

Exhibit A
SCOPE OF SERVICES

ENGINEERING CONSULTING SERVICES

RFP NO.: 190-0353-NC (SS)

PROJECT NO.: 004375A

KLOSTERMAN BAYOU WATERSHED
MANAGEMENT PLAN

Prepared for:



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PROJECT TITLE

Klosterman Bayou Watershed Management Plan (Project # 004375A)

Note: All deliverables are required to meet the general requirements of the Southwest Florida Water Management District (DISTRICT), Pinellas County (COUNTY), and the Federal Emergency Management Agency (FEMA) as noted in the scope of work presented below.

OBJECTIVE

On behalf of the Pinellas County Board of County Commissioners, the Public Works Department has sought the services of Applied Sciences Consulting, Inc. to develop a Watershed Management Plan (WMP) for the Klosterman Bayou watershed in accordance with County, Southwest Florida Water Management District (SWFWMD or DISTRICT) and Federal Emergency Management Agency (FEMA) requirements.

BACKGROUND

This request involves the development of a comprehensive WMP for the Klosterman Bayou watershed. The study will primarily be focused towards water quality, flood control and natural systems improvement projects. The WMP shall also consider future scenarios by incorporating sea level rise (SLR) and climate change as it relates to rainfall patterns (changes in depth, duration, intensity) as part of the County's resiliency planning efforts. This WMP will be used as a tool in the planning, regulation, and management of watersheds for future development and for determining and prioritizing capital improvement projects.

The Klosterman Bayou watershed is generally located in the in the northwest region of Pinellas County with an area of approximately 3.2 square miles. Roughly 11 percent of that area is under the jurisdiction of City of Tarpon Springs, the remainder of the watershed is unincorporated County. Klosterman Bayou abuts 6 other watersheds. Lake Tarpon to the east, Sutherland Bayou and Smith Bayou towards the south, Anclote River and St. Joseph Sound to the north and Clearwater Harbor to the west. All boundary conditions from the abutting watersheds must be considered during the development of the WMP.

There has been no formal WMP completed for the Klosterman Bayou watershed, thus this will be the first full effort to model and analyze the watershed. There are 2 major tributaries in the watershed - Channel A and Channel B. Channel A is the main tributary draining Innisbrook Golf Course, which occupies a substantial amount of the watershed.

PROJECT DESCRIPTION

The PROJECT involves development of a comprehensive WMP for the watershed that results in recommendations for water quality, flood control, and natural system improvement projects.

SCOPE OF WORK

The general scope of this project is to update and complete the WMP for the Klosterman Bayou Watershed in accordance with the Guidelines and Specifications for:

- Flood Hazard Mapping Partners
(<https://www.fema.gov/flood-maps/guidance-partners/guidelines-standards>)
- The nine elements listed in United States Environmental Protection Agency (USEPA) 319(h) Guidance Manual
(<http://water.epa.gov/polwaste/nps/cwact.cfm>)
- Recommended Projection of Sea Level Rise in the Tampa Bay Region (2019)
(http://www.tbrpc.org/wp-content/uploads/2019/07/CSAP_SLR_Recommendation_2019_Final.pdf)
- SWFWMD Watershed Management Program Guidelines and Specifications published in 2017 (rev 2020)
(ftp://ftp.swfwmd.state.fl.us/pub/GWIS/WMP_Guidance_Documents/)
Username: Anonymous Password: (your email address)
- Pinellas County Comprehensive Plan, as applicable.
(http://www.pinellascounty.org/plan/comprehensive_plan.htm)

2.0 GENERAL SCOPE OF WORK

The general scope of work includes:

- A. Project Development - Includes initial data collection and the development of a Project Management Plan (PMP) that lists deliverables, schedules, a quality assurance/quality control (QA/QC) plan, communication plan, and a breakdown of resource allocations.
- B. Digital Topographic Information - Includes development of a digital terrain model (DTM) based on the best available LiDAR for Pinellas County. This effort is typically included in the Watershed Evaluation phase of the project. It will include suitable modifications to the DTM to account for any topo voids or other necessary adjustments.
- C. Watershed Evaluation - This effort will develop an existing conditions watershed evaluation including data collection efforts and field evaluations and inspections. Such information includes data regarding soil hydraulics, terrain information (LiDAR), watershed boundary limits, receiving water body characteristics (groundwater, rivers, etc.), catchment characterization, hydraulic element inventory, depression storage, land use, etc. Routines in ArcMap along with custom programs will be used to acquire and analyze the watershed data in GWIS compliant format. The ultimate goal is to incorporate the processed information as data input into computer simulation models for floodplain development, and water quality load assessments. ICPR4 1D will be used for floodplain analysis. Developing an updated

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land use map will also be of the evaluation for use in other tasks. A report detailing issues, data gaps, and a finalized watershed approach along with Generic hydraulic and hydrologic geodatabase are to be delivered and Peer reviewed for approval before moving forward.

- D. Floodplain Analysis - Includes the processing of the information acquired under the Watershed Evaluation plus any additional data regarding pertinent terrain voids, missing hydraulic element data, and geotechnical information to develop a debugged and stable computer simulation model of the watershed. In addition to the Generic geodatabase, a Model geodatabase will be developed containing items specifically required for input into ICPR4. The Green-Ampt method of computing excess runoff will be used. The result is an existing conditions water quantity model which will serve as the basis for other tasks including floodplain delineation/analyses consistent with SWFWMD and FEMA guidelines for rainfall volumes, floodplain delineation, and flood zone definition.
- E. The Flood Protection Level of Service analysis - Includes determination of Level of Service (LOS) for the watershed based on model results and floodplain mapping. This effort, in conjunction with the SWRA and Water Quality analyses, will identify problem areas and guide development of Best Management Practices (BMPs) for flood reduction and/or water quality improvements. This effort will also consider evaluate and address future conditions by incorporating SLR.
- F. The Surface Water Resource Assessment - Includes the development of a surface water resource assessment (SWRA) that is specific to the watershed. This effort also assists in the development of BMPs for improving water quality and natural systems. It will be performed in concert with the LOS determination and water quantity analyses mentioned above.
- G. The Best Management Practice (BMP) analysis - includes the development of conceptual structural and/or non-structural BMPs that address water quality problems and/or flooding within the watershed. Deliverables for this task include a BMP analysis report identifying the BMP projects, ICPR and water quality models in support of the final BMPs and a geodatabase of the components of the conceptual design.

Notes:

- Unless specified, all deliverables will be digital files. No hardcopies will be provided.
- Peer review will be conducted at strategic points during the project by an independent 3rd party reviewer. At each peer review point, the CONSULTANT's efforts will include preparation of responses to peer reviews of the project geodatabase and all developed models.

A detailed scope of work is defined below:

2.1 PROJECT DEVELOPMENT

2.1.1 Data Collection and Initial Evaluation

This task includes coordination and research that CONSULTANT conducted to become familiar with the watershed under study, project goals, background, data available, scope of work, and the COUNTY/DISTRICT study process and Guidance documents. The COUNTY/DISTRICT will provide or direct the CONSULTANT to obtain the following relevant information:

- Topographic Information
- Historical Water Levels
- FEMA Flood Insurance Rate Map (FIRM) feature data sets
- FEMA Flood Insurance Studies (FIS)
- Water quality sampling information
- USGS Gage Locations
- NOAA Tidal Gage Locations
- DISTRICT/COUNTY Data Collection Site Locations
- Stormwater Inventory
- Site-Specific Information, including known flooding problem areas (photos, videos, notes, etc.)
- Water Quality Data
- Existing Studies and Models
- Adjacent Watershed Studies
- Data collection "Date certain"

The CONSULTANT will set up a GIS base map using relevant information from the above list. It is assumed that the COUNTY and/or the DISTRICT will provide this information with limited exceptions.

2.1.2 Draft Project Plan

The CONSULTANT shall document the approach to execute tasks and identify outstanding project related issues; establish a communication protocol with members of the project team, the COUNTY, the DISTRICT, and other project stakeholders; and establish a project specific Quality Assurance / Quality Control (QA/QC) plan. This is the initial effort; however, this document shall be revisited periodically to assess the actual progress, evaluate staff allocations, include deficiencies and the recovery actions completed and planned, if any.

The Project Plan shall include the following contents:

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- Introduction
- Goals and Objectives
- Project Approach for the approved Scope of Work
- Staff Allocation
- Quality Assurance Plan
- Communication Plan
- Assumptions and Issues Management
- Attachments/Appendices
- Project Schedule
- Project Cost

2.1.3 Kick-off Meeting

Upon the COUNTY's acceptance of the draft Project Plan, the kick-off meeting will be conducted to discuss the draft Project Plan accomplished in Task 2.1.2. Details may be added for anticipated work effort and issues of importance.

2.1.4 Final Project Plan

Within fifteen (15) days of the kick-off meeting, the CONSULTANT shall finalize the Project Plan developed in Task 2.1.2 to include additional information from Task 2.1.3 and submit to the COUNTY for approval.

Deliverables

- A. Kickoff Meeting Minutes*
- B. Draft Project Plan*
- C. Final Project Plan*

2.2 WATERSHED EVALUATION

2.2.1 Assembly and Evaluation of Watershed Data

2.2.1.1 Drainage Pattern and Watershed Boundary

The CONSULTANT shall examine drainage patterns and define the preliminary watershed boundary based on information previously identified in 2.1.1.

- The DISTRICT Planning Units
- Topographic Information
- USGS National Hydrography Dataset (NHD)
- Aerial Imagery
- Stormwater Inventory
- ERPs and Roadway Plans
- Existing Studies and Models, if any
- Modeling of Klosterman Bayou
- Adjacent Watershed Studies

2.2.1.2 Areas of Development

The CONSULTANT shall identify ERPs and roadway plans to be incorporated into the watershed model based on, but not limited to, the following:

- Data Collection Cut-off Date (Date Certain)
- Aerial Imagery
- Topographic Information
- The DISTRICT Guidance Documents
- Public Interest

ERPs that have been constructed or are under construction as of the "date certain" and are considered to have substantial impact to the watershed will be incorporated within the watershed model. ERPs that started construction after the "date certain" shall be documented for potential future model update.

A summary table shall be provided indicating which ERPs/as- built will or will not be incorporated in the watershed model or are reserved for future model update.

The CONSULTANT will review the ERP list with the scanned files available from the DISTRICT. The CONSULTANT will notify the COUNTY of data collection efforts needed where ERP data are not available, or the scanned files are not legible.

The CONSULTANT shall review ERPs and roadway plans to determine whether any data gaps exist or if there are areas where additional information is needed. ERP data for areas within and near the watershed was provided by the DISTRICT in August 2020. The CONSULTANT will search the DISTRICT'S website for additional ERP information, if needed, and request roadway or other plans from the COUNTY or FDOT to fill data gaps. A "Data Gaps" polygon feature class will be developed to delineate significant data gaps not addressed by aforementioned searches.

The plan sheet that shows the drainage network for the development or roadway will be georeferenced, if available. It is anticipated that up to two (2) plan sheets will be georeferenced for each development or roadway. The georeferenced sheets will be used for catchment development, topographic refinement, and Hydronetwork refinement.

2.2.1.3 Initial GIS Processing

The CONSULTANT shall perform initial GIS processing to develop the Catchments and Surface Connectivity.

The CONSULTANT will place junctions appropriately to determine the effects of storage routing on hydrologically determined flow rates. As a goal, the CONSULTANT will place junctions in stormwater management and storage areas, ponds or lakes, natural lakes,

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wetlands and depressions for catchment delineation in accordance with DISTRICT G&S. It is anticipated that the preliminary schematic will be a raw schematic (Arc Hydro generated catchments and Hydronetwork features), mostly generated from automated processes within GIS. A refined network ready for model incorporation will be developed later in the scope of work.

The Klosterman Bayou Watershed can, for the most part, be considered a developed area, therefore, the CONSULTANT will generally adhere to the level of detail specified in the DISTRICT G&S.

It is anticipated a meeting, if appropriate, will be conducted between the COUNTY and the CONSULTANT, to discuss preliminary results, alternative threshold criteria, potential to expand the task scope and budget, and other issues.

2.2.1.4 Topographic Voids Replacement Methodology

The CONSULTANT shall identify and document the topographic voids based on, but not limited to, the following:

- Data Collection Cut-off Date
- Aerial Imagery
- ERPs and Roadway Plans
- Site-Specific Information, if any
- Existing Studies and Models, if any

The CONSULTANT shall propose the methodology to eliminate topographic voids, such as: refinement of topographic information based on ERPs or roadway plans, site physical surveys to establish pertinent elevations or bias in the LiDAR, or no action needs may be taken based on the significance of the void area to overall floodplain delineation and other tasks. The proposed methodology shall be included in Task 2.2.1.10.

2.2.1.5 DEM and LiDAR Suitability Review

The CONSULTANT will review the best available DEM, breaklines, and accuracy report. The DEM will be reviewed to identify possible problems with the LiDAR based DEM such as floating breaklines and insufficient post spacing, and voids. The CONSULTANT will perform a desktop review of the best available DEM for suitability. It is anticipated that the DEM provided by the County will be suitable for watershed modeling. If necessary, comments and concerns will be relayed to the COUNTY and DISTRICT.

The CONSULTANT will review metadata accompanying the LiDAR data and incorporate subsequent changes and updates to the DEM during task 2.2.2.3 Topographic Information Refinement. It is understood that the DEM is a dynamic dataset, and a final DEM will be delivered at the end of the Watershed Evaluation phase of the study.

2.2.1.6 Hydrologic Characteristics and Percolation

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The CONSULTANT shall examine hydrologic characteristics of the watershed. When applicable, the CONSULTANT shall identify locations where percolation simulation is desired based on, but not limited to, the following:

- Soil Map
- Potentiometric Surface Map
- ERP and Roadway Plans
- Site-Specific Information if any
- Topographic information

It is anticipated that percolation data will be available from ERP files or site-specific investigation. The CONSULTANT shall review existing percolation data and develop a watershed-specific approach to conduct an additional geotechnical investigation if any. No site geotechnical testing is proposed for the study.

2.2.1.7 Historical Water Levels

The CONSULTANT shall assemble information on historic water levels, surveys, photos or videos of flooding, and any other available information including, but not limited to, the following:

- Seasonal High-Water Level (SHWL)
- Potentiometric Surface Maps
- Lake levels
- Stream or River Profiles
- High water levels
- Flood photos
- Flooding complaints
- Stream Gauges

The CONSULTANT shall identify locations where additional historic water levels information is desired but unavailable based on the data listed above.

2.2.1.8 Data Acquisition Plan

Upon evaluation of available watershed data and initial GIS processing, the CONSULTANT shall develop an approach to data acquisition. This watershed specific approach shall identify locations where hydraulic feature data collection will occur and what the method of collection will be. Hydraulic feature data will be collected beginning from the depression areas progressing upstream until the local system is considered insignificant. All regional and intermediate systems will be inventoried for hydraulic characteristics. More detail concerning the proposed approach shall be included in Task 2.2.1.10.

2.2.1.9 Pre-field Reconnaissance Plan

HydroJunctions shall be placed where fieldwork is required to parameterize a hydraulic feature and will be developed per guidance in the WMPG (Guidance Document 1a) for use

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in the field data acquisition, and the GWIS Database Design Document Version 1.6 (Guidance Document 2a) and for eventual documentation of the acquisition process. A preliminary HydroNetwork with HydroJunction and HydroEdge feature classes will be further developed upon completion of field data acquisition.

The CONSULTANT shall also document the level of accuracy for the acquisition of additional spatial information in accordance with the “Acquisition of Geospatial Information to Complete the Generic Watershed Parameters” (Guidance Document 2b). It is anticipated that vertical referencing to LiDAR-derived data points on hard surfaces will be acceptable (Level 2 specification of accuracy in Guidance Document 2b). Field survey may later be performed for hydraulic structures, cross-sections, and other topographic information. Field survey may be accomplished with a combination of GPS and traditional survey techniques when sufficient information is not attainable from existing data sources (i.e. LiDAR, As-Built drawings, etc.). GPS surveying may involve Real-Time Kinematic (RTK) units or Differential GPS (DGPS) depending on the circumstances. The appropriate level of accuracy for the information to be gathered will be determined by the CONSULTANT in close consultation with the COUNTY and must be approved by the COUNTY prior to field data acquisition.

2.2.1.10 Task Memorandum

The CONSULTANT shall document the efforts involved in Tasks 2.2.1.1 through 2.2.1.9. The document shall include, but not limited to, the following:

- Watershed Boundary and Surroundings
- Major Conveyance Systems and Drainage Pattern
- List of ERP & Roadway Plans to Incorporate
- Initial GIS Processing
- Topographic Voids Locations
- Methodology to Eliminate Topographic Voids
- Land use Distribution by Cut-off Date
- Hydrologic Soil Group Distribution
- Percolation Locations
- Historical Water Levels
- Potential Data Issues, if any
- Data Acquisition Plan
- Field Data Acquisition Accuracy Approach

2.2.1.11 Pre-Submittal Meeting (See Task 2.2.6.3)

2.2.1.12 Quality Assurance and Quality Control (See Task 2.2.6.4)

Deliverables

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- A. *Digital Elevation Model (DEM)*
- B. *GWIS geodatabase containing the following feature classes:*
 - *Topographic information (e.g., contours, breaklines)*
 - *Preliminary watershed boundary*
 - *Areas of development*
 - *ERPs to be incorporated into the watershed model*
 - *Initial GIS catchments*
 - *Preliminary Hydro-, Model-, and HEP Networks*
 - *Historical water levels*
 - *Land use map*
 - *Soil map*
 - *Data acquisition locations*
 - *Identify data type and acquisition methodology*
 - *Other feature classes and tables, if applicable*
- C. *Task memorandum (Task 2.2.1.10)*
- D. *Project-specific QA/QC document*
- E. *Responses to comments geodatabase*

2.2.2 Hydrologic and Hydraulic Feature Database

2.2.2.1 Acquisition of Data

The CONSULTANT shall perform data acquisition based on the approach developed in Task 2.2.1.8 for the following:

- Desktop Acquisition from ERP & Roadway Plans
- Drainage Feature
- Topographic Information
- Construction Plans Prior to ERP regulation
- Field Reconnaissance and Survey
- Drainage Feature
- Topographic Information

Desktop reconnaissance will consist of using all previously obtained data and mapping programs such as Google Earth street view and Bing birds-eye view to determine watershed conditions and hydraulic features. Field reconnaissance and survey will be required to fill any outstanding data gaps following the desktop research effort.

Field reconnaissance will involve the locating and field verifying hydraulic features as anticipated from the data acquisition plan. Photos should be taken with a device with Global Positioning System (GPS) capabilities so that images can be georeferenced within GIS. The digital photos shall be hyperlinked to GIS data. Field sketches and notes will be provided for each location visited.

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An access letter will be obtained from the COUNTY. Google Street View will be used to identify any gated communities. In the case of gated communities, homeowners associations will be contacted to obtain gate codes. A list of large private (or public) land owners from which access is needed will be provided to and discussed with the COUNTY to identify any known contacts and/or access concerns. Access to large private (or public) properties will be coordinated with the property owners or their representatives. The COUNTY's PM will be copied on any and all correspondence.

The CONSULTANT will conduct up to two (2) days of field reconnaissance for two people to verify structure locations and hydraulic conductivity. Additional field reconnaissance can be provided for an additional fee with written authorization from the COUNTY.

The number and location of surveys needed for the project will be estimated during the Data Acquisition Plan task. A professional survey budget allowance of \$15,000 is included in the current fee estimate. Additional survey can be provided for an additional fee with written authorization from the COUNTY.

The CONSULTANT shall also document any immediate maintenance needs and notify the COUNTY.

2.2.2.2 HydroNetwork Development

The HydroNetwork is used to establish connectivity between features to identify which direction water flows. The HydroNetwork is comprised of HydroEdge and HydroJunction feature classes, which are limited to modeled bridges, channel conveyances, and pipe and control structure conveyances. The CONSULTANT shall develop the Hydronetwork including:

- HydroJunctions and HydroEdges
- Hydraulic Element Points (HEPs)

The HydroJunction and HydroEdge features will contain spatial data of the stormwater infrastructure with hyperlinks to supporting data.

The sources of the Hydronetwork are anticipated to include:

- Hydraulic Data from ERPs received from the DISTRICT
- Roadway Plans from FDOT, COUNTY, or other municipalities
- Existing GIS stormwater infrastructure databases from COUNTY or other Municipalities
- Aerial Imagery
- Bing birds-eye view
- Google street view
- Field Reconnaissance
- Survey

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The drainage infrastructure digitized to HydroneNetwork is anticipated to only include drainage structures anticipated to be included in the model network.

The CONSULTANT, with input from the COUNTY and DISTRICT, shall establish a consistent procedure and conversion factor(s) to be used to convert data in NGVD29 (or other datums, if any) to NAVD88 datum.

The datum used will be noted for data sources reviewed for their potential incorporation to the watershed model. The DISTRICT G&S will be used to determine datums when not specified.

The HEP Network is used to define subelements (culverts, weirs, etc.) from the Hydro Network, and to store specific structure data. The HEP Network is comprised of Hydraulic_Element_Point and HEP_Line feature classes, which are limited to modeled bridges, pipes, and control structure conveyances. The CONSULTANT will create HEP features in a manner consistent with DISTRICT G&S.

The system level shall also be assigned to the HydroNetwork in accordance with the DISTRICT G&S.

2.2.2.3 Topographic Information Refinement

When identified in the methodology of elimination of topographic voids in Task 2.2.1.4, the CONSULTANT shall refine the topographic information with ERP and roadway plans (e.g., computer-aided drafting files) or field data acquisition (e.g., site-specific survey). Any changes shall be annotated in the accompanying metadata.

2.2.2.4 Hydrologic Feature Database

The CONSULTANT shall review and update, if necessary, the latest land use map based on, but not limited to, the following:

- Data Collection Cut-off Date
- Impervious area provided with the LiDAR
- Aerial Imagery
- ERPs and Roadway plans
- Site-Specific Information, if any
- The CONSULTANT shall develop a generic lookup table for the watershed to include land use parameters.
- The CONSULTANT shall review and update, if necessary, the soil map based on, but not limited to, the following:
 - Soil Survey
 - Site-Specific Information, if any

When applicable, the CONSULTANT shall develop a generic lookup table for the watershed to include soil parameters. Green-Ampt will be used to simulate the hydrologic portion of the watershed. The Green Ampt methodology for determining rainfall excess is most

appropriate for the predominantly deep sandy soil conditions and other conditions as exhibited in this watershed.

Pre-Submittal Meeting (See Task 2.2.6.3)

Quality Assurance and Quality Control (See Task 2.2.6.4)

Deliverables

- A. *Refined topographic information*
- B. *GWIS geodatabase containing feature classes from previous tasks and the following feature classes and tables:*
 - *HydroNetwork*
 - *HydroJunctions and HydroEdges*
 - *HEPs*
 - *Updated land use map & lookup table*
 - *Updated soil map & lookup table*
 - *Other feature classes and tables, if applicable*
- C. *TSDN*
- D. *Project-specific QA/QC document*
- E. *Responses to comments geodatabase*

2.2.3 Preliminary Model Features

2.2.3.1 Additional GIS Processing

When deemed necessary, the CONSULTANT shall perform additional GIS processing to update the following:

- Catchment
- Surface Connectivity
- Preferential Flow Path
- Percent Impervious
- DCIA and non-DCIA

2.2.3.2 Preliminary Model Schematic

The CONSULTANT shall refine the GIS processed catchments and connectivity in conjunction with ERP and roadway plans and HydroNetwork developed in Task 2.2.2.2. This task should follow SWFWMD G&S to develop preliminary model features. The CONSULTANT shall identify the data source of each hydraulic feature to be included in the watershed model.

The CONSULTANT shall also coordinate with adjacent watershed(s) when necessary.

2.2.3.3 Model Parameterization Approach

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The CONSULTANT shall develop and document the approach to parameterize model features developed in Task 2.2.3.2. The model parameters shall include, but not limited to, the following:

- Design, Calibration, and Verification Storm Events
- Rainfall Excess and Unit Hydrographs
- Time of Concentration
- Initial Stages and Baseflow
- Stage-Storage Relationships
- Boundary Conditions
- DCIA vs UCIA
- Percolation Criteria
- Hydraulic Links (Pipes, Channels, Weirs, etc.)

The proposed approach shall be included in Task 2.2.3.4.

2.2.3.4 Watershed Evaluation Report

The CONSULTANT shall document the efforts involved in Watershed Evaluation. This report can be an expansion of the memorandum developed in Task 2.2.1.10 with documentation of its subsequent tasks up to this point.

2.2.3.5 Pre-Submittal Meeting (See Task 2.2.6.3)

2.2.3.6 Quality Assurance and Quality Control (See Task 2.2.6.4)

Deliverables

- A. Refined topographic information*
- B. GWIS geodatabase containing feature classes from previous tasks and the following feature classes and tables:*
- C. Preliminary model features*
- D. Other feature classes and tables, if applicable*
- E. Watershed evaluation report*
- F. TSDN*
- G. Project-specific QA/QC document*
- H. Pre-submittal meeting*

2.2.4 Peer Review of Watershed Evaluation

2.2.4.1 Peer Review Kick-off Meeting and Presentation

The CONSULTANT will prepare and submit a draft PowerPoint presentation to the COUNTY and the DISTRICT for review and approval. The presentation will summarize the work accomplished in the Watershed Evaluation with emphasis on approach, effort, and end products. This subtask includes a web-based meeting to discuss the presentation and the COUNTY and DISTRICT comments.

The CONSULTANT will address and incorporate the COUNTY and DISTRICT comments into the final PowerPoint presentation. The CONSULTANT will then deliver the presentation in a web-based meeting format to the peer review consultant, the COUNTY, the DISTRICT, and other interested parties. The complete deliverable set shall be transmitted to the peer review consultant prior to this meeting.

2.2.4.2 Meeting to Present Peer Review Comments

Within thirty (30) days of the peer review kick-off meeting and presentation (Task 2.2.4.1), a meeting will be held for the peer review consultant to present draft review comments to the CONSULTANT, the DISTRICT, and the Cooperator if needed. The meeting will be in a remote format unless otherwise specified. Peer review deliverables shall be transmitted to the CONSULTANT prior to this meeting.

During the peer review process, the peer review consultant may seek clarification and request additional information from the CONSULTANT. Additional information requested from the CONSULTANT, if any, shall be transmitted to the peer review consultant in a timely manner.

2.2.4.3 Meeting to Discuss Approach of Responding to Peer Review Comments

Within twenty (20) days of the meeting to present peer review comments (Task 2.2.4.2), a meeting will be held for the CONSULTANT to present the approach to responding to peer review comments. The meeting will be in a remote format unless otherwise specified.

The CONSULTANT may seek clarification from the peer review consultant prior to the meeting. Clarification requested from the peer review consultant, if any, shall be provided to the CONSULTANT in a timely manner.

2.2.5 Final Approved Watershed Evaluation Deliverables

2.2.5.1 Revised Deliverables

Within sixty (60) days of receiving COUNTY/DISTRICT/PEER review comments, the CONSULTANT shall address and resubmit watershed evaluation deliverables to the COUNTY.

2.2.5.2 Pre-Submittal Meeting (See Task 2.2.6.3)

2.2.5.3 Quality Assurance and Quality Control (See Task 2.2.6.4)

Deliverables

- A. Attend peer review kick-off meeting*
- B. Revised Watershed Evaluation deliverables*
- C. Responses to comments geodatabase*
- D. Project-specific QA/QC document*

2.2.6 Project Management

2.2.6.1 Progress Meetings

A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the CONSULTANT, and other Cooperators, if needed. During each meeting the CONSULTANT Project Manager shall report the work completed, staff utilization, actual progress as compared to the performance schedule, work planned for the next month, coming milestone, project issues, any deficiencies and the recovery actions completed and planned.

2.2.6.2 Progress Reports with Invoicing

All scheduled invoices shall include progress report with the CONSULTANT Project Manager's assessment of the project's actual progress as compared to the performance schedule. Details must include any deficiencies and the recovery actions completed and planned.

2.2.6.3 Pre-Submittal Meetings

Within five (5) business days of each anticipated submittal, the CONSULTANT shall conduct a pre-submittal meeting with the COUNTY prior to transmitting full deliverables. The CONSULTANT will present to the COUNTY how the deliverables would satisfy the scope of work as well as follow the data delivery structure and include all applicable contents to date. The meeting will be in a remote format unless otherwise specified. This task also includes packaging up and transmitting the deliverables.

2.2.6.4 Quality Assurance and Quality Control (QA/QC)

The CONSULTANT shall follow the Quality Assurance Plan submitted in the Project Development task. A project-specific QA/QC document shall be submitted with each scheduled submittal. The QA/QC manager shall certify that QA/QC has been performed on all deliverables and that any outstanding issues have been communicated with the COUNTY. The COUNTY reserves the right to request QA/QC documents from the CONSULTANT.

2.3 WATERSHED MANAGEMENT PLAN - FLOODPLAIN ANALYSIS

2.3.1 Watershed Model Parameterization

2.3.1.1 Acquisition of Additional Model Parameters

Additional information needed to fill the watershed parameter gaps, if any, shall be acquired. These parameter gaps may include, but not limited to, the following:

- Drainage Feature
- Topographic Information
- Groundwater

It is assumed that additional surveying and/or revisions to the terrain data will not be required as part of this task.

When percolation information is desired but missing from existing data, the COUNTY shall conduct further geotechnical investigation and provide the information to the CONSULTANT.

2.3.1.2 Development of Model Specific Geodatabase

The CONSULTANT shall develop watershed model parameters per the approach defined in Task 2.2.3.3 of Watershed Evaluation. When deemed necessary, the CONSULTANT may use a revised approach for certain parameters. The revised approach shall be documented in Tasks 2.3.1.4. The CONSULTANT shall store the parameterization information within a GWIS geodatabase in a format that can be imported into the model framework.

2.3.1.3 Model Setup, Debug, and Stabilization

The CONSULTANT shall transfer model parameters from GWIS geodatabase into the model framework, set up, and debug the model. The following preliminary simulations shall be performed:

- 100-year/1-day Storm
- No Rainfall

The CONSULTANT shall also develop the level pool plots for the following:

- Initial Conditions
- 100-year/1-day Floodplain

The CONSULTANT shall identify and address the following potential issues based on the preliminary simulations and plots:

- Continuity Error (preferably less than 2%)
- Inadequate Simulation Time
- Flow Reversals or Sudden Change
- Instability
- Significant Initial Flows
- Missing Interconnections (glass walls)

2.3.1.4 Model Parameterization Approach Update

If applicable, the CONSULTANT shall update the Watershed Evaluation report with revised model parameterization approach.

2.3.1.5 Pre-Submittal Meeting (see Task 2.3.8.3)

2.3.1.6 Quality Assurance/Control (See Task 2.3.8.4)

Deliverables

- A. GWIS geodatabase containing all applicable feature classes and tables*

- B. Model input/output files for:*
 - *100-year/1-day Storm*
 - *No Rainfall*
- C. Geodatabase containing level pool plots for:*
 - *Initial Conditions*
 - *100-year/1-day Floodplain*
- D. Updated watershed evaluation report with revised model parameterization approach, if applicable*
- E. TSDN*
- F. Project-specific QA/QC document*
- G. Pre-submittal meeting*

2.3.2 Final Approved Watershed Model Parameterization Deliverables

2.3.2.1 Revised Deliverables

Within sixty (60) days of the COUNTY/DISTRICT review comments, the CONSULTANT shall address comments and re-submit watershed model parameterization deliverables to the COUNTY/DISTRICT.

2.3.2.2 Pre-Submittal Meeting (see Task 2.3.8.3)

2.3.2.3 Quality Assurance/Control (See Task 2.3.8.4)

Deliverables

- A. Revised Task 2.3.1 deliverables*
- B. Responses to comments geodatabase*
- C. Project-specific QA/QC document*
- D. Updated Project Plan*
- E. Pre-submittal meeting*

2.3.3 Watershed Model Development and Floodplain Delineation

2.3.3.1 Model Calibration and Verification

The CONSULTANT will calibrate the ICPR model to one (1) of the rainfall events developed in Task 2.2.3.4. The CONSULTANT shall simulate a monitored event by adjusting appropriate model parameters within an acceptable range and using the measured rainfall depth and distribution, and then compare simulated surface water stages, flows, volumes, and time of occurrence to the measured data collected at gaging stations. The model is considered well calibrated when the simulated surface water stages, flows, volumes, and time of occurrence are in reasonable range, which shall be discussed with the COUNTY, with the measured data. The antecedent moisture content (AMC) condition and site-specific condition shall also be considered.

The CONSULTANT shall simulate one or more other recent storm events independent of the event used for calibration. The model is considered well verified when the simulated

surface water stages, flows, volumes, and time of occurrence are in reasonable range, which shall be discussed with the COUNTY, with the measured data. The AMC condition and site-specific condition shall also be considered.

Model calibration and verification shall consider rainfall spatial distribution. Calibration and verification rainfall will be based on the DISTRICT's Doppler Radar-derived rainfall data at a 2- kilometer grid size.

2.3.3.2 Model Validation

The model simulation results will be assessed for accuracy and reasonableness with historic water levels, if any, corresponding to one of the existing, suitable simulations. The existing, suitable simulations include the calibration event, verification event, or design storm event with similar depth and duration.

2.3.3.3 Design Storm Simulations

Unless otherwise specified, the CONSULTANT shall simulate the following nine (9) design storms:

- 2.33-year, 5-year, 10-year, 25-year, 50-year, 100-year, and 500-year, 1-day events using the Florida Modified Type II 24-hour distribution as specified in 40D-4.
- 10-year, 50-year, and 100-year, 5-day events using the DISTRICT's 120-hour distribution.

The results should show simulated stages increasing the severity of the event unless it can be well explained.

2.3.3.4 Multi-Day Event Simulations and Rainfall Justification to Project Floodplain

Unless otherwise specified, the CONSULTANT shall simulate the following additional multi-day events:

- 100-year/3-day, 100-year/7-day, and 100-year/10-day events using FDOT rainfall distribution (Guidance Document 4c). The recent updated NOAA document (2014) will be used if adopted by FDOT.

To project 100-year floodplain, a rainfall event of duration longer than 1-day may be used if compelling evidence presents, such as historic water levels developed in Task 2.2.1.7 of Watershed Evaluation and existing studies.

The CONSULTANT shall also coordinate with adjacent watershed(s) when necessary.

2.3.3.5 Floodplain Delineation

The CONSULTANT shall delineate the floodplain based on digital topographic information and model predicted peak stages of the 100-year storm event(s). The final product of this task shall be floodplain mapping that meets FEMA standards for updating the existing

DFIRMs. The approach of mapping transition zones shall be documented in Task 2.3.3.6 – Floodplain Justification Report.

The floodplain area will be compared for accuracy with the model stage versus area relationships. A 10% error is considered the maximum acceptable deviation for each subbasin. Volumetric comparisons will be made for the FEMA floodplain event between model storage at significant storage nodes to the volume provided by the terrain DEM.

The CONSULTANT shall also generate flood depth grids associated with the delineated floodplain.

The CONSULTANT shall also coordinate with adjacent watershed(s) when necessary.

The CONSULTANT shall compare the preliminary floodplain with effective FEMA flood hazard zone and document the comparison and explanation in Task 2.3.3.6 – Floodplain Justification Report.

2.3.3.6 Floodplain Justification Report

The CONSULTANT shall document the efforts involved in Tasks 2.3.3.1 through 2.3.3.5 and also merge with Watershed Evaluation report to develop this Floodplain Justification Report.

2.3.3.7 Sea-Level Rise (SLR) Analyses

CONSULTANT shall model three scenarios for SLR and evaluate the 100-year and 25-year 24-hour rainfall in each scenario. The three scenarios will be the projections identified in the Pinellas County Restore Act Vulnerability Assessment and published in "Global and Regional Sea Level Rise Scenarios for the United States" (NOAA, 2017). The three projections are:

- Intermediate-Low Scenario (1.9 ft. of SLR from 2000 - 2100)
- Intermediate Scenario (3.9 ft. of SLR from 2000 - 2100)
- High Scenario (8.5 ft. of SLR from 2000 - 2100)

Associated draft, level-pool floodplains will be developed. SLR scenarios will be evaluated using the existing conditions model (developed in Task 2.3.1.3) with updated boundary conditions and rainfall depths. It is anticipated that rainfall depths for the future conditions 100-year and 25-year 24-hour storm events will be provided by the COUNTY or will be available from reference data.

2.3.3.8 Pre-Submittal Meeting (see Task 2.3.8.3)

2.3.3.9 Quality Assurance/Control (see Task 2.3.8.4)

Deliverables

- A. *GWIS geodatabase containing:*
- *Updated features classes and tables*

Exhibit A
Klosterman Bayou Watershed Management Plan

- *100-year floodplain*
- B. *Model input/output files for:*
 - *Calibration and verification storms*
 - *Design storms*
 - *Multi-day events*
- C. *100-year flood depth grids*
- D. *Floodplain justification report*
- E. *TSDN*
- F. *Project-specific QA/QC document*
- G. *Pre-submittal meeting*

2.3.4 Peer Review of Watershed Model Development and Floodplain Delineation

Within fifteen (15) days after the watershed model development and floodplain delineation deliverables are transmitted to the COUNTY, the peer review process shall resume.

2.3.4.1 Peer Review Meeting and Presentation

A remote meeting, unless otherwise specified, will be conducted for the CONSULTANT to conduct a PowerPoint presentation to the peer review consultant, the COUNTY, the Cooperator, and other interested parties, by summarizing the work accomplished in Watershed Model Development and Floodplain Delineation with emphasis on approach, effort, and product. The full deliverables shall be transmitted to the peer review consultant prior to this meeting.

2.3.4.2 Meeting to Present Peer Review Comments

Within thirty (30) days of the peer review meeting and presentation (Task 2.3.4.1), a meeting will be held for the peer review consultant to present draft review comments to the CONSULTANT, the COUNTY, and the Cooperator if needed. The meeting will be in a remote format unless otherwise specified. Peer review deliverables shall be transmitted to the CONSULTANT prior to this meeting.

During the peer review process, the peer review consultant may seek clarification and request additional information from the CONSULTANT. Additional information requested from the CONSULTANT, if any, shall be transmitted to the peer review consultant in a timely manner.

2.3.4.3 Meeting to Discuss Approach to Responding to Peer Review Comments

Within twenty (20) days of the meeting to present peer review comments (Task 2.3.4.2), a meeting will be held for the CONSULTANT to present the approach to responding to peer review comments. The meeting will be in a remote format unless otherwise specified.

The CONSULTANT may seek clarification from the peer review consultant prior to the meeting. Clarification requested from the peer review consultant, if any, shall be provided to the CONSULTANT in a timely manner.

2.3.5 Approved Floodplain Analysis Deliverables for Preliminary Floodplain Open House

2.3.5.1 Revised Deliverables

Within sixty (60) days of the meeting to present peer review comments (Task 2.3.4.2), the CONSULTANT shall address peer review comments, as well as any COUNTY review comments, and resubmit watershed model development and floodplain delineation deliverables to the COUNTY.

2.3.5.2 Pre-Submittal Meeting (see Task 2.3.8.3)

2.3.5.3 Quality Assurance/Control (see Task 2.3.8.4)

Deliverables

- A. Revised Task 2.3.4 deliverables*
- B. Responses to comments geodatabase*
- C. Project-specific QA/QC document*
- D. Pre-submittal meeting*

2.3.6 Preliminary Floodplain Open House and Response to Public Comments

2.3.6.1 Preliminary Floodplain Open House and Public Relations

The CONSULTANT will assist the COUNTY/DISTRICT with conducting the preliminary floodplain open house. Assistance consists of providing adequate professionals as needed, based on the number of impacted parcels and anticipated attendance of the public meeting. The CONSULTANT will assist citizens by responding to questions at the meeting; operate laptop computers that can display recent aerials, existing flood hazard zones, base map information, parcels, and the preliminary floodplains. The CONSULTANT will also assist the COUNTY with development of a map that the COUNTY will post to its website for residents to see how their property is impacted by new floodplains. The CONSULTANT will also look into hosting on their own website and provide the COUNTY the link. The CONSULTANT will assist the COUNTY with developing a mailer list of impacted parcels.

2.3.6.2 Response to Public Comments

Public comment period closes forty-five (45) days after the open house unless otherwise specified. Within fifteen (15) days of the public comment period closure, the COUNTY will provide public comments collected by the CONSULTANT. The public comments will be included in a comments geodatabase. The CONSULTANT shall review and respond to public comments and update Task 2.3.6 deliverables as necessary.

2.3.7 Final Approved Floodplain Analysis Deliverables

2.3.7.1 Revised Deliverables

Within thirty (30) days after the public comments are transmitted to the CONSULTANT, the CONSULTANT shall respond to public comments and re-submit the full floodplain analysis deliverables to the COUNTY/DISTRICT, including floodplain transition zones.

2.3.7.2 Pre-Submittal Meeting (see Task 2.3.8.3)

2.3.7.3 Quality Assurance/Control (see Task 2.3.8.4)

Deliverables

- A. Attend public meeting*
- B. Revised Task 2.3.6 deliverables by responding to public comments geodatabase*
- C. The complete PowerPoint presentation for peer review*
- D. Signed and sealed Floodplain Justification Report*
- E. Project-specific QA/QC document*
- F. Updated Project Plan*
- G. Pre-submittal meeting*

2.3.8 Project Management

2.3.8.1 Progress Meetings

A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the CONSULTANT, and Cooperators, if needed. During each meeting the CONSULTANT Project Manager shall report the work completed, staff utilization, actual progress as compared to the performance schedule, work planned for the next month, coming milestone, project issues, any deficiencies and the recovery actions completed and planned.

2.3.8.2 Progress Reports with Invoicing

All scheduled invoices shall include progress report with the CONSULTANT Project Manager's assessment of the project's actual progress as compared to the performance schedule. Details must include any deficiencies and the recovery actions completed and planned.

2.3.8.3 Pre-Submittal Meetings

Within five (5) business days of each anticipated submittal, the CONSULTANT shall conduct a pre-submittal meeting with the COUNTY prior to transmitting full deliverables. The CONSULTANT will present to the COUNTY how the deliverables would satisfy the scope of work as well as follow the data delivery structure and include all applicable contents to date. The meeting will be in a remote format unless otherwise specified. Upon written approval by the COUNTY, the CONSULTANT shall submit the deliverables to the COUNTY for review. If during the meeting, the COUNTY determines there are deficiencies in the anticipated deliverables, the CONSULTANT shall address deficiencies and re-schedule the pre-submittal meeting until written approval by the COUNTY is received.

2.3.8.4 Quality Assurance and Quality Control (QA/QC)

The CONSULTANT shall follow the Quality Assurance Plan submitted in the Project Development task. A project-specific QA/QC document shall be submitted with each scheduled submittal. The QA/QC manager shall certify that QA/QC has been performed on all deliverables and that any outstanding issues have been communicated with the COUNTY. The COUNTY reserves the right to request QA/QC documents from the CONSULTANT.

2.4 FLOOD PROTECTION LEVEL OF SERVICE (FPLOS) DETERMINATION, DRAINAGE IMPROVEMENT ANALYSIS AND RECOMMENDATIONS

2.4.1 FPLOS Determination and Flood Damage Estimation

2.4.1.1 FPLOS Methodology Meeting

A meeting will be conducted between the COUNTY, the CONSULTANT, and the DISTRICT if needed, to discuss the FPLOS methodology and criteria to be used for this project. It is anticipated that the level-of-service criteria in the COUNTY's Comp Plan will be the basis for the FPLOS determination.

2.4.1.2 FPLOS Determination

Floodplains for the 2.33-year, 5-year, 10-year, 25-year, and 50- year events will be delineated. The 100-year and 500-year floodplains were delineated previously during Task 2.3.3.5.

The CONSULTANT shall establish landmark elevations for structures and/or roadways at each subbasin in the watershed. Road feature class with classification will be provided by the COUNTY. A feature class showing approximate structure footprints will be provided by the COUNTY. Structure classifications will be based on the Florida Department of Revenue (FOOR) classifications. The landmark elevations established for FPLOS analysis are the critical or lowest landmark elevations and are reflective of the worst-case flooding that could occur in a subbasin. These elevations will be determined from survey or estimated from topographic information and stored in geodatabase feature classes. It is assumed that for structures, the landmark elevation will be the finished floor elevation (FFE), either surveyed or estimated from LiDAR topography. Also, it is assumed that the roadway landmark elevation will be the edge of pavement.

The CONSULTANT will determine the flood protection level-of- service (FPLOS) throughout the watershed. FPLOS determinations will be based on the methodology and criterion agreed to during Task 2.4.1.1 using inundation polygons and flood depth grids as well as comparing landmark elevations with model results.

A FPLOS shall be assigned to each structure and roadway segment under analysis for each subbasin. An overall subbasin FPLOS shall be determined by the lowest FPLOS assigned within that subbasin. A table shall be provided in the FPLOS Analysis Report (2.4.1.4), which categorizes each subbasin with the roadway FPLOS, structure FPLOS, and overall FPLOS.

2.4.1.3 Flood Damage Estimate

The CONSULTANT shall determine the flood damage estimate based on the methodology defined in Task 2.4.1.1. The general methodology below is assumed.

Damage for structure and roadway flooding shall be analyzed independently due to different factors to be considered. Structure damage (including structure, content, and displacement) will heavily depend on the depth-damage function, which has been developed by federal agencies such as FEMA and US Army Corps of Engineers (USACE). Roadway damage may consider both traffic delay and roadway repair cost which rely considerably on local practice. The approach for flood damage estimates shall be discussed with the COUNTY and DISTRICT.

Flood damage for each structure and roadway segment under analysis will be performed for each design storm considered. The expected annual damage can then be estimated using the trapezoidal rule in tabular format.

2.4.1.4 FPLOS Analysis Report

The CONSULTANT shall document the efforts involved in Tasks 2.4.1.1 through 2.4.1.3.

The report shall include a table with all subbasins showing their respective FPLOS classification and expected annual flood damage. Also, the roadway flooding, structure flooding, and subbasins with the highest annual costs will be summarized and ranked. The rankings will assist the COUNTY and DISTRICT in prioritizing BMP Alternatives Analysis.

2.4.1.5 Project Management and Quality Assurance/Control

The CONSULTANT will attend a meeting to discuss the findings of the FPLOS Analysis and select locations to examine during the best management practices task. The CONSULTANT will conduct quality assurance and quality control. Quality control reviews will be documented in the comments geodatabase and in the QA/QC document, as appropriate.

Deliverables

- A. Model input/output files for design storms required by FPLOS determination methodology*
- B. Geodatabase containing:
 - *Model simulation results*
 - *Inundation polygons*
 - *Feature classes with landmark elevations**
- C. FPLOS designation for each subbasin*
- D. Flood depth grids for design storms*
- E. FPLOS analysis report*
- F. Project specific QA/QC document*
- G. Responses to comments geodatabase*

2.5 SURFACE WATER RESOURCE ASSESSMENT (SWRA)

2.5.1 SWRA Approach

A meeting will be conducted between the CONSULTANT, the COUNTY project manager to discuss water quality data available, known issues, and the approach of SWRA that is specific to the watershed. The methodology of pollutant loading analysis, shall also be determined.

Pollutants to be assessed are the following:

- Total Nitrogen (TN)
- Total Phosphorus (TP)

The CONSULTANT will identify and review any existing documents dealing with either the impairment assessment or TMDL development and recommend appropriate actions regarding either the impairment assessment or TMDL. The information compiled will be examined in order to develop recommendations to reduce pollutant loadings (if appropriate) to address relevant impairments and to aid in the implementation of any draft or final TMDLs. These recommendations will be the basis for the development of water quality BMPs to be included in the BMPs Alternatives Analysis.

The COUNTY/DISTRICT shall establish the goals of the SWRA and which pollutants, if any, are of additional concern using but not limited to the sources below:

- FDEP classification and designation of waterbodies within the watershed
- FDEP waterbody identification (WBID) basins within the watershed
- Total Maximum Daily Loads (TMDLs), Basin Management Action Plans (BMAPs), or Reasonable Assurance Plans that may affect the watershed
- FDEP Impaired Waters Rule (IWR) Database
- SWFWMD Water Management Information System (WMIS)
- USGS National Water Information Service (NWIS)
- FDEP Wastewater Facility Regulation (WAFR)
- Florida Department of Health (FDOH) septic tank feature class for parcels and/or permits
- Florida Water Management Inventory (FLWMI)
- Sanitary Sewer coverage (from the COUNTY)
- US Environmental Protection Agency (EPA) Storage and Retrieval (STORET) Database
- Existing studies, historical records, and data not uploaded to online databases (Water Atlas, STORET, and IWR)
- FDEP Florida STORET Database
- The Florida Water Resource Monitoring Catalog (Water-CAT)
- The Watershed Information Network (WIN)
- Locally collected data

2.5.2 Water Quality Assessment

The CONSULTANT shall compile available historical and existing water quality data that may be pertinent to the watershed. Possible trends in water quality data that has been regularly collected shall be noted. In general, water quality data shall be collected and analyzed for, but not limited to, the following:

- Streams
- Lakes
- Groundwater

Data sets examined will include the IWR data set used by FDEP, as well as additional data sets, as available, from the COUNTY and/or other publicly available water quality monitoring efforts. The Klosterman Bayou watershed characteristics will also be assessed relative to any known anthropogenic or environmental factors, and physical features within the watershed which may be impacting water quality conditions or sampling results, particularly for the impairment parameters such as land use types, point- and non-point discharges, extent of existing stormwater runoff treatment, and base flow. The assessment will include a comparison against criteria, as well as a discussion of the appropriateness of the criteria. The assessment will be used along with the Pollutant Loading Model to guide in the development of water quality BMPs.

2.5.3 Existing Conditions Pollutant Loading Analysis

The CONSULTANT will develop average annual pollutant loading estimates for total nitrogen (TN), total phosphorous (TP), biological oxygen demand (BOD), and total suspended solids (TSS) using a spreadsheet, GIS, or similar model. The pollutant loading model shall use land use-based event mean concentrations to calculate pollutant loads. Pollutant loading will consider the presence and efficiency of BMPs in the watershed. Gross and net pollutant loads will be reported and mapped by subbasin. Point sources such as septic tanks and wastewater treatment facilities shall be considered as part of the pollutant loading analysis. The Pollutant Loading Model will be used along with the Water Quality Assessment to guide in the development of water quality BMPs.

2.5.4 SWRA Report

The CONSULTANT shall document the efforts involved in Tasks 2.5.1 through 2.5.3 in a SWRA of Water Quality report.

The report shall include the following:

- A table of all subbasins and the expected pollutant load generated for each constituent analyzed.
- Summary of land use types
- Presence of existing BMPs
- Locations where pollutants are discharged to major surface waterbodies
- Significant discharges of pollutants to groundwater

The findings in the report will help the COUNTY and DISTRICT prioritize the BMP Alternatives Analysis.

2.5.5 Pre-Submittal Meeting

Within five (5) business days of each anticipated submittal, the CONSULTANT shall conduct a pre-submittal meeting with the COUNTY and DISTRICT prior to transmitting full deliverables. The CONSULTANT will present how the deliverables will satisfy the scope of work as well as follow the data delivery structure and include all applicable contents to date. The meeting will be in remote format, unless otherwise specified. This task includes one (1) pre-submittal meeting. The pre-submittal meeting will involve a web-based walk-through of key elements of the deliverables typically through a PowerPoint presentation format. A brief transmittal memorandum will be prepared summarizing the deliverables being submitted. Both of these efforts are intended to facilitate the review by the COUNTY and the DISTRICT. This task also includes packaging up and transmitting the deliverables.

2.5.6 Project Management and Quality Assurance/Control

The CONSULTANT will attend a meeting to discuss the findings of the SWRA task and potential projects to evaluate during the BMP analysis. The CONSULTANT will conduct quality assurance and quality control. Quality control reviews will be documented in the comment's geodatabase and in the QA/QC document, as appropriate.

Deliverables

- A. *Meeting minutes*
- B. *SWRA Report*
- C. *Geodatabase/Water Quality Assessment Data*
- D. *Pollutant Loading Model/GIS files*
- E. *Project Specific QA/QC Document*
- F. *Responses to comments geodatabase*

2.6 BEST MANAGEMENT PRACTICES (BMP) ALTERNATIVES ANALYSIS

2.6.1 BMP Site Selection

A BMP site selection meeting will be held between the CONSULTANT and the COUNTY / DISTRICT. Prior to the meeting the CONSULTANT will identify locations that have been characterized with flooding and/or water quality concerns within the FPLOS and SWRA deliverables. 7 to 10 sites will be identified for BMP alternatives analysis. These sites may be a combination of structural and non-structural BMP alternatives.

The COUNTY / DISTRICT and CONSULTANT will set the FPLOS and/or Water Quality target for each selected site (e.g. 25-year event).

2.6.2 BMP Alternatives Analysis, Recommendation and Rankings

The CONSULTANT will conduct a BMP alternatives analysis for the BMPS selected in 2.6.1 in the watershed. Each BMP shall include the following:

Exhibit A
Klosterman Bayou Watershed Management Plan

- Measurable benefit (e.g., acres treated)
- Resource benefit (e.g., providing flood protection during 25- year, 24-hour storm, lbs/year of target contaminant removed)
- Existing/proposed conditions models (ICPR, pollutant loading model)
- Planning level cost estimate
- Benefit/cost analysis (For flood reduction BMPs benefit/cost is reduction in flood damages versus cost of project over the life of the project, for water quality BMPs benefit/cost is cost per pound or cost per acre of pollutant removed. O&M costs will be shown separately.)
- Preliminary design (GIS features showing proposed grading contours, proposed subbasin delineations, contributing area of BMP, drainage structures to be removed, proposed drainage structures, roadway reconstruction, etc.)
- BMP permitting analysis

The CONSULTANT will model the selected Flood Protection BMPs using ICPR. Water Quality BMPs will also be modeled using ICPR, if necessary, to ensure there will be no adverse impacts as a result of the BMP. ICPR models using the mean annual, 5-year, 10-year, 25-year, 50-year, and 100-year storms will be used to evaluate the effect on flooding. Proposed conditions inundation polygons will be included to show flood protection benefit.

The mass pollutant removal and the drainage area treated for each constituent analyzed in the SWRA task shall be determined for each water quality BMP. Reduction in pollutant loading shall be assessed using the same methods as those used in evaluating BMPs within the SWRA task.

The CONSULTANT shall rank the alternatives using the COUNTY's ranking tool:

- Flood Control Benefit (e.g, FPLOS Improvement)
- Permitability
- Implementability
- Water Quality and Environmental Benefit
- Natural Systems Improvement
- Construction Cost
- Operation and Maintenance Cost
- Cost Benefit Analysis
- Public Acceptance
- Availability

Ranking tables will be included in the BMP Alternatives Analysis Report (2.6.3).

The ranking may also include an analysis of the proposed project for one of the SLR/Rainfall Depth scenarios in Task 2.3.3.7.

The CONSULTANT will not provide construction plans or apply for conceptual ERP permits for the proposed BMPs.

2.6.3 BMP Alternatives Analysis Report

An alternative BMP Analysis report will be developed. A draft alternative analysis and recommendations report will be prepared to summarize the findings of the BMP Analysis. Upon review and comment by the COUNTY, a final report will be issued.

2.6.4 Project Management and Quality Assurance/Control

The CONSULTANT will attend a meeting to discuss the findings of the BMP analysis. The CONSULTANT will conduct quality assurance and quality control. Quality control reviews will be documented in the comments geodatabase and in the QA/QC document, as appropriate.

Deliverables

- A. Alternatives analysis and recommendations report*
- B. Model input/output files for proposed conditions*
- C. Pollutant load model GIS files*
- D. Geodatabase containing:*
 - *Site locations*
 - *Locations of final recommended projects*
 - *Model simulation results for proposed conditions*
 - *Inundation polygons for proposed conditions*
- E. Project specific QA/QC document*
- F. Responses to comments geodatabase*

PERFORMANCE SCHEDULE

The following tasks are to be completed within the number of months indicated below, counted forward from the date the COUNTY issues Notice to Proceed to the CONSULTANT. The COUNTY has up to six (6) months to issue Notice to Proceed to the CONSULTANT. The project agreement is for project completion in thirty-six (36) calendar months from the notice to proceed. Based on the schedule below, project completion is anticipated to take twenty-two (22) consecutive calendar months from the notice to proceed.

Exhibit A Klosterman Bayou Watershed Management Plan

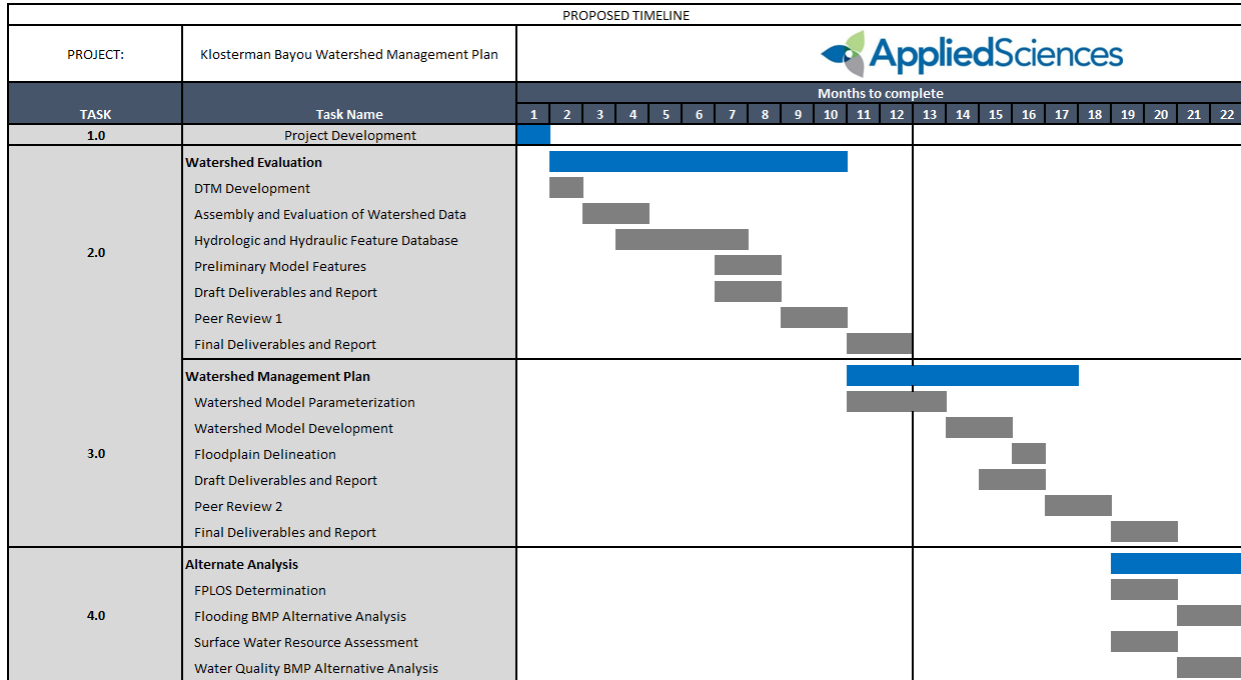


EXHIBIT "B"

PROJECT BUDGET BY:
 PROJECT NAME:
 AGREEMENT NUMBER:
 TASK WORK ASSIGNMENT:
 PROJECT METRIC (SQ MI):

Applied Sciences Consulting, Inc.
 Klosterman Bayou WMP

3.4 (Pumped + Marine + Freshwater)

Title/Job Description	Sr Principal	Super- visory Engineer	Sr. Prof. Engineer	Prof. Engineer	Engineer III	Sr. Design Engineer	Environ. Scientist I	Admin	Prof. Engineer III	Prof. Engineer II	Prof. Engineer I	Engineer Intern / Scientist III	Engineer Intern / Scientist I	Survey Sub- Consultant	Line Item Costs	Line Item Hours	Element Costs Running Total	Total Project Costs Running Total
Firm Name	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	SAI	SAI	SAI	SAI	SAI					
Personnel Hourly Rate	\$213.00	\$185.00	\$163.00	\$142.00	\$130.00	\$129.00	\$79.00	\$59.00	\$181.00	\$162.00	\$152.00	\$131.00	\$110.00					
ELEMENT & TASK DESCRIPTIONS																		
2.1 Project Development																		
2.1.1 Data Collection and Initial Evaluation																		
	0.0	0.0	0.0	20.0	0.0	32.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$7,284.00	56.0	\$8,284.00	\$8,284.00
2.1.2 Draft Project Plan	0.0	0.0	0.0	4.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,832.00	20.0	\$10,116.00	\$10,116.00
2.1.3 Kickoff Meeting	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	\$0	\$1,000.00	6.0	\$1,000.00	\$1,000.00
2.1.4 Final Project Plan	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$10,684.00	\$10,684.00
2.1.5 Project Management and Quality Assurance/Quality Control	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$516.00	4.0	\$11,200.00	\$11,200.00
Element 2.1 Hours	0.0	2.0	2.0	28.0	0.0	36.0	20.0	0.0	0.0	0.0	2.0	0.0	0.0				\$11,200.00	
Element 2.1 Days (8 Hour/Day)	0.0	0.3	0.3	3.5	0.0	4.5	2.5	0.0	0.0	0.0	0.3	0.0	0.0					
Element 2.1 Costs	\$0	\$370	\$326	\$3,976	\$0	\$4,644	\$1,580	\$0	\$0	\$0	\$304	\$0	\$0	\$0				
2.2 Watershed Evaluation																		
2.2.1 Assembly and Evaluation of Watershed Data																		
2.2.1.1 Drainage Pattern and Watershed Boundary																		
	0.0	0.0	0.0	2.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,116.00	10.0	\$1,116.00	\$12,316.00
2.2.1.2 Areas of Development	0.0	0.0	0.0	0.0	0.0	72.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$9,604.00	76.0	\$10,720.00	\$21,920.00
2.2.1.3 Initial GIS Processing	0.0	0.0	0.0	2.0	0.0	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,632.00	14.0	\$12,352.00	\$23,552.00
2.2.1.4 Topographic Voids Replacement Methodology	0.0	0.0	2.0	4.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$4,764.00	36.0	\$17,116.00	\$28,316.00
2.2.1.5 DEM and LiDAR Suitability Review	0.0	0.0	2.0	4.0	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,966.00	22.0	\$20,082.00	\$31,282.00
2.2.1.6 Hydrologic Characteristics and Percolation	0.0	0.0	10.0	0.0	6.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,726.00	20.0	\$22,808.00	\$34,008.00
2.2.1.7 Historical Water Levels	0.0	0.0	2.0	2.0	2.0	2.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,602.00	14.0	\$24,410.00	\$35,610.00
2.2.1.8 Data Acquisition Plan	0.0	0.0	0.0	4.0	4.0	2.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,978.00	18.0	\$26,388.00	\$37,588.00
2.2.1.9 Pre-field Reconnaissance Plan	0.0	0.0	4.0	8.0	10.0	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$8,080.00	70.0	\$34,468.00	\$45,668.00
2.2.1.10 Task Memorandum	0.0	0.0	2.0	4.0	6.0	4.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$4,086.00	40.0	\$38,554.00	\$49,754.00
2.2.1.11 Pre-Submittal Meeting	0.0	0.0	2.0	2.0	2.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,134.00	22.0	\$40,688.00	\$51,888.00
2.2.1.12 Quality Assurance and Quality Control	0.0	0.0	2.0	2.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,430.00	18.0	\$43,118.00	\$54,318.00
2.2.2 Hydrologic and Hydraulic Feature Database																		
2.2.2.1 Acquisition of Data																		
	0.0	0.0	4.0	28.0	56.0	48.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	\$15,000.00	\$35,944.00	172.0	\$79,062.00	\$90,262.00
2.2.2.2 HydroNetwork Development	0.0	0.0	0.0	4.0	0.0	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,242.00	10.0	\$80,304.00	\$91,504.00
2.2.2.3 Topographic Information Refinement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$0.00	0.0	\$80,304.00	\$91,504.00
2.2.2.4 Hydrologic Feature Database	0.0	0.0	0.0	2.0	0.0	12.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,990.00	16.0	\$82,294.00	\$93,494.00
2.2.2.5 Pre-Submittal Meeting	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$82,862.00	\$94,062.00
2.2.2.6 Quality Assurance and Quality Control	0.0	0.0	2.0	2.0	2.0	0.0	8.0	0.0	4.0	4.0	2.0	0.0	0.0	\$0	\$3,178.00	24.0	\$86,040.00	\$97,240.00
2.2.3 Preliminary Model Features																		
2.2.3.1 Additional GIS Processing																		
	0.0	0.0	0.0	2.0	0.0	8.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,790.00	16.0	\$87,830.00	\$99,030.00
2.2.3.2 Preliminary Model Schematic	0.0	0.0	18.0	38.0	4.0	12.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$10,714.00	76.0	\$98,544.00	\$109,744.00
2.2.3.3 Model Parameterization Approach	0.0	0.0	4.0	4.0	4.0	4.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$3,204.00	28.0	\$101,748.00	\$112,948.00
2.2.3.4 Watershed Evaluation Report	0.0	0.0	2.0	2.0	2.0	4.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,808.00	28.0	\$104,556.00	\$115,756.00
2.2.3.5 Pre-Submittal Meeting	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$652.00	4.0	\$105,208.00	\$116,408.00

EXHIBIT "B"

PROJECT BUDGET BY: Applied Sciences Consulting, Inc.
 PROJECT NAME: Klosterman Bayou WMP
 AGREEMENT NUMBER:
 TASK WORK ASSIGNMENT:
 PROJECT METRIC (SQ MI): 3.4 (Pumped + Marine + Freshwater)

Title/Job Description	Sr Principal	Super- visory Engineer	Sr. Prof. Engineer	Prof. Engineer	Engineer III	Sr. Design Engineer	Environ. Scientist I	Admin	Prof. Engineer III	Prof. Engineer II	Prof. Engineer I	Engineer Intern / Scientist III	Engineer Intern / Scientist I	Survey Sub- Consultant	Line Item Costs	Line Item Hours	Element Costs Running Total	Total Project Costs Running Total
Firm Name	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	SAI	SAI	SAI	SAI	SAI					
Personnel Hourly Rate	\$213.00	\$185.00	\$163.00	\$142.00	\$130.00	\$129.00	\$79.00	\$59.00	\$181.00	\$162.00	\$152.00	\$131.00	\$110.00					
2.2.3.6 Quality Assurance and Quality Control	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,028.00	8.0	\$106,236.00	\$117,436.00
2.2.4 Peer Review of Watershed Evaluation																		
2.2.4.1 Peer Review Kick-off Meeting and Presentation	0.0	0.0	2.0	4.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,468.00	12.0	\$107,704.00	\$118,904.00
2.2.4.2 Meeting to Present Peer Review Comments	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$442.00	4.0	\$108,146.00	\$119,346.00
2.2.4.3 Meeting to Discuss Approach of Responding to Peer Review	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$109,366.00	\$120,566.00
2.2.5 Final Approved Watershed Evaluation Deliverables																		
2.2.5.1 Revised Deliverables	0.0	0.0	4.0	10.0	4.0	40.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$10,912.00	98.0	\$120,278.00	\$131,478.00
2.2.5.2 Pre-Submittal Meeting	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$120,846.00	\$132,046.00
2.2.5.3 Quality Assurance and Quality Control	0.0	0.0	2.0	0.0	2.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$902.00	8.0	\$121,748.00	\$132,948.00
2.2.6 Project Management																		
2.2.6.1 Progress Meetings	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$122,316.00	\$133,516.00
2.2.6.2 Progress Reports with Invoicing	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$122,884.00	\$134,084.00
2.2.6.3 Pre-Submittal Meetings	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$123,452.00	\$134,652.00
2.2.6.4 Quality Assurance and Quality Control (QA/QC)	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$124,672.00	\$135,872.00
Element 2.2 Hours	0.0	0.0	78.0	162.0	128.0	288.0	234.0	0.0	4.0	4.0	2.0	0.0	0.0				\$124,672.00	
Element 2.2 Days (8 Hour/Day)	0.0	0.0	9.8	20.3	16.0	36.0	29.3	0.0	0.5	0.5	0.3	0.0	0.0					
Element 2.2 Costs	\$0	\$0	\$12,714	\$23,004	\$16,640	\$37,152	\$18,486	\$0	\$724	\$648	\$304	\$0	\$0	\$15,000				
2.3 Watershed Management Plan - Floodplain Analysis																		
2.3.1 Watershed Model Parameterization																		
2.3.1.1 Acquisition of Additional Model Parameters	0.0	0.0	0.0	2.0	0.0	6.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,374.00	12.0	\$1,374.00	\$137,246.00
2.3.1.2 Development of Model Specific Geodatabase	0.0	0.0	12.0	40.0	32.0	40.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$20,116.00	164.0	\$21,490.00	\$157,362.00
2.3.1.3 Model Setup, Debug, and Stabilization	0.0	0.0	12.0	6.0	12.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$6,864.00	54.0	\$28,354.00	\$164,226.00
2.3.1.4 Model Parameterization Approach Update	0.0	0.0	2.0	2.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,442.00	12.0	\$29,796.00	\$165,668.00
2.3.1.5 Pre-Submittal Meeting	0.0	0.0	2.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,130.00	8.0	\$30,926.00	\$166,798.00
2.3.1.6 Quality Assurance and Quality Control	0.0	0.0	2.0	0.0	2.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$902.00	8.0	\$31,828.00	\$167,700.00
2.3.2 Final Approved Watershed Model Parameterization Deliverables																		
2.3.2.1 Revised Deliverables	0.0	0.0	4.0	4.0	8.0	16.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$6,220.00	56.0	\$38,048.00	\$173,920.00
2.3.2.2 Pre-Submittal Meeting	0.0	0.0	2.0	2.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,084.00	10.0	\$39,132.00	\$175,004.00
2.3.2.3 Quality Assurance/Control	0.0	0.0	2.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,102.00	8.0	\$40,234.00	\$176,106.00
2.3.3 Watershed Model Development and Floodplain Delin.																		
2.3.3.1 Model Calibration and Verification	0.0	0.0	18.0	2.0	14.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$5,554.00	38.0	\$45,788.00	\$181,660.00
2.3.3.2 Model Validation	0.0	0.0	2.0	2.0	4.0	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,794.00	24.0	\$48,582.00	\$184,454.00
2.3.3.3 Design Storm Simulations	0.0	0.0	0.0	4.0	8.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$2,240.00	20.0	\$50,822.00	\$186,694.00
2.3.3.4 Multi-Day Event Sims. and Rainfall Justification to Project Flood.	0.0	0.0	0.0	4.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,404.00	12.0	\$52,226.00	\$188,098.00
2.3.3.5 Floodplain Delineation	0.0	0.0	0.0	4.0	0.0	8.0	24.0	0.0	0.0	0.0	20.0	0.0	16.0	\$0	\$8,296.00	72.0	\$60,522.00	\$196,394.00
2.3.3.6 Floodplain Justification Report	0.0	0.0	4.0	8.0	4.0	16.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$6,268.00	56.0	\$66,790.00	\$202,662.00
2.3.3.7 Sea-level Rise (SLR) Analyses	0.0	0.0	12.0	0.0	2.0	24.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$6,576.00	54.0	\$73,366.00	\$209,238.00

EXHIBIT "B"

PROJECT BUDGET BY: Applied Sciences Consulting, Inc.
PROJECT NAME: Klosterman Bayou WMP
AGREEMENT NUMBER:
TASK WORK ASSIGNMENT:
PROJECT METRIC (SQ MI): 3.4 (Pumped + Marine + Freshwater)

Title/Job Description	Sr Principal	Super-visory Engineer	Sr. Prof. Engineer	Prof. Engineer	Engineer III	Sr. Design Engineer	Environ. Scientist I	Admin	Prof. Engineer III	Prof. Engineer II	Prof. Engineer I	Engineer Intern / Scientist III	Engineer Intern / Scientist I	Survey Sub-Consultant	Line Item Costs	Line Item Hours	Element Costs Running Total	Total Project Costs Running Total
Firm Name	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	SAI	SAI	SAI	SAI	SAI					
Personnel Hourly Rate	\$213.00	\$185.00	\$163.00	\$142.00	\$130.00	\$129.00	\$79.00	\$59.00	\$181.00	\$162.00	\$152.00	\$131.00	\$110.00					
2.3.3.8 Pre-Submittal Meeting	0.0	0.0	2.0	2.0	2.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,344.00	12.0	\$74,710.00	\$210,582.00
2.3.3.9 Quality Assurance/Control	0.0	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,172.00	8.0	\$75,882.00	\$211,754.00
2.3.4 Peer Review of Watershed Model Development and Floodplain																		
2.3.4.1 Peer Review Meeting and Presentation	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$610.00	4.0	\$76,492.00	\$212,364.00
2.3.4.2 Meeting to Present Peer Review Comments	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$610.00	4.0	\$77,102.00	\$212,974.00
2.3.4.3 Meeting - Discuss Approach to Resp. to Review Cmets	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$78,322.00	\$214,194.00
2.3.5 Approved Floodplain Analysis Deliverables for Preliminary																		
2.3.5.1 Revised Deliverables	0.0	0.0	2.0	16.0	24.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$9,330.00	70.0	\$87,652.00	\$223,524.00
2.3.5.2 Pre-Submittal Meeting	0.0	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,088.00	8.0	\$88,740.00	\$224,612.00
2.3.5.3 Quality Assurance/Control	0.0	0.0	4.0	4.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,852.00	16.0	\$90,592.00	\$226,464.00
2.3.6 Preliminary Floodplain Open House and Response to Public																		
2.3.6.1 Preliminary Floodplain Open House and Public Relations	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$91,812.00	\$227,684.00
2.3.6.2 Response to Public Comments	0.0	0.0	0.0	4.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,600.00	12.0	\$93,412.00	\$229,284.00
2.3.6.3 Meeting - Discuss Approach and Responding to Public Cmets	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$284.00	2.0	\$93,696.00	\$229,568.00
2.3.7 Final Approved Floodplain Analysis Deliverables																		
2.3.7.1 Revised Deliverables	0.0	0.0	2.0	4.0	16.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$5,038.00	38.0	\$98,734.00	\$234,606.00
2.3.7.2 Pre-Submittal Meeting	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$99,302.00	\$235,174.00
2.3.7.3 Quality Assurance/Control	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$100,522.00	\$236,394.00
2.3.8 Project Management																		
2.3.8.1 Progress Meetings	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$101,090.00	\$236,962.00
2.3.8.2 Progress Reports with Invoicing	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$101,658.00	\$237,530.00
2.3.8.3 Pre-Submittal Meetings	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$102,226.00	\$238,098.00
2.3.8.4 Quality Assurance and Quality Control (QA/QC)	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$103,446.00	\$239,318.00
Element 2.3 Hours	0.0	0.0	108.0	154.0	146.0	194.0	192.0	0.0	0.0	0.0	20.0	0.0	16.0				\$103,446.00	
Element 2.3 Days (8 Hour/Day)	0.0	0.0	13.5	19.3	18.3	24.3	24.0	0.0	0.0	0.0	2.5	0.0	2.0					
Element 2.3 Costs	\$0	\$0	\$17,604	\$21,868	\$18,980	\$25,026	\$15,168	\$0	\$0	\$0	\$3,040	\$0	\$1,760	\$0				
2.4 FPLOS Determination, Alternatives Analysis and Recommendations																		
2.4.1 FPLOS Determination and Flood Damage Estimation																		
2.4.1.1 FPLOS Methodology Meeting	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	\$0	\$958.00	6.0	\$958.00	\$240,276.00
2.4.1.2 FPLOS Determination	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	20.0	\$0	\$8,934.00	64.0	\$9,892.00	\$249,210.00
2.4.1.3 Flood Damage Estimate	0.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	12.0	4.0	2.0	\$0	\$3,112.00	22.0	\$13,004.00	\$252,322.00
2.4.1.4 FPLOS Analysis Report	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,304.00	8.0	\$14,308.00	\$253,626.00
2.4.1.5 Project Management and Quality Assurance/Control	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$568.00	4.0	\$14,876.00	\$254,194.00
2.5 Surface Water Resource Assessment (SWRA)																		
2.5.1 SWRA Approach	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	8.0	0.0	8.0	\$0	\$3,794.00	26.0	\$3,794.00	\$257,988.00
2.5.2 Water Quality Assessment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	56.0	\$0	\$7,984.00	68.0	\$11,778.00	\$265,972.00
2.5.3 Existing Conditions Pollutant Loading Analysis	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	4.0	32.0	0.0	0.0	\$0	\$6,122.00	40.0	\$17,900.00	\$272,094.00

EXHIBIT "B"

PROJECT BUDGET BY:

Applied Sciences Consulting, Inc.

PROJECT NAME:

Klosterman Bayou WMP

AGREEMENT NUMBER:

TASK WORK ASSIGNMENT:

PROJECT METRIC (SQ MI):

3.4 (Pumped + Marine + Freshwater)

Title/Job Description	Sr Principal	Super-visory Engineer	Sr. Prof. Engineer	Prof. Engineer	Engineer III	Sr. Design Engineer	Environ. Scientist I	Admin	Prof. Engineer III	Prof. Engineer II	Prof. Engineer I	Engineer Intern / Scientist III	Engineer Intern / Scientist I	Survey Sub-Consultant	Line Item Costs	Line Item Hours	Element Costs Running Total	Total Project Costs Running Total
Firm Name	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	ASCI	SAI	SAI	SAI	SAI	SAI					
Personnel Hourly Rate	\$213.00	\$185.00	\$163.00	\$142.00	\$130.00	\$129.00	\$79.00	\$59.00	\$181.00	\$162.00	\$152.00	\$131.00	\$110.00					
2.5.4 SWRA Report	0.0	0.0	2.0	0.0	4.0	0.0	0.0	0.0	0.0	4.0	12.0	0.0	12.0	\$0	\$4,638.00	34.0	\$22,538.00	\$276,732.00
2.5.5 Pre-Submittal Meeting	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	\$0	\$546.00	4.0	\$23,084.00	\$277,278.00
2.5.6 Project Management and Quality Assurance/Control	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	8.0	\$0	\$2,420.00	18.0	\$25,504.00	\$279,698.00
2.6 Best Management Practices (BMP) Alternatives Analysis																		
2.6.1 BMP Site Selection	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$1,220.00	8.0	\$1,220.00	\$280,918.00
2.6.2 BMP Alternatives Analysis, Recommendation and Rankings	0.0	0.0	16.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	32.0	8.0	\$0	\$12,992.00	92.0	\$14,212.00	\$293,910.00
2.6.3 BMP Alternatives Analysis Report	0.0	0.0	0.0	8.0	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	\$0	\$3,208.00	24.0	\$17,420.00	\$297,118.00
2.6.4 Project Management and Quality Assurance/Control	0.0	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	4.0	\$0	\$2,828.00	20.0	\$20,248.00	\$299,946.00
Element 2.4 Hours	0.0	4.0	40.0	42.0	18.0	8.0	0.0	0.0	4.0	16.0	150.0	36.0	120.0				\$60,628.00	
Element 2.4 Days (8 Hour/Day)	0.0	0.5	5.0	5.3	2.3	1.0	0.0	0.0	0.5	2.0	18.8	4.5	15.0					
Element 2.4 Costs	\$0	\$740	\$6,520	\$5,964	\$2,340	\$1,032	\$0	\$0	\$724	\$2,592	\$22,800	\$4,716	\$13,200	\$0				
Total Hours	0.0	6.0	228.0	386.0	292.0	526.0	446.0	0.0	8.0	20.0	174.0	36.0	136.0				\$299,946.00	
Total Days (8 Hour/Day)	0.0	0.8	28.5	48.3	36.5	65.8	55.8	0.0	1.0	2.5	21.8	4.5	17.0					
Basic Services Total Costs	\$0	\$1,110	\$37,164	\$54,812	\$37,960	\$67,854	\$35,234	\$0	\$1,448	\$3,240	\$26,448	\$4,716	\$14,960	\$15,000				
Contingency Services																		\$0.00
Project Total Cost																		\$299,946.00