stream TXRAM data forms;
- 3) **Subtask 1.5** Application for an Individual Section 404 Permit with supporting documentation including on-site and off-site alternatives analysis;
- 4) **Subtask 1.6** Compensatory Mitigation Plan required for a Nationwide or Individual Section 404 Permit;
- 5) **Subtask 1.7** Tier 1 or Tier 2 401 Certification;
- 6) **Subtask 1.8** Public notice document and written response to public comments;
- 7) **Subtask 1.9** Written record of agency coordination.
- 8) **Subtask 2.3** Biological Assessment report that will incorporate information collected, compiled and evaluated in **Subtasks 2.1–2.3**.
- 9) **Subtask 3.1** Meeting minutes from the initial agency coordination teleconference;
- 10) **Subtask 3.2** Research Design prepared for the USACE and THC;
- 11) **Subtask 3.4** Historic resources survey report;
- 12) **Subtask 4.3** Scope of Work and Texas Antiquities Permit application;
- 13) **Subtask 4.5** An archeological survey report;

- 14) **Subtask 4.6** Curation of paperwork and photographs;
- 15) **Subtask 5.2** Geological Assessment Report;
- 16) **Subtask 6.2** Completed TPWD Marl, Sand Shell, Gravel, and Mudshell Permit with contact list for and pre-printed mailing labels; and
- 17) **Subtask 7.3** Riparian corridor vegetation management plan.

SCHEDULE

Work will be completed with deliverables prepared and submitted according to a schedule mutually developed by Hicks & Company and LAN.

COSTS

The proposed not-to-exceed cost to complete all tasks describe above is **\$156,359.21**. An itemized fee estimate based on current hourly billing rates for each activity and task is attached.

OVERALL ASSUMPTIONS

We have prepared this Scope of Services and fee estimate as accurately as possible with the current level of knowledge of the project and based on the assumptions included herein. Hicks & Company assumes relevant requested materials will be provided by LAN in a timely manner and submittals for review, comment, and/or signature will be addressed and returned as quickly as possible.

This Scopes of Services and fee estimate does not include costs associated with the assumptions listed below. If needed or required, such services would be performed under a supplemental scope of services and associated fee.

- Rights of entry will be provided by and coordinated with LAN. When rights of entry cannot be obtained, investigations will be performed through the use of aerial photography, existing desktop data sources, and visually, from city- or county-owned property and/or public rights of way in order to achieve task elements requiring offsite information.
- Systematic tree or vegetation survey requiring GPS coordinate information.
- If sedimentation removal within the San Marcos River is a part of this project, the required Sedimentation Impact Study for a TPWD Marl, Sand, Gravel, Shell and Mudshell Permit would be prepared by LAN and/or the City of San Marcos.
- Aerial photographs, design maps, and plans will be provided by LAN in a timely fashion as needed in a GIS-compatible format.
- If substantial changes occur in the project boundary or design plans to require reevaluations after field investigations have been completed, additional services will be supplemental to this Scope of Services.
- The anticipated tasks proposed by Hicks & Company for archeological services are dependent upon concurrence of the USACE and THC with AmaTerra's recommendations in their draft report of investigations, as well as any additional investigations requested by the agencies.

- Further work at Site 41HY553 would consist of additional shovel testing and backhoe trenching to better determine the nature of its subsurface component and the site's overall boundaries.
- The need for significance testing or data recovery excavations at site 41HY553 has been noted in previous documentation; should such investigations be necessary, they would proceed under a separate scope and budget.
- Long-term assessment of stream and wetland ecological functions will utilize TXRAM. The USACE may require five to 10 years of monitoring through functional assessments. Such future functional assessments could be performed under a separate scope of services and budget.
- Project design may involve the services of an experienced fluvial geomorphologist familiar with the natural dynamics of streams in the southwestern U.S., including those in central Texas. Hicks & Company does not provide this service.
- This Scope of Services does not include a Phase I Environmental Site Assessment (ESA). A Phase I ESA could be performed under a separate scope of services and budget, if needed or required.
- Costs are included for estimating projected fees; billing will be based on actual rates.

HICKS & COMPANY FEE ESTIMATE
City of San Marcos Purgatory Creek Channel Improvement Project
May 13, 2019

Labor	Billing Rate	Sr. Program Manager	Sr. Env'l Sci II	Env Env'l Sci II	Env Prof III	Env Prof II	Env Prof I	Env Tech I	Total
		\$181.80	\$151.50	\$121.20	\$106.05	\$96.96	\$86.36	\$53.03	
Task 1 Section 404 Permit Compliance									
1.1 Initial Consultation with USACE			2						2.0
1.2 Site Visit and Review of previously collected data			12	8					20.0
1.3 Stream and Wetland Functional Assessment			20	8					28.0
1.4 Confirm Need for Approved Jurisdictional Determination			1						1.0
1.5 Prepare Individual Section 404 Permit			40						40.0
1.6 Prepare Compensatory Mitigation Plan			40						40.0
1.7 Complete Tier 1 or Tier 2 401 Certification			10						10.0
1.8 Prepare Public Notice and Response to Comments			20	20					40.0
1.9 Prepare record of agency coordination and consultation			2						2.0
GIS Support					40				40.0
Attend 1 USACE Site Visit			8	8					16.0
Project Mgmt/Coordination/Admin - QA/QC		3	18						21.0
Task 1 Labor Hours		3.0	173.0	44.0	40.0	0.0	0.0	0.0	260.0
Task 1 Subtotal		\$ 545.40	\$ 26,209.50	\$ 5,332.80	\$ 4,242.00	\$ -	\$ -	\$ -	\$ 36,329.70
Task 2 USACE Consultation with USFWS									
2.1 Pre-field Investigation and Consultation			4	8					12.0
2.2 Field Investigations			12	12					24.0
2.3 Biological Assessment Report Preparation			40	52		8			100.0
GIS Support					40				40.0
Project Mgmt/Coordination/Admin - QA/QC		2	12	3					17.0
Task 2 Labor Hours		2.0	68.0	75.0	40.0	8.0	0.0	0.0	193.0
Task 2 Subtotal		\$ 363.60	\$ 10,302.00	\$ 9,090.00	\$ 4,242.00	\$ 775.68	\$ -	\$ -	\$ 24,773.28
Task 3 Compliance with Section 106 of the NRHP									
3.1 USACE Coordination				8	8	4			20.0
3.2 Research Design/Background Review - Standing Str.					20	2			22.0
3.3 Historic Resources Survey - Standing Structures					16	16			32.0
3.4 Historic Resources Survey Report - Draft and Final					44	8			52.0
GIS Support					8				8.0
Project Mgmt/Coordination/Admin - QA/QC		6	2						8.0
Task 3 Labor Hours		6.0	2.0	8.0	96.0	30.0	0.0	0.0	142.0
Task 3 Subtotal		\$ 1,090.80	\$ 303.00	\$ 969.60	\$ 10,180.80	\$ 2,908.80	\$ -	\$ -	\$ 15,453.00
Task 4 Compliance with the Antiquities Code of Texas									
4.1 Texas Historical Commission Coordination				8		2			10.0
4.2 Archeological Background Study				24					24.0
4.3 Scope of Work and Texas Antiquities Permit Application				12		3			15.0
4.4 Field Investigations				70				94.0	164.0
4.5 Report				80		4		40.0	124.0
4.6 Curation				2				20.0	22.0
GIS Support					16				16.0
Project Mgmt, QA/QC		2.0	4.0	4					10.0
Task 4 Labor Hours		2.0	4.0	200.0	16.0	9.0	0.0	154.0	385.0
Task 4 Subtotal		\$ 363.60	\$ 606.00	\$ 24,240.00	\$ 1,696.80	\$ 872.64	\$ -	\$ 8,166.62	\$ 35,945.66
Task 5 Geologic Assessment									
5.1 Pre-field Geologic Research			2				2		4.0
5.2 Geologic Assessment Field Work			8				8		16.0
5.3 Data Evaluation and Report Preparation			10			2	10		22.0
GIS Support					8				8.0
Project Mgmt/Coordination/Admin - QA/QC		1	3						4.0
Task 5 Labor Hours		1.0	23.0	0.0	8.0	2.0	20.0	0.0	54.0
Task 5 Subtotal		\$ 181.80	\$ 3,484.50	\$ -	\$ 848.40	\$ 193.92	\$ 1,727.20	\$ -	\$ 6,435.82
Task 6 TPWD Sand, Shell, and Gravel Permit									
6.1 Application preparation and submission			20			4			24.0
6.2 Attend 1 site visit with TPWD			6						6.0
GIS Support					8				8.0
Project Mgmt/Coordination/Admin - QA/QC		1	3						4.0
Task 6 Labor Hours		1.0	29.0	0.0	8.0	4.0	0.0	0.0	42.0

	Sr. Program Manager	Sr. Env'l Sci II	Env Env'l Sci II	Env Prof III	Env Prof II	Env Prof I	Env Tech I	Total
Labor Billing Rate	\$181.80	\$151.50	\$121.20	\$106.05	\$96.96	\$86.36	\$53.03	
Task 6 Subtotal	\$ 181.80	\$ 4,393.50	\$ -	\$ 848.40	\$ 387.84	\$ -	\$ -	\$ 5,811.54
Task 7 Develop Riparian Vegetation Management Plan								
7.1 Collect baseline information on existing conditions		8	8					16.0
7.2 Identify Vegetation Management Needs and Goals		10	10					20.0
7.3 Develop Vegetation Management Plan		25	25		6			56.0
Attend 2 meetings with streambank restoration consultants		4	4					8.0
GIS Support				45				45.0
Project Mgmt/Coordination/Admin - QA/QC	1	11						12.0
Total Task 7 Hours	1.0	58.0	47.0	45.0	6.0	0.0		157.0
Task 7 Subtotal	\$ 181.80	\$ 8,787.00	\$ 5,696.40	\$ 4,772.25	\$ 581.76	\$ -		\$ 20,019.21
Total Labor Costs								\$ 144,768.21
Direct Costs	Unit	Rate	Quantity					
TSS Karst Database Search	Report	\$250.00	1					\$ 250.00
Mileage	Mile	\$0.58	1,850					\$ 1,073.00
Field supplies	Each	\$25.00	4					\$ 100.00
Texas Archeological Site Data Form	Each	\$96.00	8					\$ 768.00
Curation Fee	Each	\$400.00	1					\$ 400.00
Backhoe and Operator	Day	\$1,800.00	5					\$ 9,000.00
Total Direct Costs								\$ 11,591.00
TOTAL COSTS								\$ 156,359.21
Supplemental Task 8 - If requested (Subtotal not included in Total Costs above)								
Task 8 Preparation of Approved Jurisdictional Determination	1	20	10					31.0
Total Task 8 Hours	1.0	20.0	10.0	0.0	0.0	0.0		31.0
Task 8 Subtotal	\$181.80	\$3,030.00	\$1,212.00	\$0.00	\$0.00	\$0.00	\$0.00	\$ 4,423.80

13 September 2019



Jennifer L. Miller
Lockwood Andrews & Newnam, Inc.
407 S. Stagecoach Trail, Suite 207
San Marcos, Texas 78666

Re: **Revised Engineered Soils Consulting Proposal
Purgatory Creek Channel Improvement Project**

Jennifer,

Jeffrey L. Bruce & Company, LLC (JBC) is pleased to offer the following scope of services to assist Lockwood Andrews & Newnam, Inc. (LAN) with the design and construction administration services for the Purgatory Creek Channel Improvement Project in San Marcos, Texas. The project area is the 6100 linear foot channel improvements including upland riparian around the trail and spillway of Purgatory Creek as bounded by the San Marcos River, railroad line and South Mitchell Street. Our specific experience with the agronomic soils design is extensive and will provide your office with current technology and industry trends related to design, quality control and construction quality assurance process needed to insure the project meets the expectations of LAN and your client.

Based on our discussions, the following proposal reflects the proposed scope of work in LAN's 4 April 2019 Draft Conceptual Plan and attached as reference. JBC has reviewed your scope outline and has tailored our scope and fees to provide soils assessment and soils design. The work required to provide a complete and comprehensive quality assurance program for the design review related services for the implementation of the work described in the proposal.

SCOPE OF WORK

Provide services as hereinafter described to design the agronomic assessments, and soil mix for the specified plant material surfaces. JBC will coordinate with LAN and LAN consultants related to agronomic soils best management practices for native restoration areas. Incorporate into the design solutions sustainability practices related to soils and vegetative slope stabilization. JBC will research and incorporate best management practices related to site and water resource management through innovative design solutions in soils system applications.

The following scope of services will complement the scope of work outlined in the LAN request for proposal letter as referenced above. It is understood that the proposed scope of work outlined may be modified as the project develops. If the project schedule changes or the scope of work requires revision, JBC will make every effort to work within the scope and fee proposed, however, we reserve the right to modify our scope of work and/or fee as necessary.

SCOPE OF SERVICES

Soil Predesign Assessment & Analysis

1. Attend one (1) WebEx kick-off meeting with the design team to refine and document a thorough understanding of the project, encompassing work tasks, work products, project schedule, activity network, project decision dates, and responsibilities.
2. Collect and review previous studies and information relevant to the project area; to review existing database and to define preliminary issues to be addressed in the assessment and analysis.
3. Conduct one (1) on-site investigation of existing soils to analyze agronomic suitability of the existing soils and organize the information in a format that facilitates its use during the project development phase. Surface soil samples will be collected by JBC for laboratory analysis to supplement deeper Geotechnical Engineering split sampling laboratory analysis. Field investigations will be conducted to confirm this data, identify new information needs, and refine our knowledge of the site soil conditions.
 - Determine an existing agronomic soil testing approach and methodology including
 - Particle Size Analysis
 - Uniformity Coefficient, D15, D50, D85
 - Saturated Hydraulic Conductivity (K-sat)
 - Bulk Density
 - Compost: Organic Amendment Evaluation
 - Procter with Infiltration Rates
 - Nutrient & Salinity Diagnostic Test
 - Soil Microbial Community Analysis
 - Coordinate with the soils testing laboratory
 - Review and summarize laboratory test results
4. Assess and analyze, existing site soils for agronomic performance with the intent to provide recommendations to on soil management planning and protection that will be used to adjust drainage characteristics, improve soil structure, add organic matter, mitigate compaction and manage irrigation demand.
5. JBC will attend one (1) WebEx meeting with the design team and city officials to present the Soil Predesign Assessment & Analysis.
6. Deliverables: Soil Predesign Assessment & Analysis.
 - On-site investigation and sampling of existing soils
 - Prepare inventory and summary of laboratory test results
 - Develop a collection of overlay maps depicting the location, patterns and relationships of natural soil features and agronomic suitability
 - Prepare a working paper that identifies natural soil systems including estimates of agronomic health and soil management approach
 - Provide presentation of findings to team and owner representatives

Design Development Phase

1. Review project parameters, current soil technologies and design concepts and offer preliminary information with respect to the technical feasibility, suitability to the site, preliminary construction cost, and maintenance and operation considerations. Provide comment back to LAN relative to overall planting approach for the site and sustainability practices and approaches.
2. Review and comment on the geotechnical and environmental soil reports. Evaluate potential soil system profiles including amending native soils for each specified plant species and associated soils map for the project site including a narrative of each soil type and technical specifications for each soil type design.
3. Attend one (1) WebEx meeting with the design team to review and coordinate the project. Work with your office and your subconsultants via fax, telephone, and exchange of drawings throughout the design phase to establish criteria for the agronomic soil systems. During this phase of work JBC will address:
 - Evaluate engineered and native soil characteristics related to plant community strategies and client needs.
 - Review the City's landscape maintenance and management practices as it related to this project.
4. JBC will assemble their findings and recommendations for each of the items identified. An estimate of probable construction cost will be provided to quantify materials and develop unit prices for the proposed work. JBC will receive and record comments of participants pertinent to the final development of agronomic soil recommendations.
5. Prepare soil management plan with profile design information with details. Coordinate project logistics and schedule with LAN and team consultants. Evaluate native soil amendment options and possible imported soils. Make recommendations and provide cost analysis of each option including
 - Plan showing topsoil and agronomic subsoil types and areas to be stripped
 - Methods for stripping, stockpiling, re-spreading and improving the soils
 - Agronomic soil haul routes
 - Location and content of each soil stockpile
 - Schedules of volumes for each agronomic materials
 - Expected after-use for each harvested material
9. Work with LAN and sub consultants to develop site sustainability methods and practices including vegetative slope stabilization material and products.
10. Prepare of outline technical specifications for landscape soils.
11. Provide review and comment of the cost estimate prepared by others, including assessment of unit and application costs. Provide quantity take-offs and recommendations for cost savings.
12. Participate in weekly conference calls during this phase, duration one hour each as part of the coordinate process.

13. Deliverables: Design Development Phase.

- Outline Specification for landscape planting soils
- Provide, coordination and review to assist the design team as it impacts agronomic soils and vegetative slope protection
- Review and comment on probable construction cost
- Provide quantity take-offs for materials
- City review comments of Design Development will be addressed in Construction Documents Phase as authorized in a future contract.

Construction Document Phase (Not in Contract)

1. Provide the following documentation, coordination and review to assist the design team in the preparation of construction documents. Prepare for review document submissions at 60% including,
 - Review of 60% budget estimates prepared by others and provide comment and recommendations for cost savings.
 - Contact LAN project manager to ensure that our documentation is properly coordinated. Issue a letter summarizing the results of these contacts.
 - Provide soil system profiles for each soil type and technical specifications detailing soil mix properties and parameters and other pertinent design information related to the installation of planting soils and soil systems.
2. Provide the following documentation, coordination and review to assist the design team in the preparation of final construction documents. Participate in conference calls to coordinate with the design team members. Prepare for review three (3) document submissions at 90%, 99% and 100% for the design team and client review. During this phase of work JBC will provide the following:
 - Provide review and comment of the cost estimate prepared by others, including assessment of unit and application costs, agronomic soil volumes, soil amendments, blending processes and plant establishment fertility. Provide quantity take-offs and recommendations for cost savings.
 - Contact LAN project manager to ensure that our documentation is properly coordinated. Issue a letter summarizing the results of these contacts.
 - Provide soil system profiles for each soil type and technical specifications detailing soil mix properties and parameters and other pertinent design information related to the installation of planting soils and soil systems.
 - Provide complete plans, details and specifications based upon the approved 60% documents. Construction documents provided will include the following:
 - Soil design mix for each soil type with technical soils drawings
 - Provide agronomic recommendations concerning:
 - Compost: Organic Amendment Evaluation
 - Gravel Distribution Analysis
 - Physical Evaluation of Landscape Soil Mixes
 - Fertility and tissue testing
 - Growing Medium Particle Size Analysis
 - Landscape Soils Microbiological Amendments

3. JBC will provide independent technical peer review of the completed project design details at 90%, 99% and 100% document submittals and specification providing comments on the sections impacting agronomic systems.
4. Deliverables: Construction Document Phase.
 - Issue a letter summarizing team coordination items at 60%, 90%, 99% and 100% document submittals.
 - Soil design mix for each soil type with technical soils drawings
 - Develop technical drawings depicting soil management plan with profile design information with details, performance criteria, amendment sources, handling and blending processes.
 - Final Technical Specification for agronomic planting soils
 - Provide agronomic soil recommendations concerning vegetative establishment, fertility, and maintenance.
 - Review and comment on probable construction cost
 - Provide quantity take-offs for materials

SERVICES NOT INCLUDED

1. Office or site visits: Services and reimbursable expenses for additional site or office visits will be billed as extra services.
2. Design and Budget Changes: Any conceptual changes resulting in increased complexity or changes in design requiring rework once the documentation process has been authorized may be considered extra services.
3. JBC will provide rootzone system design above subgrade. This proposal does not include services for subgrade testing, agronomic materials testing, and design of utilities past the point of connection, stormwater calculations and local permitting in conjunction with construction.
4. This proposal does not include services for:
 - Related off-site improvements
 - Bidding or construction phase services.
 - Project representation at public meetings
 - Compiling, printing and issuing all bid and contract documents.
 - Preparation and review of all contracts and documents of obligation serving the project
 - Preparation of multiple documentation packages for phased development

EXTRA SERVICES

1. We will identify services not included in our proposed scope of work if they are requested. We will advise your office of the impact on our work, and propose an increase to the fee amount before any work is undertaken that is outside our scope of services.

INFORMATION TO BE SUPPLIED

1. Utilities: water, sewer, gas, storm drainage, electricity, and telephone.
2. Any known existing hydraulic information, subsurface investigations, soil mixes, and any other site-specific investigations.
3. Any as built drawing documentation, specification, and/or construction plans of the existing facility (if available).

FEES

Based on the complexity of the projects and the amount of documentation anticipated, we will provide the services described in the above proposal in accordance with the above scope of services. Billing shall be on an hourly basis per phase up to the not to exceed fee as shown below.

Predesign Assessment & Analysis	\$ 21,650
Design Development Phase	\$ 8,095
Construction Documentation Phase	Not in Contract
Estimate Reimbursable Expense	\$ 6,985

Reimbursable Expenses

1. Automobile mileage to meeting destinations more than 25 miles from the base office of the partner or staff member traveling will be billed at the current IRS mileage rate per mile.
2. Reimbursable expenses are attached and are included in our fee proposal. Expenses will be billed as a direct cost plus 10% as it is incurred. Receipts will be provided with each invoice.
 - Airfare, transportation, lodging, meals and other living expenses associated with out-of-town travel
 - Automobile mileage to meeting destinations more than 25 miles from the base office of the partner or staff member traveling will be billed at the current IRS mileage rate per mile.
 - In-House printing costs associated with document submission requirements will be billed as a direct cost.

Hourly Billing Rates

1. Billing rates effective through 31 December 2020.

Principal	\$190.00/hr.
Senior Project Manager	\$120.00/hr.
Project Landscape Architect	\$ 85.00/hr.
Associate Landscape Architect	\$ 80.00/hr.
Administrative Assistant	\$ 60.00/hr.
Agronomist	\$225.00/hr.

As part of this scope of work and fee schedule, JBC will maintain the current hourly rates listed above through the design of the project (18 months). JBC billing rates will be updated in

January 2021, and if appropriate, may be provided as an amendment to the contract for services if the project completion is delayed beyond 18 months.

CONTRACT

This proposal is not a contract for execution. Should the terms set forth herein be agreeable and acceptable as a basis for agreement, a contract for professional services will be prepared and executed prior to beginning work.

CREDITS AND ACKNOWLEDGMENTS

Jeffrey L. Bruce & Company shall, **where appropriate**, be given credit and acknowledgment for consulting by your office, your agent, and/or your client in published articles and/or promotional brochures. JBC will comply with all confidentially agreement provisions regarding publications related to this project.

Please let me know if you require any further information

Sincerely,

Jeffrey L. Bruce & Company, LLC.

A handwritten signature in black ink, appearing to read 'JL Bruce', with a large loop at the start and a long horizontal stroke extending to the right.

Jeffrey L. Bruce, FALSA, FASIC, LEED, GRP
President

TASK DESCRIPTION		Principal	Senior Project Manager	Project Landscape Architect	Associate	Agronomist	Support	TOTAL HRS.	TOTAL LABOR COSTS	EXPENSES	TOTAL LABOR PLUS EXPENSES
CONTRACT RATE PER HOUR		\$ 190.00	\$ 120.00	\$ 85.00	\$ 80.00	\$ 225.00	\$ 60.00				
Soil Predesign Assessment & Analysis (0-30% Design)											
1.1	Attend Kickoff Meeting & Preparation	4				4		8	\$ 1,660.00		\$ 1,660.00
1.2	Review Previous Studies & Relevant Information	4			2	4		10	\$ 1,820.00		\$ 1,820.00
1.3	Conduct On-site Soil Investigation & Sampling	12				12		24	\$ 4,980.00		\$ 4,980.00
1.4	Review Laboratory Test Results	2			4	4		10	\$ 1,600.00		\$ 1,600.00
1.5	Develop Overlay & Analysis Maps	2	4		8	2		16	\$ 1,950.00		\$ 1,950.00
1.6	Working Paper on Agronomic Suitability & Management Approach	4	4		8	4		20	\$ 2,780.00		\$ 2,780.00
1.7	Provide Presentation of Soil Predesign Assessment	10	4		6	10		30	\$ 5,110.00		\$ 5,110.00
1.8	Finalize Working Paper Based on Review Comments	2	4		4	2		12	\$ 1,630.00		\$ 1,630.00
1.9	Adminstrative Documentation & Expenses						2	2	\$ 120.00	\$ 6,150.00	\$ 6,270.00
HOURS/EXPENSES SUB-TOTALS		40	16	0	32	42	2	132		\$ 6,150.00	
TOTAL LABOR COSTS		\$7,600.00	\$1,920.00	\$0.00	\$2,560.00	\$9,450.00	\$120.00				
% DISTRIBUTION OF STAFF HOURS		30.3%	12.1%	0.0%	24.2%	31.8%	1.5%				
Expense Markup (10 %)										\$ 615.00	
SUBTOTAL		\$7,600.00	\$1,920.00	\$0.00	\$2,560.00	\$9,450.00	\$120.00		\$21,650.00	\$6,765.00	\$28,415.00
Design Development Phase (30% Design)											
2.1	Provide Review of Planting & Vegetative Approaches	2	4		6	2		14	\$ 1,790.00		\$ 1,790.00
2.2	Develop Soil Type Profiles & Amendment Approaches	1	2			2		5	\$ 880.00		\$ 880.00
2.3	Prepare Agronomic Soil Management Plan	4			4	4		12	\$ 1,980.00		\$ 1,980.00
2.4	Agronomic Soil Component Sourcing & Blending	2				4		6	\$ 1,280.00		\$ 1,280.00
2.5	Outline Technical Specification	2			8	2		12	\$ 1,470.00		\$ 1,470.00
2.6	Review Estimates of Probable Construction Cost	1			2	1		4	\$ 575.00		\$ 575.00
2.7	Adminstrative Documentation & Expences						2	2	\$ 120.00	\$ 200.00	\$ 320.00
HOURS/EXPENSES SUB-TOTALS		12	6	0	20	15	2	55		\$ 200.00	
TOTAL LABOR COSTS		\$2,280.00	\$720.00	\$0.00	\$1,600.00	\$3,375.00	\$120.00				
% DISTRIBUTION OF STAFF HOURS		21.8%	10.9%	0.0%	36.4%	27.3%	3.6%				
Expense Markup (10 %)										\$ 20.00	
SUBTOTAL		\$ 2,280.00	\$ 720.00	\$ -	\$ 1,600.00	\$ 3,375.00	\$ 120.00		\$8,095.00	\$220.00	\$8,315.00
Total Project Hours/Expenses		52	22	0	52	57	4	187			
Total Project % Distribution of Staff Hours		28%	12%	0%	28%	30%	2%				
TOTAL									\$29,745.00	\$6,985.00	\$36,730.00

September 12, 2019

Proposal

Jennifer Miller, PE
Lockwood, Andrews & Newnam, Inc.
407 S. Stagecoach Trail, Suite 207
San Marcos, Texas 78666

**Re: Landscape Architecture Proposal
 Purgatory Creek Channel Improvement Project**

Asakura Robinson Company (AR) is pleased to submit this landscape architecture services proposal for the above-mentioned project. Our firm has built our reputation on our strength in working with owners, consultants and stakeholders and we welcome this opportunity to work with you and your team in creating a high-quality project.

A. Scope of Work

1. The project site is located in San Marcos, Texas. The project area is a roughly 220' right-of-way along approximately 5200 linear feet of Purgatory Creek (plus the spillway area) identified as Phase 1 in the Purgatory Creek Channel Improvement Project Preliminary Engineering report (PER), between S. Johnson Avenue and the confluence of Purgatory Creek with the San Marcos River. The PER estimates Phase 1 landscape area costs at approximately \$0.46 million and pedestrian/bike trail and safety costs at approximately \$0.92 million.
2. The preliminary phase of the project is expected to commence in November 1, 2019 and Schematic Design is expected to commence in March 2020 and be completed within twenty-four (24) months from the notice to proceed and effective start date of work.
3. AR shall provide landscape architecture services for Schematic Design (30% design) phase of the project. Services for the Design Development, Construction Documents, and Construction Observation phases of the project will be determined upon completion of Schematic Design by written consent of the client. Submittals shall be at the following design levels: 30%, 60%, 90%, 99%, and 100%.
4. Landscape design criteria shall meet the client's need and expectation as well as City, County and Texas Commission on Environmental Quality (TCEQ) landscape requirements, as applicable.
5. Hardscape layout and details, irrigation, landscape design, placemaking and wayfinding elements, site furnishings and exterior landscape lighting shall be provided for the following scope of work areas within the work area described above:
 - a. Landscape areas along both banks of length of channel and pilot channel;
 - b. Landscape layout and details within channel and pilot channel area;
 - c. Key habitat "pool" areas;
 - d. Creek edge along Children's Park and spillway location;
 - e. Bridge connections (note: AR assumes that client is responsible for design and engineering of new and upgraded crossings, including pedestrian crossings; AR to provide design input on pedestrian bridges and design for wayfinding elements at bridge locations).
6. AR shall incorporate LID design principles into the project where feasible and acceptable by the client.

7. AR shall incorporate Crime Prevention through Environmental Design (CPTED) principles and best practices in Universal Access into the project where feasible and acceptable by the client.

Task I: Public Engagement

1. Assist client in preparation of up to one (1) public engagement meeting.
2. Attend and assist client with up to one (1) public engagement meeting.
3. Attend up to two (2) meetings with owner stakeholders, including City of San Marcos staff.

Task II: Schematic Design (30% design)

1. Meet with the client to discuss the project expectations and general character of the project.
2. Visit the site and note the general character of the site.
3. Review Preliminary Engineering Report and City of San Marcos Open Spaces Master Plan.
4. Coordinate with client, permitting consultant, and stream restoration consultant and provide necessary landscape drawings required for permitting.
5. Develop overall landscape design concept plan including hardscape and softscape layout.
6. Develop landscape and placemaking narrative in written memo format with illustrations as necessary to illustrate written concepts.
7. Develop schematic opinion of probable construction cost for client review.

The following tasks are for reference, not included in this scope and will be contracted in a separate contract upon completion of Task II: Schematic Design.

Task III: Design Development (60% design) - Not in contract

The final scope of Task III will be determined and contracted following the completion of schematic design. Based upon the client approved schematic design, AR shall prepare a more refined landscape plan which may include the following:

1. Coordinate with client regarding layout and grading issues.
2. One round of revisions to the landscape concept plan and narrative per one set of client, owner and other consultants for comments.
3. Develop a refined landscape plan with proposed plant selection and planting media specifications.
4. Develop irrigation main line plan, including irrigation zones, and details; identify areas of probable temporary irrigation (*AR to contract with second tier sub-consultant for all work related to irrigation design*).
5. Finalize hardscape design and propose paving material selection.
6. Develop a landscape lighting concepts with fixture selection as well as coordinate with client and/or electrical engineer for the power connection, as needed.
7. Develop wayfinding graphics package with signage design and locations. Wayfinding shall include design of signage and locations, material selections, and graphic design and other design related to the presentation of information on signage.
8. Develop site furnishing plan with proposed furniture selections.
9. Furnish two (2) illustrative renderings and two (2) illustrated sections showing key site conditions as identified with client.
10. Coordinate with client, permitting consultant, and stream restoration consultant and provide necessary landscape drawings required for permitting.
11. Refine opinion of probable construction cost.

Task IV: Construction Documents (90%, 99%, 100% design) - Not in contract

The final scope of this phase will be determined and contracted following the completion of schematic design. Based upon the client approved design development plans and estimated construction budgets, AR shall prepare scaled construction documents for the project, including the following:

1. Prepare tree preservation and mitigation plans and details, including removal of invasive species
2. Prepare a hardscape layout plan, identifying all proposed improvements.
3. Prepare fine grading plan(s).

4. Prepare irrigation plans and details, including identification of areas of temporary irrigation *(AR to contract with second tier sub-consultant for all work related to irrigation design)*.
5. Prepare landscape plan, planting and plant media details, schedules and specifications.
6. Prepare lighting plan and light fixture selection.
7. Prepare a site furnishing plan, including wayfinding signage plan and details.
8. Prepare construction specifications for landscape portion of work.
9. Coordinate with client, permitting consultant, and stream restoration consultant and provide necessary landscape drawings required for permitting.
10. Provide 100% CD opinion of probable construction cost.

B. Compensation

Task I	Public Engagement	\$ 9,808.00
Task II	Schematic Design	\$ 55,070.00
Task III	Design Development*	(not in contract)
Task IV	<u>Construction Documents*</u>	(not in contract)

Reimbursable Expenses (NTE 3%)	\$1,946.34
Subconsultant Fees**	(not in contract)

Total **\$ 66,824.34**

*Fees and scope for Task III Design Development and Task IV will be determined under a new proposal upon the completion of Task III Schematic Design with approval by Client.

**Fees and scope for Task III Design Development and Task IV subconsultant services will be determined under a new proposal upon the completion of Task III Schematic Design with approval by Client.

Fees and reimbursable costs shall be billed monthly on a time & materials (T&M) basis with a fee not to exceed the total above or actual costs for additional services and reimbursables as defined herein.

Detailed hourly estimate for compensation fees are provided in 'Attachment A – Landscape Fee Proposal' of this proposal.

Subconsultant services required are detailed in 'Attachment B – Subconsultant Proposal', beginning on page 6 of this proposal.

Reimbursable expenses are expenditures for the project made by AR and consultants in the interest of the project plus an administrative fee of **10%**. Reimbursable expenses include, but are not limited to travel expenses, costs of reproduction, postage, services of professional consultants which cannot be quantified at the time of contracting, and other, similar project – related expenditures. Reimbursable expenses shall not exceed **\$1,946.34** without prior approval by Client.

C. Exclusions to Scope of Services and Additional Services

1. Client shall provide the following information as required for performance of the work. AR assumes no responsibility for the accuracy of such information or services and shall not be liable for errors or omissions therein. Should AR be required to provide services in obtaining or coordinating compilation of this information, such services shall be charged as Additional Services.
 - a) Topography, boundary surveys and Legal descriptions of property.
 - b) Existing site engineering and utility base information.
 - c) Soils Engineering, Geo-technical and other Consultant services if required.
 - d) Application and Permit Fees
2. Permitting services, including USACE 404 permits, are excluded from scope, other than furnishing landscape drawings for permitting as described in Tasks above.

3. LEED and SITES accreditation is excluded from scope.
4. Additional Services include but are not limited to:
 - a) Construction observation and post-construction services.
 - b) Work requested and or authorized by the Client not defined in the 'Scope of Work' or revisions and changes to Client approved drawings and the preparation of alternatives or change orders requested by the Client.
 - c) Preparation of as-built drawings or of measured drawings or existing conditions.
 - d) Design for permanent irrigation larger than the area proposed in the subconsultant's scope of work where permanent irrigation design is limited to 20% of the approximately 24-acre project site.
 - e) Models, special renderings, promotional photography, special printing, special equipment, special printed reports or publication, maps, and documents requested by the Client.

Hourly rates for Additional Services:

Margaret Robinson	Principal	\$ 215/hr
Jessica Krug	Principal	\$ 162/hr
Brendan Wittstruck	Principal	\$ 153/hr
Erin Cannon	QA/QC	\$ 136/hr
Claire Eddleman-Heath	Project Manager	\$ 128/hr
Katie Coyne	Senior Planner	\$ 123/hr
Staff	3.36 x direct personal expense (DPE)	

D. Jurisdiction and Termination

JURISDICTION – The Texas Board of Architectural Examiners has jurisdiction over complaints regarding the professional practices of persons registered as landscape architects in Texas. The Board may be reached at the following address: Texas Board of Architectural Examiners, P.O. Box 12337 Austin, TX 78711-2337 Phone / (512) 305-8900 TERMINATION – Termination will be addressed in subcontract agreement with client.

We appreciate your consideration of our firm, and we look forward to working with you. If this proposal meets your approval, please sign and return one (1) copy to our office at your earliest convenience.

Yours truly,



Margaret Robinson, Founding Principal
Asakura Robinson Company, LLC

Jennifer Miller, PE
Lockwood, Andrews, and Newnam, Inc.

Date: September 10, 2019

Date _____

Attachment A: Landscape Fee Proposal

Purgatory Creek Channel Improvements
Landscape Fee Proposal

Task Description	Principal in Charge - Margaret Robinson	Principal Designer - Brendan Wittstruck	Project Manager - Claire Eddleman-Heath	Principal Administrator - Hayley Pallister	QA/QC - Erin Cannon	Senior Associate Planner - Katie Coyne	Associate Designer	Designer	Garza Irrigation Design	Total AR	Total Cost	Percent of Total Estimate Fee
	\$215.00	\$153.00	\$128.00	\$210.00	\$136.00	\$123.00	\$97.00	\$87.00				
30% DESIGN TASKS												
Task I - Public Engagement												
1. Assist client in preparation of up to one (1) public engagement meeting	2		8			8	12	12		42	\$4,646.00	
2. Attend and assist client with up to one (1) public engagement meeting	2		4			4				10	\$1,434.00	
3. Attend up to two (2) meetings with owner stakeholders, including City of San Marcos staff.	8		8			8				24	\$3,728.00	
HOURS SUB-TOTAL	12	0	20	0	0	20	12	12		76		
COSTS SUB-TOTAL	\$2,580.00	\$0.00	\$2,560.00	\$0.00	\$0.00	\$2,460.00	\$1,164.00	\$1,044.00	\$0.00	\$ 9,808.00	\$9,808.00	5%
Task II - Schematic Design												
1. Meet with the client to discuss the project expectations and general character of the project.	2	4	4			4				14	\$2,046.00	
2. Visit the site and note the general character of the site	4	4	4			4				16	\$2,476.00	
3. Review Preliminary Engineering Report and City of San Marcos Open Spaces Master Plan		2	4			4				10	\$1,310.00	
4. Develop landscape and placemaking narrative in written memo format with illustrations as necessary to illustrate written concepts.	2	6	20	1	4	8	16	20		73	\$8,938.00	
5. Coordinate permitting with client and/or permitting consultant and stream restoration consultant, including providing necessary landscape drawings required for permitting.			8					16		24	\$2,416.00	
6. Develop schematic hardscape and softscape layout plan	4	10	30	1	4	16	60	60		185	\$19,992.00	
7. One round of revision per one set of client comments	4	10	30		4	16	30	30			\$14,262.00	
7. Develop schematic opinion of probable construction cost for client review.	2		12		2			16		32	\$3,630.00	
										0	\$0.00	
HOURS SUB-TOTAL	18	36	112	2	14	52	106	142	0	354		
COSTS SUB-TOTAL	\$3,870.00	\$5,508.00	\$14,336.00	\$420.00	\$1,904.00	\$6,396.00	\$10,282.00	\$12,354.00	\$0.00	\$55,070.00	\$55,070.00	25%

TASK I + II TOTAL HOURS	30	36	132	2	14	72	118	154	0	430		
TASK I + II TOTAL COSTS	\$6,450.00	\$5,508.00	\$16,896.00	\$420.00	\$1,904.00	\$8,856.00	\$11,446.00	\$13,398.00	\$0.00	\$ 64,878.00	\$64,878.00	30%
TASK I + II EXPENSES				\$1,946.34						\$ 1,946.34	\$1,946.34	3%

APPROVED FEE (NTE):	\$66,824.34
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NOTE: Reimbursable expenses shall be billed to client at cost plus an administrative fee of 10%; sales tax is exempted from all reimbursable expenses

Attachment B: Subconsultant Proposal



GARZA
CONSULTING
IRRIGATION DESIGN
PLANNING & COST ANALYSIS
P.O. BOX 681974
SAN ANTONIO, TEXAS
PHONE(210) 490-1191

September 11, 2019

Asakura Robinson
1224 E 12th Street, Ste 310
Austin, TX 78702

Re: Irrigation Design: *Phase 1 in the Purgatory Creek Channel Improvement Project*

Attn Claire Eddleman-Heath:

I am pleased to present the following proposal for irrigation design services for the above referenced project. A standard irrigation from a potable water source is currently planned for this project. The final scope of this proposal will be determined upon the completion of 30% design. Irrigation design to begin after the 30% submittal. The scope will include:

Irrigation Design for the site referenced above, approximately 1,444,000 SF of which 20% will be permanently irrigation (228,800 SF):

Irrigation design includes spray head and/or drip irrigation placement, piping, pipe sizing, hydraulic calculations, construction details and specifications.

Est. Construction Cost: \$343,200.00

-Design Development (60% Design) - \$6,178.

-100% Construction Documents - \$14,415.00

Garza Consulting reserves the right to update fee should the scope grow beyond what was represented for this proposal. Base fee does not include water harvesting systems, pump systems, requests to convert contractor as built to CAD, LEED calculations or revisions to plan after 100% Construction Documents have been submitted by Garza Consulting.

Additional Services

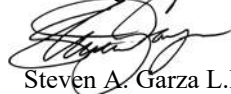
Design work requested after 100% Construction Documents have been submitted shall be billed as Additional Services. These services shall be billed at a rate of \$125/hr.

If requested by the Owner's Representative, we will make visits to the site during construction to observe progress by the Contractor. A field report will be developed after each visit documenting verbal communication with the Contractor and listing deviations from the contract documents. These services will be charged at our hourly billing rate of \$125/hr.

Garza Consulting
P.O. Box 681974
San Antonio, TX 78268
Phone: 210-490-1191

We request written approval to proceed with this project, however it may be necessary to meet to develop a more definitive scope as you deem necessary. Please call with any questions or comments. I look forward to working with you on this project.

Kind Regards,



Steven A. Garza L.I.

AGREED TO BY:

Date

SCOPE OF WORK NARRATIVE

(ATTACHMENT A: DESCRIPTION OF SERVICES)

PURGATORY CREEK CHANNEL IMPROVEMENT PROJECT

29°52'47.6"N 97°56'09.8"W

San Marcos, TX

September 18, 2019

The Lady Bird Johnson Wildflower Center (LBJWC) will work as sub-consultants to Lockwood, Andrews, and Newnam, Inc. (LAN) on the Purgatory Creek Channel Improvement Project in San Marcos, TX. The scope of services includes working with the design team in the Evaluation, Analysis and Inventory Phases of the project to contribute ecological knowledge of the region during the site assessment, the design phase to explore and finalize restoration methodologies.

The Wildflower Center will work with the design team to help create an integrated plan that functions on multiple levels enhancing the site's ecological performance and efficiency, while adhering to the main goals of hydrologic function. This includes optimizing ecosystem services (i.e. stormwater management, air and water quality improvement, carbon sequestration, landscape restoration and conservation) while thinking of construction and maintenance realities. Our experience in scientific research, landscape design, ecosystem function and professional and university education positions our group at the forefront of urban environmental design to optimize the ecological and economic performance of Purgatory Creek.

WORK PLAN

Below is a work plan individually describing each task needed to carry out the project proposal.

TASK 1 – Project Coordination – Kick-Off Meetings – Project Baselines

- > 1.1 Project Management by Task
- > 1.2 COSM/LAN Meetings (San Marcos)
- > 1.3 Team coordination calls
- > 1.4 Kick off meeting (Austin)
- > 1.5 Meeting with COSM to discuss restoration goals
- > 1.6 & 1.7 Coordination meetings with Permitting Consultant and Landscape Architect
- > 1.8 Review assessment techniques and areas of focus for the Vegetation Restoration Plan being developed for the USACE 404 permitting. Coordinate on-site activities to avoid duplication of effort and to facilitate efficient information sharing.
- > 1.9 Review existing documentation
- > 1.10 Review/comment on Agenda and Meeting Summaries
- > 1.11 Review/contribute toward goals and priorities

> Expenses

TASK 2 – Field Analysis and Site Assessment

The Wildflower Center will assess the project site and its context in terms of local ecology and culture so that site appropriate sustainable design and maintenance decisions can be made. On-site conditions such as vegetation communities, soil type and health and hydrological processes will be assessed in cooperation the larger design team. On-site the Wildflower Center will focus on aspects outside of the stream and wetland functional assessment performed by the Permitting Consultant. Examples include upland ecological health, opportunities for connectivity with the surrounding ecological region, opportunities to combine educational, experiential and storm water management goals, and opportunities to enhance vegetative community resilience in all areas. The Wildflower Center will take the lead in assessment of reference sites and adjoining natural and landscaped areas that will influence the project or that could serve as resources for design. Further detail is provided below.

- > 2.1 Project Management by Task
- > 2.2 COSM/LAN Meetings (San Marcos)
- > 2.3 Team coordination calls
- > 2.4 Site Assessment (5 days if necessary x 4 staff) of project site, reference sites and upstream area with the goal of ascertaining current ecological health, identification of opportunities for, and constraints to, protecting and enhancing the ecological health of the site and enhancing connectivity with surrounding area. City staff with applicable skills will be integrated into site assessment efforts.
 - Project Site
 - Identification of Level III Ecological Region and NRCS Ecological Sites
 - Assessment of the bank and upland vegetative communities' placement within expected community dynamics as informed by the ecological region, ecological sites and reference sites.
 - Location of significant vegetation patches that can be incorporated into site design including: special status vegetation, blocks of habitat and corridors or connections between habitat patches, species of particular utility for riparian function, upland stormwater management, pollinator and avian habitat, in-stream habitat, post-construction recovery, and human engagement. Identification of populations for salvage, seed collection or preservation. City staff knowledge of surrounding communities as well as vegetative sampling skill will be utilized.
 - Specific mapping of primary invasive species of concern on the project site will be left to Permitting Consultant. LBJWC will focus on identifying species of particular concern for development, off-site sources, conditions that encourage spread, and relationship of invasive to valuable species.
 - Location of healthy and previously disturbed soils in conjunction with Soil Consultant.
 - Potable and non-potable water sources for site, and opportunities to capture and treat rainwater, especially opportunities that can be incorporated into educational features, or that enhance overall human engagement
 - Current and historic land management
 - Assessment of site context for sources of contamination and possible ecological and social connections.
 - Reference and adjacent sites

- Identify appropriate vegetative and soil targets for the project site that support stormwater management, ecological and human engagement goals. City staff knowledge of surrounding communities and vegetative sampling skill will be utilized.
 - Identify potential donor populations for seed harvest, plant harvest or contract growing source populations as well as sources for problematic species. Coordinate with Discovery Center.
 - Assess offsite wildlife habitat and potential for connectivity with project site, particularly pollinator habitat
- > 2.5 Collect soil from reference sites to be analyzed for physical properties, texture, organic matter, bulk density, CEC, N, & P
 - > 2.6 Determine potential soil amendments for soil types and current condition in conjunction with Soils Consultant and Landscape Architect
 - > 2.7 Document species composition
 - > 2.8 Review/comment developed stream restoration and trail alignment strategy
 - > 2.9 Provide baseline report with illustrative documentation
 - > 2.10 Coordinate with Permitting Consultant on draft invasive management control methodology, particularly strategies and timing for treatments before and during installation.
 - > Expenses

TASK 3 – Discovery: Hydraulics and Hydrology

Hydraulic modeling will determine which sections require engineered reinforcement, which can be held with vegetation alone and which areas lie in between these extremes. The Wildflower Center will work with engineers to develop soft solutions, where possible, in these border cases.

- > 3.1 Project Management by Task
- > 3.2 COSM/LAN Meetings (San Marcos)
- > 3.3 Team coordination calls
- > 3.4 Review/comment on preliminary modeling providing refined feedback on appropriate vegetation/soil communities by section/reach for bank stability and in stream habitat as defined by modeling results, maintenance capacity for the section and experiential goals
- > 3.5 Review/recommendations for mitigating techniques
- > 3.6 Identify opportunities to maintain and improve ecosystem services, by section/reach to be considered during preliminary modeling
- > 3.7 Provide memorandums
- > 3.8 Field visit (if necessary)
- > Expenses

TASK 4 – 30% Design

- > 4.1 Project Management by Task
- > 4.2 COSM/LAN Meetings (San Marcos)
- > 4.3 Team coordination calls
- > 4.4 Reassess concept plan, integrating ecological and interpretive goals. Define measurable performance benchmarks
- > 4.5 Alternatives and mitigating techniques (bank stability)
- > 4.6 Develop Limits of Construction and Vegetation Soil Protection Zones
- > 4.7 Contribute to site restoration plan to be developed by landscape architects to correspond with performance goals and construction sequencing. Identify opportunities for education and landscape monitoring. This plan will incorporate the Vegetation Restoration plan developed for USACE 404 permitting, but will incorporate upland areas, modification of strategies and targets as appropriate to the construction phase, and will

include concepts of site hygiene intended to reduce the spread and establishment of invasive species during and immediately after construction when the site is particularly vulnerable.

- > 4.8 Opportunities for upland (e.g. amenities that also function as bioswales and raingardens) and in-channel ecosystem services (e.g. bank communities that provide stability as well as in-stream shade and organic matter). Integration of green infrastructure, wildland riparian restoration techniques and educational strategies.
- > 4.9 Confirm conditions of streambank stability provided by LAN
- > 4.10 Assign typologies to streambank and stream health restoration and stabilization
- > 4.11 Assign typologies of top of bank run-off management opportunities
- > 4.12 Assign typologies of opportunities to modify stormwater outfalls to align with public trail access program
- > 4.13 Assist landscape architect and review plant palette of sustainable features and plant communities for site conditions and required function (bank stability/water infiltration & cleansing/human engagement)
- > 4.14 Review/comment on Final Schematic Design Plan Document (2 times)
- > 4.15 Provide memorandums
- > 4.16 Cost Estimate Review
- > Expenses

Future Work

TASK 5 – 60% Design

- > 5.1 Project Management by Task
- > 5.2 COSM/LAN Meetings (San Marcos)
- > 5.3 Team coordination calls
- > 5.4 Work with LAN to develop BMP strategies for critical environmental feature protection during construction and restoration efforts
- > 5.5 Further develop with design team site water balance strategies for treatment of site runoff, landscape irrigation requirements
- > 5.6 Refine opportunities for upland and in-channel ecosystem services and connectivity
- > 5.7 Assist and review plant palette of sustainable features and plant communities for site conditions
- > 5.8 Further develop restoration guidelines and strategies, interpretive messages and performance benchmarks
- > 5.9 Review and assist in developing the landscape documents, drawings, and specifications for planting related items and provide comments. Documents to be reviewed will include planting plans, planting soil profiles, site sections and details prepared by design teams
- > 5.10 Provide criteria for maintenance in restoration areas and feedback on overall maintenance plan
- > 5.11 Develop seed/plug mixes with application rates and density for restoration areas
- > 5.12 Meet with maintenance professional/team to review design and provide comments
- > 5.13 Review/comment on Document (2 times)
- > 5.14 Provide memorandums
- > 5.15 Cost Estimate Review
- > Expenses

TASK 6 – 90% Design

- > 6.1 Project Management by Task

- > 6.2 COSM/LAN Meetings (San Marcos)
- > 6.3 Team coordination calls
- > 6.4 Assist in locating sources for native plant material, compost, and other soil amendments
- > 6.5 Review and develop specifications. Documents to be reviewed include soil modification, planting plans, planting soil profile plants, site sections and details, irrigation plan and details, storm drainage plans
- > 6.6 Review and comment on final selection of plantings
- > 6.7 Review and provide comments on Construction Development package 2 times
- > 6.8 Work with city staff to develop recommendations for problematic species management before, during and post construction
- > Work with city staff to develop landscape maintenance plan for restoration areas.
- > 6.9 Finalize 5 Year Maintenance Plan
- > 6.10 Cost Estimate Review
- > 6.11 Value Engineering
- > Expenses

Task 7—Construction

- > 7.1 COSM/LAN Meetings
- > 7.2 Construction observation
- > 7.3 Provide memorandums

Task 8—Post-construction

- > 8.1 2 COSM/LAN Meetings
- > 8.2 Maintenance site visits
- > 8.2 Provide memorandums

CONTRACT PROCESS

This Description of Services is not a binding document. Once the terms are agreed upon Lockwood, Andrews, and Newnam, Inc. the document must be submitted to the University of Texas' Office of the Vice President and Chief Financial Officer for authorization. Please understand that this process can sometimes take extra time to get a fully executed contract. If time is a constraint, consider providing a signed notice to proceed document to expedite the process.

SCHEDULE

The LBJWC consulting program is strengthened by our research and educational programs. However, this means that our consulting staff has multiple responsibilities and outside commitments beyond consulting. Request for information should keep the center's structure in mind and advanced notification for information is appreciated.

ADDITIONAL SERVICES

Services requested by Lockwood, Andrews, and Newman Inc. not included in the above project scope may be requested as need. For additional services, compensation will be billed according to the following hourly rates:

CONSULTING RATES

Associate Principal	\$199.80/hour
Senior Designer	\$183.60/hour
Ecologist, Ph.D.	\$172.80/hour
Project Manager	\$162.00/hour
Environmental Resource Specialist	\$129.60/hour

Technical Staff:	\$118.80/hour
GIS/CADD	
Arborist/Horticulturalist	
Conservation/Botanist	
Invasive Species Specialist	

These rates are subject to periodic adjustments.

Thank you for the opportunity to work with you on this exciting project. Please call us with any questions or needed changes.

Sincerely,

Matthew D. O'Toole
Director of Ecological Research & Design
Lady Bird Johnson Wildflower Center
E: motoole@wildflower.org | T: 512.232.0134

TASK DESCRIPTION		SR DESIGNER	ECOLOGIST	PROJ MGR	STAFF	TOTAL HRS.	TOTAL LABOR COSTS	EXPENSES	TOTAL LABOR PLUS EXPENSES
CONTRACT RATE PER HOUR		\$ 183.60	\$ 172.80	\$ 162.00	\$ 118.80				
TASK 1 - Project Coordination - Kick Off Meetings - Project Baselines									
1.1	Project Management by Task	0	0	8	0	8	\$1,296.00		\$1,296.00
1.2	COSM/LAN Meetings (San Marcos)	0	8	8	0	16	\$2,678.40		\$2,678.40
1.3	Team coordination calls	0	0	8	0	8	\$1,296.00		\$1,296.00
1.4	Kick off meeting (Austin)	0	0	8	0	8	\$1,296.00		\$1,296.00
1.5	Meeting with COSM to discuss restoration goals	0	0	8	0	8	\$1,296.00		\$1,296.00
1.6	Coordination meeting with Permitting Consultant	0	0	8	0	8	\$1,296.00		\$1,296.00
1.7	Coordination meeting with Landscape Architect	0	0	8	0	8	\$1,296.00		\$1,296.00
1.8	Vegetation Restoration Plan Review Meeting (Discuss Strategy)	0	0	8	0	8	\$1,296.00		\$1,296.00
1.9	Review existing documentation	0	0	10	0	10	\$1,620.00		\$1,620.00
1.1	Review/comment on Agenda and Meeting Summaries	0	0	4	0	4	\$648.00		\$648.00
1.11	Review/contribute toward goals and priorities	0	0	4	0	4	\$648.00		\$648.00
HOURS/EXPENSES SUB-TOTALS		0	8	82	0	90	\$14,666.40	\$269.70	\$14,936.10
TOTAL LABOR COSTS		\$0.00	\$1,382.40	\$13,284.00	\$0.00				
% DISTRIBUTION OF STAFF HOURS		0.0%	8.9%	91.1%	0.0%				
Expense Markup (10 %)								\$26.97	
SUBTOTAL		\$0.00	\$1,382.40	\$13,284.00	\$0.00		\$14,666.40	\$296.67	\$14,963.07
TASK 2.1 - Field Analysis and Site Assessment									
2.1	Project Management by Task	0	0	8	0	8	\$1,296.00		\$1,296.00
2.2	COSM/LAN Meetings (San Marcos)	0	8	8	0	16	\$2,678.40		\$2,678.40
2.3	Team coordination calls	0	0	8	0	8	\$1,296.00		\$1,296.00
2.4	Site Assessment* (5 days if necessary x 4 staff): Site, reference sites, upstream area	40	40	40	40	160	\$25,488.00		\$25,488.00
2.5	Collect soil from reference sites to be analyzed for biological and physical properties, bulk density, CEC, N, & P. Samples sent to Jeffrey Bruce for analysis.	0	0	8	4	12	\$1,771.20		\$1,771.20
2.6	Determine potential soil amendment for soil types	0	0	8	0	8	\$1,296.00		\$1,296.00
2.7	Document species composition - for upland and wetland communities, this work needs to supplement data collected by Hicks and Company. Review Biological Assessment by Hicks and Company.	0	0	8	8	16	\$2,246.40		\$2,246.40
2.8	Review/comment developed stream restoration and trail alignment strategy	0	0	16	0	16	\$2,592.00		\$2,592.00
2.9	Provide baseline report	0	0	24	0	24	\$3,888.00		\$3,888.00
2.10	Contribute to invasive species control methodology	0	0	12	0	12	\$1,944.00		\$1,944.00
HOURS/EXPENSES SUB-TOTALS		40	48	140	52	280		\$269.70	
TOTAL LABOR COSTS		\$7,344.00	\$8,294.40	\$22,680.00	\$6,177.60				
% DISTRIBUTION OF STAFF HOURS		14.3%	17.1%	50.0%	18.6%				
Expense Markup (10 %)								\$26.97	
SUBTOTAL		\$7,344.00	\$8,294.40	\$22,680.00	\$6,177.60		\$44,496.00	\$296.67	\$44,792.67
	* See companion document for additional detail								

TASK DESCRIPTION		SR DESIGNER	ECOLOGIST	PROJ MGR	STAFF	TOTAL HRS.	TOTAL LABOR COSTS	EXPENSES	TOTAL LABOR PLUS EXPENSES
TASK 3 - Discovery: Hydraulics and Hydrology									
3.1	Project Management by Task	0	0	8	0	8	\$1,296.00		\$1,296.00
3.2	COSM/LAN Meetings (San Marcos)	0	8	8	0	16	\$2,678.40		\$2,678.40
3.3	Team coordination calls	0	0	8	0	8	\$1,296.00		\$1,296.00
3.4	Review/comment on preliminary modeling	0	0	8	0	8	\$1,296.00		\$1,296.00
3.5	Review/recommendations for alternative and mitigating techniques	0	0	8	0	8	\$1,296.00		\$1,296.00
3.6	Identify opportunities to maintain and improve ecosystem services, by section, to be considered during preliminary modeling and during design. Provide feedback on appropriate vegetation/soil communities capable of meeting goals such as bank stability and in-stream habitat while fitting within constraints such as maximum allowable hydraulic resistance and maintenance capacity.	0	0	12	0	12	\$1,944.00		\$1,944.00
3.7	Provide memorandums	0	0	8	0	8	\$1,296.00		\$1,296.00
3.8	Field visit (if necessary)	0	0	8	0	8	\$1,296.00		\$1,296.00
HOURS/EXPENSES SUB-TOTALS		0	8	68	0	76		\$269.70	
TOTAL LABOR COSTS		\$0.00	\$1,382.40	\$11,016.00	\$0.00				
% DISTRIBUTION OF STAFF HOURS		0.0%	10.5%	89.5%	0.0%				
Expense Markup (10 %)								\$26.97	
SUBTOTAL		\$0.00	\$1,382.40	\$11,016.00	\$0.00		\$12,398.40	\$296.67	\$12,695.07
TASK 4 - 30% Design									
4.1	Project Management by Task	0	0	8	0	8	\$1,296.00		\$1,296.00
4.2	COSM/LAN Meetings (San Marcos)	0	8	8	0	16	\$2,678.40		\$2,678.40
4.3	Team coordination calls	0	0	8	0	8	\$1,296.00		\$1,296.00
4.4	Reassess concept plan, integrating ecological and interpretive goals. Define measurable performance benchmarks	0	0	8	0	8	\$1,296.00		\$1,296.00
4.5	Alternatives and mitigating techniques (bank stability)	0	0	12	0	12	\$1,944.00		\$1,944.00
4.6	Develop Limits of Construction and Vegetation Soil protection Zones	0	0	12	0	12	\$1,944.00		\$1,944.00
4.7	Contribute to site restoration plan developed by landscape architects to correspond with performance goals and construction sequencing. Identify opportunities for education and landscape monitoring	0	0	12	0	12	\$1,944.00		\$1,944.00
4.8	Opportunities for upland and in-channel ecosystem services	0	0	12	0	12	\$1,944.00		\$1,944.00
4.9	Confirm conditions of streambank stability provided by LAN	0	0	12	0	12	\$1,944.00		\$1,944.00
4.10	Assign typologies to streambank and stream health restoration and stabilization	0	0	12	0	12	\$1,944.00		\$1,944.00
4.11	Assign typologies of top of bank run-off management opportunities	0	0	12	0	12	\$1,944.00		\$1,944.00
4.12	Assign typologies of opportunities to modify stormwater outfalls to align with public trail access and program	0	0	12	0	12	\$1,944.00		\$1,944.00
4.13	Assist landscape architect and review plant pallet of sustainable features and plant communities for site conditions and required function (bank stability/water infiltration & cleansing/human) engagement	0	0	12	0	12	\$1,944.00		\$1,944.00
4.14	Review/comment on Final Schematic Design Plan Document (2 times)	0	0	8	0	8	\$1,296.00		\$1,296.00
4.15	Provide memorandums	0	0	20	0	20	\$3,240.00		\$3,240.00
4.16	Cost Estimate Review	0	0	12	0	12	\$1,944.00		\$1,944.00
HOURS/EXPENSES SUB-TOTALS		0	8	180	0	188		\$269.70	
TOTAL LABOR COSTS		\$0.00	\$1,382.40	\$29,160.00	\$0.00				
% DISTRIBUTION OF STAFF HOURS		0.0%	4.3%	95.7%	0.0%				
Expense Markup (10 %)								\$26.97	
SUBTOTAL		\$0.00	\$1,382.40	\$29,160.00	\$0.00		\$30,542.40	\$296.67	\$30,839.07
PROJECT TOTAL							\$102,103.20	\$1,186.68	\$103,289.88