

Exhibit A

SCOPE OF SERVICES

**Engineering Consulting Services
RFP No.: 190-0042-NC (SS)**

Roosevelt Creek Watershed Management Plan

Prepared for:

**Pinellas County
Public Works Department
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PROJECT TITLE

Roosevelt Creek Watershed Management Plan

I. OBJECTIVE

On behalf of the Pinellas County Board of Commissioners, the Public Works Department (COUNTY) is seeking the services of a firm qualified to update and complete a Watershed Management Plan (WMP) for the Roosevelt Creek Watershed in accordance with County, Southwest Florida Water Management District (SWFWMD or DISTRICT) and Federal Emergency Management Agency (FEMA) requirements.

II. BACKGROUND

The Roosevelt Creek watershed is located in central Pinellas County and serves a drainage area of approximately 12.6 sq.mi. of developed urban land. The area contains portions of the cities of Pinellas Park and St. Petersburg, and includes a combination of residential, commercial, industrial, and transportation land uses. Discharges from the Roosevelt Creek Watershed flow from south to north into tidal marsh areas along Old Tampa Bay through a system of storm-sewers and open ditches. The Roosevelt Creek watershed contains a significant number of industrial facilities including three permitted wastewater facilities, the Bridgeway Acres Landfill, several closed Class I and Class II landfills, the Airco Golf Course, a waste-to-energy plant, and the St. Petersburg/Clearwater International Airport. Six tributaries drain the Watershed with Channel 5 being the largest in the basin. Existing drainage models are over 10 years old and documented flooding occurs at select locations. The watershed is one of SWFWMD’s top 20 priority watersheds for WMP updates and is among the District’s priorities in the Tampa Bay region for improving flood protection in Pinellas County coastal watersheds. There are also known water quality issues in the watershed. Previous studies indicate manure, sewage and wastewater inputs as sources of nutrient loading in the watershed. In addition, Roosevelt Creek is located within the Coastal Old Tampa Bay planning unit in FDEP’s Group 1 for impaired water bodies for which Total Maximum Daily Loads (TMDLs) have been established. The marine portion of the Roosevelt Creek basin (WBID 1624) as well as the Cross Canal North (WBID 1625) are listed as impaired for dissolved oxygen and nutrients/Chl-a. The freshwater portion of Roosevelt Creek (WBID 1624A) is on the 2009 verified list as impaired for fecal coliform bacteria.

III. PROJECT DESCRIPTION

This project involves the update and completion of the comprehensive WMP for the Roosevelt Creek Watershed. The WMP will yield results and recommendations for water quality, flood control, and natural system improvement projects. Further, the WMP will consider sea level rise (SLR), where appropriate, as part of the County’s resiliency planning efforts. This project will be co-funded by SWFWMD. Therefore, in accordance with the areas of responsibility of SWFWMD, the WMP will address flood protection, water quality and natural systems. The completed WMP will be used as a tool in the planning, regulation, and management of the watersheds for future development and as a method for determining and prioritizing capital improvements projects.

IV. SCOPE OF WORK

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

- Flood Hazard Mapping Partners (available at <https://www.fema.gov/medialibrary/assets/documents/13948>)
- The nine elements listed in United States Environmental Protection Agency (USEPA) 319(h) Guidance Manual (<http://water.epa.gov/polwaste/nps/cwact.cfm>)
- SWFWMD Recommended Projection of Sea Level Rise in the Tampa Bay Region (<http://www.tbrpc.org/recommended-projection-of-sea-level-rise-in-the-tampa-bayregion/>)
- SWFWMD standards published in 2017 (rev 2018) <ftp://ftp.swfwmd.state.fl.us/pub/GWIS/> Username: Anonymous Password: (your email address)
- Pinellas County Comprehensive Plan, as applicable. (http://www.pinellascounty.org/plan/comprehensive_plan.htm)

The general scope of work will include:

1. 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.
2. Digital Topographic Information: Includes development of a digital terrain model (DTM) based on the latest Pinellas County LiDAR. This effort is typically included in the Watershed Evaluation phase of the project. It will include modifications to the DTM to accurately model the groundwater-surface water interaction and possibly adding missing breaklines.
3. Watershed Evaluation: This effort will develop an existing conditions watershed evaluation including data collection efforts and field evaluations and inspections.
4. Floodplain Analysis: Includes the development of 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 and flood zone definition.
5. Level of Service Determinations, Drainage Improvements Alternative Analysis and Recommendations: 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.
6. SWRA and BMPs for Water Quality: Includes the development of a surface water resource assessment (SWRA) that is specific to the watershed. This effort also involves the development

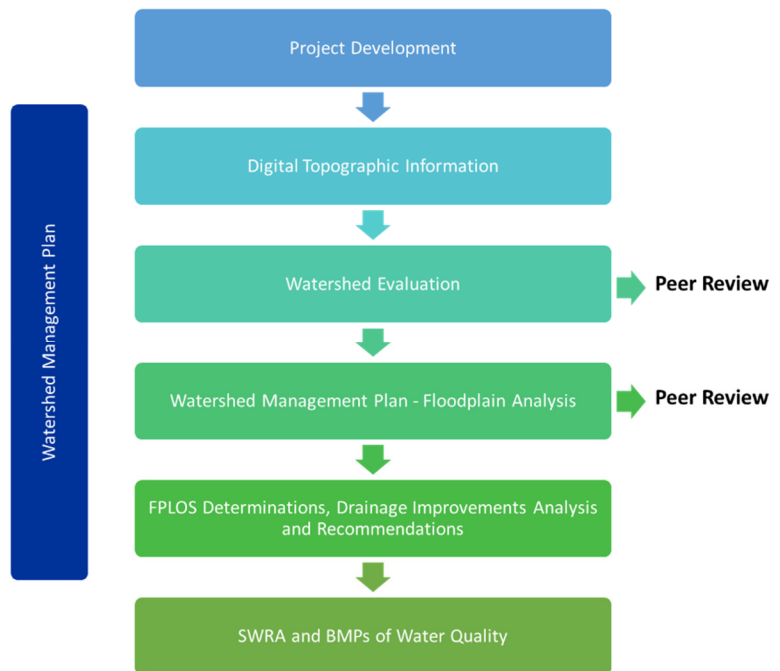


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of BMPs for improving water quality and natural systems. It will be performed in concert with the LOS determination and water quantity analyses mentioned above.

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:

1.0 PROJECT DEVELOPMENT

1.1 Kickoff Meeting

The CONSULTANT will coordinate and participate in a remote web-based project kickoff meeting. The CONSULTANT will provide an agenda and meeting minutes. The purpose of the meeting is to discuss the County's primary objectives of the WMP, the available information, flooding and/or water quality concerns in the watershed, stakeholder involvement, coordination with adjacent watershed studies (i.e., City of St. Petersburg), and the overall approach to the WMP.

1.2 Data Collection and Initial Evaluation

Following the kickoff meeting, the CONSULTANT will collect and review relevant information for the Roosevelt Creek Watershed Management Plan. The COUNTY will provide or direct the CONSULTANT to obtain the following relevant information:

- Topographic Information (COUNTY/2018/2019)
- Aerial Imagery (COUNTY/2019)
- Landuse and Soils Data (SWFWMD and NRCS)
- Rainfall Data (NEXRAD, SWFWMD, USGS and COUNTY)
- The DISTRICT Planning Units
- USGS National Hydrography Dataset (NHD)
- National Wetlands Inventory Dataset (NWI)
- ERP Polygons (DISTRICT ftp)
- ERP digital datasets (DISTRICT)
- Additional record drawings (COUNTY)
- Historical Water Levels (SWFWMD HWE database)
- 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 (COUNTY)
- Site-Specific Information, including known flooding problem areas (photos, videos, notes, etc.)
- Existing Studies and Models
- Adjacent Watershed Studies
- Current approved ICPR model and associated GIS (COUNTY)

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- Surface water and groundwater management operations records/protocols for both the Bridgeway Acres and Toytown Landfills

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.

Additional notes regarding this scope element:

1. Study Area: The study area is limited to the boundaries of the Roosevelt Creek Watershed but excluding the areas located within the City of St. Petersburg.
2. Date Certain: The CONSULTANT will use a “date certain of 2/7/2019 (aerial imagery acquisition date). Data for features altered or constructed after this date will not be incorporated or evaluated as part of this study with the exception of the following projects:
 - Roosevelt Stormwater Facility (PID 003130A) – Note construction not anticipated until June 2020
 - Roosevelt Creek Channel 5 (PID 002123A)
 - Gateway Project
 - 49th Street Harley Davidson (SWFWMD ERP 15405.002)
 - Waste Management Parking Expansion (SWFWMD ERP 42092.001)
 - FDOT I-275 – from south of Gandy Boulevard to north of 4th Street N (SWFWMD ERP 42458.002)
 - Carillon Phase II Master Plan (SWFWMD ERP 05537.046)
3. ERPs Files: These are the primary source of model input data. The CONSULTANT will identify the data needs for the project and obtain the necessary information from the COUNTY (or DISTRICT).
 - The DISTRICT’s ERP layer will be reviewed to identify the development that has occurred since the model was developed and which ERP data sets will be needed to update the watershed model.
 - Aerial imagery will also be compared to previous project data to determine any additional areas that may need to be updated but were not in the DISTRICT’s ERP layer.
 - The 2018/2019 DEM will be visually compared to the current model network to identify significant changes in the terrain indicating potential construction/development.
4. Additional Data Collection: ERPs needed but not provided by the COUNTY and/or DISTRICT will be downloaded from the DISTRICT’s WMIS website. This task also includes requesting missing roadway construction documents (preferably record drawings) from the local FDOT office. It is assumed that there will be no fees associated with providing the information since it is for another State agency.
 - A preliminary review of the ERP feature class indicated that there are approximately 370 ERPs within the watershed.
 - It is assumed that the District and the County will provide the files for at least 80% of ERPs.
 - The CONSULTANT will be responsible for downloading up to 20% of the ERP files (74 ERPs).
5. Datum: The NAVD88 vertical datum will be used for all vertical elevations in the model and geodatabase (unless otherwise noted).
6. Datum Conversion: The CONSULTANT with the approval of the COUNTY will establish a consistent procedure (e.g., conversion factor) for the conversion of data from NGVD29 to NAVD88.
7. Water quality and groundwater related data will be collected as part of Tasks 4.2.2 and 2.1.5, respectively, instead of Task 1.

1.3 Draft Project Plan

The CONSULTANT will evaluate the available information and develop a project plan to execute tasks and identify outstanding project related issues. This is the initial effort; however, this document shall be

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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:

- 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

Note: This details scope of work document is anticipated to suffice for the Project Approach as well as the Assumptions/Issues Management sections of the plan.

1.4 Final Project Plan

The CONSULTANT will update the project plan based on comments provided by the COUNTY.

1.5 Project Management and Quality Assurance/Quality Control (QA/QC)

Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 1.0 Deliverables

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

2.0 WATERSHED EVALUATION

2.1 Assembly and Evaluation of Watershed Data

2.1.1 Drainage Pattern and Watershed Boundary

The CONSULTANT shall examine drainage patterns and define the preliminary watershed boundary based on, but not limited to, the following:

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- The DISTRICT Planning Units
- Topographic Information (2018/2019 LiDAR/DEM)
- USGS National Hydrography Dataset (NHD)
- 2017 Aerial Imagery
- Stormwater Inventory
- ERPs and Roadway Plans
- Existing Studies and Models
- Adjacent Watershed Studies

Additional notes regarding this scope element:

1. The watershed boundary will be reviewed and compared to surrounding watersheds for consistency.
2. The Roosevelt Creek Watershed is bounded on the west by the Cross Bayou watershed, on the south by the Tinney Creek and Sawgrass Lake watersheds, and on the northeast by Tampa Bay.
3. Cross Bayou: The most current model for these adjacent systems is in the Cross Bayou watershed which was updated in 2013. There are some overlaps noted between the two watershed boundaries that must be reconciled, however, it is generally assumed the Cross Bayou watershed, being more recently updated, is more accurate than the Roosevelt Creek information at this point. The Roosevelt boundary will be preliminarily matched to Cross Bayou but significant changes (e.g., adding/removing developments or storage features) will be reviewed against ERP data.
4. St Petersburg: Similarly, the St. Petersburg updated model will also be treated as a “boundary” of sorts against which the Roosevelt Creek limits will be compared. The SAI team will contact the City in an attempt to obtain advanced copies of the subbasin feature class data in the hopes of addressing discrepancies with the City’s consultant prior to finalization of that study.
5. Tinney Creek and Sawgrass Lake: The existing models for the two remaining watershed boundaries, Tinney Creek and Sawgrass Lake, will not have much impact on the Roosevelt Creek system. Just half of the Sawgrass Lake watershed (referred to as Basin O by the City of St. Pete) has model information (c.a., 1996) and that extent is contained within the City of St. Petersburg and does not border the Roosevelt Creek watershed. There is no GIS or model data available for the remaining half of the watershed and it has not been updated since 1981. Tinney Creek is also contained within the limits of St. Petersburg. The original Tinney Creek model was developed in SWMM based on old data and will be updated along with the city-wide model update by the St. Petersburg.
6. Any areas of uncertainty will be identified for field inspections (under a subsequent task) to confirm final configurations.

2.1.2 DEM Review, Topographic Void Update, and Hydro-correction

The COUNTY will provide the CONSULTANT with a DEM from the best available LiDAR. It is anticipated that this is the new Florida State-Wide LiDAR data set that was acquired for the Pinellas County area on December 7-19, 2018 and March 8, 2019.

LiDAR Deliverables: It is SAI’s understanding that in April 2020, the COUNTY anticipates receiving the final deliverables for the recent LiDAR acquired in December 7-19, 2018 and March 8, 2019. The COUNTY will provide the following related to this LiDAR product:

- LAS files with points classified to bare earth, roof top, and water.
- Breaklines
- Impervious surface polygons (roof tops, driveways, parking lots, and streets), if available.
- Polygons denoting FEMA low confidence areas
- DEMs (1-ft or 2-ft and 5-ft; for both bare earth and bare earth with structures)

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QC Review: NOT INCLUDED. This scope of work does not include a detailed QC review of the LiDAR vendor's deliverables (e.g., reviewing the point clouds for mis-classifications or breaklines for inappropriate placement). It is anticipated that the QC reviews have been previously conducted by the LiDAR vendor, the COUNTY, and the DISTRICT.

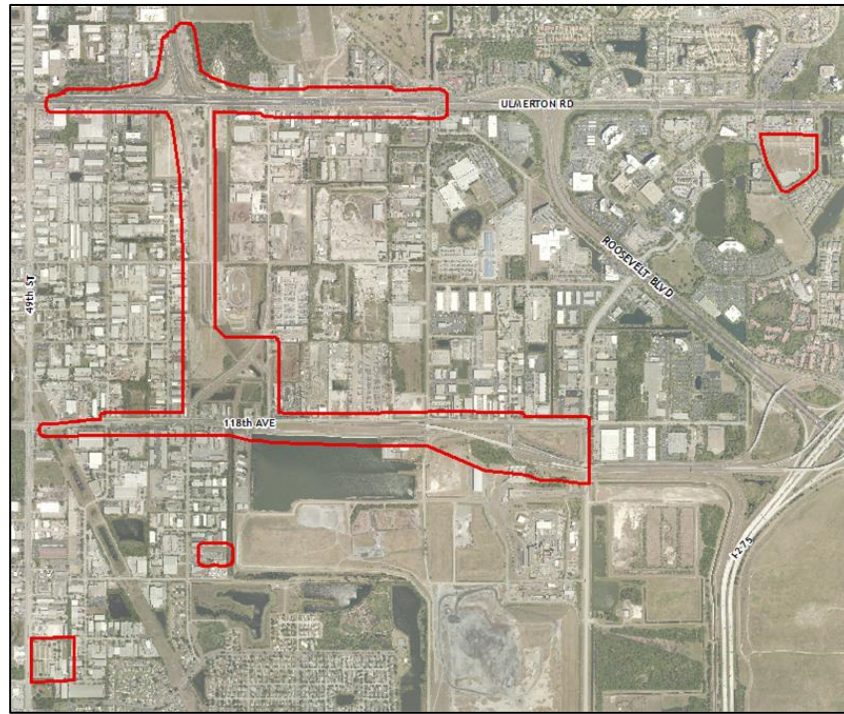
Low Confidence Area Review: SAI will review the low confidence areas and identify implications (if any) that they may have on the modeling effort.

Topographic Void Evaluation: The CONSULTANT shall conduct a topographic void evaluation. Using the 2019 DISTRICT aerial imagery the latest approved DEM, and the ERP layer, the CONSULTANT will identify areas where the DEM does not describe existing topography and will document them in a topographic void polygon feature class. The identified topo voids will be analyzed and designated as "minor impact" or "moderate and significant impact".

Topographic Void Update: The DEM will be modified to include storage areas (such as ponds) for topographic voids considered "moderate and significant impact". The DEM will only be modified to include those storage areas. The remainder of the ground surface in the void areas will remain unchanged. This will be accomplished by digitizing the pond/storage area information from the available construction documents. This will only be completed for the following post-date certain projects defined in Task 1.2.

- Roosevelt Stormwater Facility (PID 003130A)
- Roosevelt Creek Channel 5 (PID 002123A)
- Gateway Project
- 49th Street Harley Davidson (ERP 15)
- Waste Management Parking Expansion (ERP 42092.001).002)

Figure 1 – Post Date Certain Projects to Be Included in Model



Missing Breakline Review and Update: It is SAI's understanding that breaklines were not developed by USGS/FDEM for wet ponds and/or depressional areas less than 2 acres in size. SAI will review the LiDAR

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data and develop breaklines for wet ponds and/or depressional areas greater than 0.5 acres. The DEM will be leveled in the water body based on the lowest reasonable LAS point elevation.

Hydro-corrections: In addition to identifying topographic voids, the DEM will also need to be evaluated relative to needs of the groundwater model. Specifically, bathymetric information must be included to adequately model the interaction between the surface and groundwater. This effort will primarily include, but not limited to, modifications to the DEM in ponds, lakes and channels areas.

Documentation: The CONSULTANT shall document the evaluation, revision methodology, and results in the technical report (Task 1.2.1.9).

2.1.3 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:

- 2017 Aerial Imagery
- Latest Approved Topographic Information (2019 DEM)
- The DISTRICT Guidance Documents
- Public Interest

The CONSULTANT conducted a preliminary review of the ERPs in the watershed from the DISTRICT's ERP shapefile. The review identified:

- 370 ERPs total

Date Certain: The Date Certain is anticipated to be the project's aerial imagery collection date February 7, 2019. With the exception of the specific projects/developments identified in Task 2.1.2, it is anticipated at this point that developments that are not substantially constructed as of the date certain will not be included in the model.

New Update Areas: The CONSULTANT will identify the areas of new development/construction based on review of the imagery, terrain, ERP features, and current model network. A polygon feature class will be developed to define the boundaries of the planned model update areas.

ERP Needs Comparison: The CONSULTANT shall compare the list of ERPs and roadway plans to be incorporated with the available scanned files provided by the DISTRICT. Additionally, the CONSULTANT will identify ERPs that may contain structure data but are not legible and will notify the COUNTY of additional collection efforts, if needed.

Data Cataloguing: The current model data set does not clearly and consistently identify the sources of information for each hydraulic feature. The existing reference documents will need to be catalogued for easy accessibility throughout the project and identification of verification needs. Reference documents (e.g., construction plans, record drawings, permit information, etc.) are cataloged in both an excel table and related GIS polygons. The excel table includes a reference ID for each document folder; this is typically the ERP permit application number, however if data is obtained from another source a reference ID is manually assigned. The excel document includes details such as the project name, vertical datum, and legibility.

- It is estimated that there are approximately 740 reference documents (from ~370 ERPs) that will require cataloguing.
- The excel file will be used to populate the RefDocs feature class (or joined to it).
- With respect to vertical datums, if the reference document does not indicate the datum, it will be assumed that the datum is NGVD29 if the source is before a specific date (e.g., 2006) to be

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discussed with the COUNTY. After that date, the CONSULTANT will compare the ERP inverts to the DEM at minimum of 2 locations to identify the assumed vertical datum. It is assumed that approximately 20% of the reference documents will need to be checked against the DEM.

- A polygon will be established for each reference document which facilitates retrieval and review of the information as needed during the course of the project. Typically, the ERP shape will be used as the polygon. If no shape feature is already established, one will be drawn based on the extent of the project in the data set.

Georeferencing: The CONSULTANT shall geo-reference, in GIS, pertinent construction plan sheets from ERPs which are to be incorporated into the watershed model. These georeferenced sheets will be used in subsequent tasks for catchment development, topographic refinement, and HydroNetwork and HEP Network development.

The budget for this task assumes that up to 740 reference documents (from ~370 ERPs) will be reviewed and that 100 or fewer will be georeferenced.

2.1.4 Initial GIS Processing

The CONSULTANT shall perform initial GIS processing using the DISTRICT's Arc Hydro workflow to provide initial catchments based on the latest approved DEM. A significant portion of the model network was previously developed throughout the Roosevelt Creek Watershed, so it is not anticipated to be necessary to develop surface connectivity, develop preferential flow paths, change individual link flow directions, and incorporate linear structures. The preliminary catchments schematic will be a raw schematic that will be used as reference information in later tasks to develop subbasins in new development areas, evaluate the current subbasin delineations, and make changes where needed.

2.1.5 Hydrologic Characteristics and Recharge

The CONSULTANT shall examine hydrologic characteristics of the watershed. Integration of the surface water model with groundwater is anticipated for this project. The CONSULTANT shall review the following information and develop an approach to integrating the groundwater component using the available information:

- DEM
- Soil Map
- Potentiometric Surface Map
- ERP and Roadway Plans
- Site-Specific Information, if any
- NRCS Soil Data
- Well Data
- Surficial Aquifer Data (per FGS and WMD regional data)
- Evapotranspiration Data
- Potentiometric Surface Maps (FDEP and SWFWMD)
- Surficial Aquifer Base DEM (FGS)
- Crop Coefficient Data (FAO and IFAS)
- Reference Evapotranspiration (USGS)
- Surficial Aquifer Well Data (COUNTY and SWFWMD)

It is anticipated that the groundwater data will be available from the sources above. Geotechnical investigation is not included in this scope of work. The aquifer data will be evaluated to determine if leakage should be accounted for in the groundwater model. In addition, the development of the surface

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water model will take into account the groundwater model needs to accurately model the surface water-groundwater interaction. Consequently, the surface water and groundwater model data development will be closely coordinated.

2.1.6 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)
- Lake levels
- Historic water levels
- Flood photos
- Flooding complaints
- Stream gage data
- Rain data

Field Data Collection: Field collection of high water mark data is not included in this scope of work but may be added as an additional task if the opportunity arises.

SWFWMD HWL Database: The DISTRICT's Historic Water Level database will be used along with any additional information provided by the COUNTY. The CONSULTANT will review the information provided, develop a point feature class (*KnownFlooding*) to represent the flooding, and hyperlink the flooding photos and complaint records to the point features. The *KnownFlooding* feature class will have the same schema as the DISTRICT's Historic Water Level database to facilitate future data migration by the DISTRICT if desired.

Meeting with Stakeholders to Discuss Flooding Concerns: The CONSULTANT will then conduct a web-based meeting with the COUNTY, DISTRICT, and other stakeholders to confirm the locations of all known flooding concerns and the locations of any and all known historic water mark data.

Flood Documentation Figures: A series of figures will be created that present the flooding complaints and photos along with associated dates for the various points throughout the watershed.

Notes on Known Flooding Conditions: Based on the CONSULTANT's previous review of available flooding documentation within the Roosevelt Creek watershed, most of the documented flooding has occurred on the west side of the watershed, near the City of Pinellas Park. SWFWMD has only one historic flood location documented within the watershed (at 40th St. N). The CONSULTANT reviewed the County's pipe inventory and determined there are no identified "hotspots" within the Roosevelt Creek watershed. The CONSULTANT previously contacted several of the stakeholders within the watershed to get input on flooding conditions in their areas. Pinellas County did identify that flooding is commonly observed along Automobile Boulevard (south of Ulmerton Road) and at the Public Works facility along 126th Avenue N. The City of Pinellas Park confirmed that flooding occurs in area south of Ulmerton Road and north of 118th Avenue N, between 4th Street and 49th Street N. Flood photos were provided by various stakeholders from within the watershed. The City of Pinellas Park provided flooding photos for various locations within their community and a local business, The Brett Company, provided flooding photographs of significant flooding that they have observed within the watershed.

2.1.7 Existing Model Data Migration

The existing conditions Roosevelt Creek model was last developed/updated in 2006 (Roosevelt Creek Watershed (L068) Watershed Evaluation Report, September 2006). The associated GIS is not in the GWIS format and will need to be updated to GWIS version 2.1 before the acquisition of data begins. The

CONSULTANT has previously migrated the spatial GIS data into a GWIS geodatabase during previous work on the County Wide Flood Forecasting model development, but the related data tables remain unpopulated. The CONSULTANT will use ArcHydro tools to convert the XML exports from the existing ICPR3 model into GWIS (version 1.6) and manual manipulations of the data to correctly populate all of the data tables. The CONSULTANT will then convert the geodatabase from version 1.6 to version 2.1.

2.1.8 Existing Model Data QC Review

The existing conditions Roosevelt Creek model was last developed/updated in 2006 based on LiDAR data from 1999. The CONSULTANT will conduct a series of QC checks on the existing model input data (outside of the St. Pete model domain). Issues and discrepancies in the current model data will be documented. Addressing the issues will be conducted in subsequent tasks.

2.1.9 Preliminary Hydro-, Model-, and HEP Network Development

Current Model Features: The current model only includes the Model Network, not the Hydro or HEP Networks. The CONSULTANT will develop HydroNetwork features and HEP Network features for all of the structures (e.g., pipes, drop structures, weirs, etc.) in the current model (excludes non-modeled secondary drainage features). Assumptions:

- 255 pipes
- 69 drops structures
- 9 structural weirs
- 85 channels

Current Model Feature Sub-Types: Feature sub-types are used by the modelers to facilitate model changes and for QC reviews. The CONSULTANT will add subtypes (to the ADDL_MODEL_DATA table) for the currently modeled features such as the following:

- Nodes: Wet pond, dry pond, wetland, channel node, junction, etc.
- Link: Structural weir, overland weir, etc.
- Subbasin: Conventional, orphan, etc.

New Model Features: In the areas of new development and in any currently modeled areas that require further discretization, the CONSULTANT will develop the HydroNetwork, Model Network, and HEP Network features. Assumptions:

- Up to 60 new structural links (update areas only)
- Up to 35 existing structural links to modify (remaining areas; approximately 10% of overall 333 structural links)

Notes:

- The above tasks will be conducted concurrently with **Task 2.1.10**.
- The referenced features will only be developed for the primary drainage system features (not collection systems).
- This effort only includes the spatial development of the referenced features. The hydraulic feature data will be populated under **Task 2.1.10**.

2.1.10 Initial Desktop Data Acquisition

Initial Data Capture: The ERP data provided by the COUNTY and/or DISTRICT (e.g. record drawings, construction plans, etc.) at the beginning of the project will be reviewed in detail at this time. All data for the HEP Network (aka Primary Network) will be collected and input into the project's GWIS Geodatabase in the applicable GWIS tables (e.g. PIPE_BARREL, WEIR, etc.). The source of the information will be documented in the ADDL_MODEL_DATA table.

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Add Bleed-Down Structure Data to Currently Modeled Structures: Including orifices (or bleed down features) in control structures will be a necessary component of the integrated surface water – groundwater model. The CONSULTANT will research the available reference documentation (ERPs) and enter the orifice (bleed down feature) data for the currently modeled control structure features. Assumption: up to 88 structures.

Initial Subbasin Delineation - New (Update Areas): Subbasins in the update areas will be developed using the project DEM, ArcHydro-derived catchments, HydroNetwork, and available reference documents (e.g., infrastructure database, record drawings, etc.). Assumptions:

- Up to 50 new subbasins (update areas only)

Initial Subbasin Review and Revision (Remaining Areas): 100% of the current subbasins in the remaining model areas (excluding the area within St. Pete city limits) will be reviewed and revised based on the project DEM, ArcHydro-derived catchments, HydroNetwork, and available reference documents. Assumptions:

- 323 subbasins to review (remaining areas, total number of subbasins: 323)
- Up to 160 subbasins to revise (remaining areas; approximately 50% of current 323 subbasins)

Desktop Data Verification: The current model includes the following approximate number of hydraulic structures/features:

- Pipes: 255
- Drop Structures: 69
- Structural Weirs: 9
- Bridges: 0
- Nodes: 348

The CONSULTANT will review the source data for approximately 100% of the hydraulic structures (up to the quantities shown above) and confirm that the model data accurately reflects the information in the source reference documents. Any discrepancies will be corrected. The ADDL_MODEL_DATA table will be updated to reflect the appropriate RefDoc ID, source type, element subtype, and any field data acquisition needs. Pond normal water level (NWL) and wetland seasonal high water table (SHWT) elevations will be captured where available as well. These will be used in a subsequent task for confirming/re-setting initial conditions and will be important to facilitating model calibration in the future.

Field Data Acquisition Needs: Additional data acquisition efforts (e.g. survey, field verification, etc.) will be identified at this point and indicated in the ADDL_MODEL_DATA table which is related to the HydroNetwork features. These features are developed as part of **Task 2.1.9** for use in the field data acquisition, the GWIS database, and for eventual documentation of the acquisition process. The preliminary HydroNetwork with HydroJunction and HydroEdge feature classes will be further developed under a subsequent task upon completion of field data acquisition.

2.1.11 Data Acquisition Plan

Upon completion of the above referenced tasks, the CONSULTANT shall develop an approach for data acquisition, such as field reconnaissance and survey for structures not included or not legible on ERP plans. This watershed specific approach shall identify locations where collection will occur and detail the methods of collections. The CONSULTANT shall also document level of accuracy for acquisition of additional spatial information. It is anticipated that vertical referencing to LiDAR derived data points on hard surfaces will be acceptable. Field survey may also 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 (e.g. LiDAR, as-Built drawings). GPS surveying may involve Real-Time Kinematic (RTK) units

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or Differential GPS (DGPS) depending on the circumstances. The appropriate level of accuracy for the information to be gathered will be evaluated by the CONSULTANT in close consultation with the COUNTY and must be approved by the COUNTY and DISTRICT prior to field data acquisition.

2.1.12 Task Memorandum

The CONSULTANT shall document the efforts involved in **Tasks 2.1.1 through 2.1.11**. The document shall include, but not be limited to, the following:

- Watershed Boundary and Surroundings
- Major Conveyance Systems and Drainage Patterns
- List of ERP and Roadway Plans to Incorporate
- Initial GIS Processing
- Topographic Voids Locations
- Methodology to Eliminate Topographic Voids
- Landuse Distribution by Cut-off Date
- Soil Parameterization (Vertical Layer and Green-Ampt)
- Groundwater Model Approach
- Historical Water Levels
- Potential Data Issues
- Data Acquisition Plan including Field Data Acquisition Accuracy Approach

This memorandum will be provided in an electronic format (PDF) only.

2.1.13 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.

2.1.14 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote web-based meeting, unless otherwise specified, will be conducted on a monthly basis between the DISTRICT, CONSULTANT, and COUNTY. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

Management of the Team: This sub-task includes time for the SAI Project Manager to properly manage the team (SAI staff and sub-consultants) to keep the project on schedule and in budget.

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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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 2.1 Deliverables

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

2.2 Hydrologic and Hydraulic Feature Database

2.2.1 Acquisition of Data

The CONSULTANT shall perform data acquisition based on the approach developed in **Task 2.1.11**. This includes conducting field reconnaissance and survey to locate, verify, and/or parameterize hydraulic and verify/evaluate drainage divides and patterns.

Additional Desktop Data Acquisition: During the course of the watershed project additional reference documents (e.g., record drawings) will typically be obtained and cataloged. It is anticipated that the additional information obtained will be very limited.

Access Requirements Identification and Coordination: 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.

Field Reconnaissance Preparation: A sequencing plan will be developed for all structures to be addressed through field verification and/or engineering-level survey. Complete sets of field forms and maps will be prepared.

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Field Verification/Measurement: Two-person teams will visit each of the hydraulic structures identified for field verification/measurement in the **Task 2.2.11** data acquisition approach. The field teams will photograph, video, record measurements and descriptions (e.g. dimensions, shape, material, condition, end treatments, description of accessibility, maintenance issues, etc.), and document GPS coordinates at the inspected hydraulic feature. Sketches will be prepared for complex structures. If vertical elevations measurements are required, the field teams will document the requirement, and mark/photograph the locations for vertical elevations collection (control structures only) by others. It is assumed that up to 152 structures will require field verification/measurement. In addition, the budget for this task assumes drainage features and structures are reasonable to access. Note: The CONSULTANT shall document any immediate maintenance needs and notify the COUNTY.

Drainage Pattern Verification: Catchments were delineated in the office using various existing datasets including the project DEM, aerial imagery, County asset inventory data, and site development plans (ERPs), where available. It is anticipated that there will be locations where analyses of the existing datasets are inconclusive or did not provide information sufficient to determine drainage patterns. Two-person teams will visit these locations and look for drainage patterns, divides, and absence or presence of hydraulic or topographic features that may change the boundary. The findings will be documented with photographs and field notes. This subtask assumes up to 4 days of field reconnaissance for two people

Field Data Post Processing: Following completion of the field data collection efforts, the data will be reviewed, the field forms will be finalized, the photograph files will be renamed based on the HYDROCODE_DESC, a FieldRecon point feature class will be developed based on the GPS coordinates, the photos will be captioned, and the completed data sets for each feature will be combined into a single PDF, named based on the HYDROCODE_DESC, and hyperlinked to the Hydro and HEP Networks.

Incorporation of the Acquired Field Data: Following completion of the field data acquisition efforts and QC of the data sets, the data will be migrated to the project GWIS GDB. In addition, the field data acquisition requirements will be updated in GIS to reflect any remaining data acquisition needs (primarily survey by a PLS/PSM).

Data Acquisition Plan Update: Following the completion of the field verification and measurement efforts, the Data Acquisition Plan will be updated to indicate the survey needs and completed field verification efforts.

Survey by a PSM: Based on the updated survey needs, a PLS survey scope will be developed and a quote obtained from Suncoast Surveying (member of the SAI Team). The surveyor's scope of work will indicate that the survey deliverables will be required to meet the COUNTY's and DISTRICT's survey specifications. After approval of the survey proposal by the COUNTY, the CONSULTANT will authorize the survey efforts. The Surveyor will be required to provide weekly progress updates to CONSULTANT. The Surveyor's final deliverables will include certification information and QC documentation. The initial survey budget is estimated at \$30,000 but the final survey costs will be based on the actual survey needs.

Note: Additional field reconnaissance and survey can be provided for an additional fee with written concurrence from the COUNTY and DISTRICT if the need arises.

2.2.2 HydroNetwork Development

HydroNetwork Update: 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 will update the HydroNetwork with information collected from **Task 2.2.1**.

HEP Network Update: The HEP Network is used to define sub elements (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 update the HEP Network features with information collected from **Task 2.2.1**.

Data Capture: The related relevant data tables will be populated based on the information collected from **Task 2.2.1**. However, this task does not include establishing parameter values such as coefficients, Mannings roughness, etc. Parameterization will take place under a subsequent task.

2.2.3 Topographic Information Refinement (NOT INCLUDED)

Since recent LiDAR is being used for this project, additional topographic data refinement is not anticipated or included in the scope of work.

2.2.4 Hydrologic Feature Database

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

- Data Collection Cut-off Date
- Aerial Imagery
- ERPs and Roadway plans
- Site-Specific Information
- Latest NRCS soil information

The CONSULTANT shall develop a generic lookup table for the watershed to include landuse and soils parameters.

2.2.5 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.

2.2.6 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as

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compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

Pre-Submittal Meetings: 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.

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.

Task 2.2 Deliverables

- A. *Refined topographic information (updated "Engineered Surface")*
- B. *GWIS geodatabase containing feature classes from previous tasks and the following feature classes and tables:*
 - *HydroNetwork (HydroJunctions and HydroEdges)*
 - *HEPs*
- C. *Updated landuse map and lookup table*
- D. *Updated soils map and lookup table*
- E. *Project specific QA/QC document*

2.3 Preliminary Model Features

2.3.1 Additional GIS Processing

When deemed necessary, the CONSULTANT shall perform additional GIS processing to update the catchment features. ArcHydro tools will be used to the extent that it is beneficial to develop/refine the model subbasins. Manual methods will be used where appropriate (e.g., dense development with extensive subsurface drainage networks).

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**. This task should follow the DISTRICT Guidelines and Specifications 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 evaluate adjacent watershed models for boundary conditions. When applicable, the CONSULTANT will coordinate with the COUNTY or other agencies to obtain boundary information.

This task includes the development of the Model Network (nodes, links, and subbasins) and population of sub-type information in the ADDL_MODEL_DATA table. The model naming convention will be consistent with the previous Roosevelt Creek model.

Subbasin Refinement: Subbasins will be further refined based on the additional data collection efforts of **Task 2.2.1**, the project DEM, ArcHydro-derived catchments, the updated HydroNetwork, and available reference documents. Assumptions:

- Up to 25 subbasins to be revised/added

Model Network Refinement: The model network elements will be further refined based on the additional data collection efforts of **Task 2.2.1**, the updated HEP Network, and available reference documents. Assumptions:

- 40 hydraulic features to be revised/added

Surface Water: The overland flow conditions in the Roosevelt Creek watershed were previously reviewed to determine the suitability for modeling 2D overland flow. It was determined that this watershed is not a good candidate for 2D overland flow modeling. The watershed is highly developed with a significant amount of underground pipe networks that convey surface water. Although the surface model will be modeled as 1D, an overland flow region will be developed with mapped basins. Additionally, several 2D features will be incorporated into the overland flow region in order to model the surface water-groundwater interaction. These include, but are not limited to—

- Pond Control Volumes
- Channel Control Volumes
- Breaklines
- Breakpoints.

Groundwater: Based on review of the drainage network, terrain, NRCS soils data and recent studies in the area, groundwater conditions in the Watershed are likely to be affected by tidal cycles. The NRCS soils data suggest many areas exhibit a naturally shallow water table (i.e., 2 feet or less) as well. Consequently, future sea level rise (SLR) conditions are likely to reduce water table depths even further in many areas. The resulting reduction in soil storage can have significant impacts, both in the near future and beyond. For these reasons, a groundwater component of the model will be developed as part of the analysis.

Groundwater features such as breaklines and breakpoints will be incorporated into groundwater region(s) to provide adequate detail in the groundwater triangular mesh to model the surface water-groundwater interaction. Increased mesh detail is typically needed in depressional areas, ponds, lakes and channels where seepage or percolation is anticipated. If applicable, aquifer leakage data will also be incorporated into the groundwater model.

2.3.3 Model Parameterization Approach

The CONSULTANT shall develop and document the approach to parameterize model features developed in **Task 2.3.2**. It is anticipated that the approach will follow the methodology described in Section 2 of the District Guidelines and Specifications to develop and update the following hydrologic model parameters:

- Design, Multi-day, Calibration, and Verification Storms
- Rainfall Excess (Vertical Layers and Green-Ampt)
- Time of Concentration
- Node Storage
- Initial Condition
- Boundary Condition
- Channel
- Bridge
- Pipe
- Weir
- Drop Structure
- Groundwater Features and Parameterization
- Overland Flow Features

The proposed approach shall be included in the Watershed Evaluation Report in **Task 2.3.4**.

2.3.4 Watershed Evaluation Report

The CONSULTANT shall document the efforts involved in Watershed Evaluation. This report will be an expansion of the memorandum developed in **Task 2.1.12** with documentation of subsequent tasks up to this point. This report will be provided in an electronic format (PDF) only.

2.3.5 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.

2.3.6 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the

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performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

Pre-Submittal Meetings: 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.

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.

Task 2.3 Deliverables

- A. *Watershed evaluation report*
- B. *Refined topographic information*
- C. *GWIS geodatabase containing feature classes from previous tasks and the following feature classes and tables:*
 - a. *Preliminary model features*
 - b. *Other feature classes and tables, if applicable*
- D. *Project specific QA/QC document*

2.4 Peer Review of Watershed Evaluation

2.4.1 Peer Review Kick-off Meeting and Presentation

Draft Peer Review 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.

Final Peer Review Presentation: The CONSULTANT will address and incorporate the COUNTY's and DISTRICT's 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.

2.4.2 Peer Review Communication

During the peer review process, the peer review consultant may seek clarification and request additional information from the CONSULTANT. Responses and/or additional information requested from the

CONSULTANT, if any, shall be transmitted to the peer review consultant and COUNTY PM within 5 business days.

The CONSULTANT may seek clarification from the peer review consultant after receiving comments. Clarification requested from the peer review consultant, if any, shall be provided to the CONSULTANT and COUNTY PM within 5 business days.

2.4.3 Meeting - Discuss Approach to Responding to COUNTY/DISTRICT/Peer Review Comments

One web-based meeting with the COUNTY and the DISTRICT will be held to discuss comments on the watershed evaluation and the approach to address them.

2.5 Final Approved Watershed Evaluation Deliverables

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.

2.5.2 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.

2.5.3 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 2.5 Deliverables

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

3.0 WATERSHED MANAGEMENT PLAN – FLOODPLAIN ANALYSIS

3.1 Watershed Model Parameterization

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 Features
- Topographic Information
- Groundwater

This task includes the development of additional model features based on new information such as record drawings that were not previously available. Efforts included in this task: data collection, field verification (up to 1 day), documentation post-processing, and incorporation into the model.

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

The current scope of services does NOT include additional geotechnical investigation.

3.1.2 Development of Model Specific Geodatabase

The CONSULTANT shall develop watershed model parameters per the approach defined in **Task 2.3.3** of the Watershed Evaluation. When deemed necessary, and upon consultation with the County, the CONSULTANT may use a revised approach for certain parameters. The revised approach shall be documented in a revised version of the Watershed Evaluation report. The CONSULTANT shall store the parameterization information within a GWIS geodatabase in a format that can be imported into the model framework. Parameterization will include the following:

- Design, Multi-day, Calibration, and Verification Storms
- Rainfall Excess (Green- Ampt and Vertical Layers)
- Time of Concentration (for 1-D basins)
- Node Storage
- Initial Conditions
- Boundary Conditions
- Channels
- Bridges
- Pipes
- Weirs (structural)
- Weirs (overland flow)
- Drop Structures

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- Groundwater Features
- Overland Flow Features

Calibration/Verification Storm Selection: These storms will be selected through a review of the available gage data (stage and flow) within the watershed. The COUNTY and/or DISTRICT will be responsible for providing the available data. Gage data qualifiers and method of rating curve development for flow calculation will be reviewed for each gage. It may be necessary to contact the gage data managers at the DISTRICT and USGS to determine this information and reconcile any concerns. Calibration and verification efforts will not begin without the COUNTY's and DISTRICT's approval of the selected storms.

Assumptions:

- 1 calibration storm and 1 verification storm

Rainfall Excess: The Green-Ampt or Vertical Layers methods are anticipated to be used. The CONSULTANT will develop the associated runoff method parameters.

Time of Concentration: The CONSULTANT will develop times of concentration (TC) for all subbasins (current model and new) within the watershed. Assumptions:

- Up to 323 TCs for existing subbasins
- Up to 75 TCs for new subbasins

Node Storage: The CONSULTANT will recalculate stage-area relationships for all subbasins throughout the watershed using the new project DEM.

Initial Conditions: Initial conditions will be established for the surface water and groundwater using a continuous simulation no shorter than 5-years. The 25% stage exceedance from the continuous simulation will then be used as the initial conditions. The resultant level-pool floodplain plots will be reviewed for the reasonableness of the initial elevations. The water levels resulting from these simulations will be used to establish an initial water table surface that will then be used for subsequent simulations over the course of the project.

Boundary Condition Development: Node time series data (time-stage or time-flow) will also be developed for each simulated storm at boundary nodes along the watershed exterior. The Roosevelt Creek watershed is bounded by three watersheds: Cross Bayou, Sawgrass Lake, and Tinney Creek and also includes a portion of the City of St. Petersburg model which acts as a boundary to the Roosevelt Creek watershed. Conveyance interconnects will be identified and boundary stages and/or flows will be developed as needed. Initial locations will be determined based on SAI's County Wide Flood Forecasting model. Additional locations will be included if and as necessary. Along the boundary with Cross Bayou there are no known interconnects (i.e., culverts, drop structures, and ditches) that will need to be accounted for. There is only one anticipated interconnect with the Sawgrass Lake watershed, a double pipe crossing along MCI Drive. The time/stage data for this external boundary node, as well as any boundary data that is determined necessary for either the Cross Bayou or Sawgrass Lake watersheds, will be derived from the County Wide Flood Forecasting model. There are several interconnections (pipes, drop structures, and ditches/canals) between the City of St. Petersburg model and Roosevelt Creek. Each of these interconnects will be considered to make sure all connections are accounted for without duplicating conveyance. Data from the City of St. Petersburg model will be used to formulate time/stage data for boundary nodes within the Tinney Creek watershed, since this model is considered the best available data.

This task includes work to run adjacent watershed models to obtain appropriate boundary conditions for the design and calibration/verification storm events. At the direction of the County, the six required SLR scenarios (refer to Section 3.3.7) will not be simulated using the County-wide model or the St. Pete model.

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Finally, a boundary condition will be required at the Roosevelt Creek outfall to Tampa Bay for modeling purposes. Using the preliminary FEMA Flood Insurance Study (FIS) for Pinellas County (current best-available data), the 1-year stillwater elevation will be extrapolated at the nearest two FIS transects, then averaged. The determined 1-year stillwater elevation will be used for all design storm event model runs to account for joint probability (coastal and precipitation-based events). The 1-year stillwater elevation will be adjusted to account for SLR as described in Section 3.3.7. For comparison purposes, the mean high water elevation (MHW) will also be identified and presented to the County. However, MHW will not be used in the simulations as a boundary condition.

Assumptions:

- Up to 51 boundary nodes to establish times series data sets for each storm (41 current plus 10 new)

Channel Parameterization: This will involve cutting cross sections from the project terrain data, thinning sections, reviewing sections, combining sections with survey data, assigning Manning's values, calculating composite Manning's values, generating and hyperlinking PDFs for supporting documentation, and migrating the data to the GWIS GDB. This also includes the development of channel exclusion polygons. Assumptions:

- Up to 85 existing channels
- Up to 20 new channels
- Up to 55 existing cross sections
- Up to 30 new cross sections

Bridge Parameterization: Properly conditioned bridge curves will be developed for each bridge. The bridge curve development will be conducted using HEC-RAS and importing the resultant rating curves into ICPR4. Assumptions: Up to 1 bridge feature.

Pipes, Weirs (structural), Drop Structures: This effort involves calculating the associated losses and populating the remaining link parameters (e.g., solution algorithm, energy losses, inlet/outlet controls, etc.). Assumptions:

- Up to 333 existing structures
- Up to 75 new structures

Weirs (Overland Flow): New cross section line features will be developed from the new subbasin feature class for the entire model. Cross section data for each overland flow weir will be derived from the project DEM. Some of these overland flow weir locations may be better represented using a short channel link instead. The CONSULTANT will determine the most appropriate method to model overland flow throughout the watershed.

Groundwater Features Parameterization: Model development will involve the use of collected information mentioned above including data for aquifer base elevations, well and potentiometric levels, the hydro-corrected DEM, reference evapotranspiration, irrigation data and NRCS soils information. SWFWMD's "Soil Retrieving and Process Tool" developed by Lei Yang, PhD with the assistance of Harry Downing, PE will be used to help parameterize the model. The tool uses layered soil parameters in SSURGO and IFAS Soil Characterization data to calculate soils information needed for the ICPR model. Preliminary simulations are used to set initial water table levels within the soil column so that the resultant moisture profiles and available soil capacities can be calculated using the tool. The soil parameters derived by the tool (hydraulic conductivities, soil porosities, etc.) can then be directly incorporated as soils input data for ICPR4.

Note: The watershed contains both the Bridgeway Acres and Toytown Landfills. The landfill drainage systems and operations will be considered, and the groundwater management protocols will be incorporated if applicable. Additionally, the tool mentioned above will be used for the initial soil

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parameterization. These soil parameters as well as other groundwater parameters will likely be adjusted during the model calibration process.

Incorporate St. Pete Model: The CONSULTANT will incorporate the portion of the St. Pete model into the Roosevelt Creek WMP model.

Update Watershed Evaluation Report: The CONSULTANT will update the Watershed Evaluation Report to account for any changes in the approach to parametrization.

3.1.3 Model Setup, Debug, and Stabilization

Model Setup and Initial Simulation: 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

Flood Profiles and Level Pool Floodplains: Flood profiles will be developed for the main reaches for the above referenced storms. These flood profiles will be generated using ICPR4. The CONSULTANT will also develop the level pool plots for the following:

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

QC Review, Debug, and Stabilization: This is an iterative process until the model is deemed stable and representative of the existing conditions. 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
- Node and Cross Section Extrapolations
- Missing Interconnections (glass walls)

Initial Conditions: Finalizing initial stages is also part of the stabilization and will be conducted once the model has been debugged and preliminarily reviewed for instabilities.

3.1.4 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.

3.1.5 Project Management and Quality Assurance/Control

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming

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milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 3.1 Deliverables

- A. *Updated Watershed Evaluation Report*
- B. *Model Input/output Files*
- C. *Project Specific QA/QC Document*
- D. *GWIS Geodatabase*
- E. *Geodatabase containing level-pool floodplain plots*

3.2 Final Approved Watershed Model Parameterization Deliverables

3.2.1 Revised Deliverables

Within sixty (60) days of receiving the COUNTY review comments, the CONSULTANT shall address the COUNTY's review comments, and resubmit watershed model parameterization deliverables to the COUNTY.

3.2.2 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.

3.2.3 Project Management and Quality Assurance/Control

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming

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milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 3.2 Deliverables

- A. *Revised Watershed Model Parameterization Deliverables (GWIS, Model input/output, supporting documentation, TSDN, report, etc.)*
- B. *Response to Comments Geodatabase*
- C. *Project Specific QA/QC Document*

3.3 Watershed Model Development and Floodplain Delineation

3.3.1 Model Calibration and Verification

The CONSULTANT will calibrate and verify the ICPR model to two (2) different rainfall events developed in the watershed evaluation task. If necessary, the CONSULTANT will adjust model parameters and rerun the model to evaluate results against readily available and suitable observations as part of the calibration. The CONSULTANT will then evaluate a second rainfall event as part of the varication analysis. Model calibration and verification shall consider the spatial distribution of rainfall. The calibration and verification rainfall will be based on the DISTRICT's NEXRAD rainfall data, which will be compared to rain gages in the watershed.

Surface Water Calibration: These may include:

- PRF (256 was reduced to 128 for Cross Bayou)
- Manning's roughness for overland flow
- Initial abstraction
- Soil properties: Kv, MCsat, MCfield

Groundwater Calibration: Based on available surficial aquifer well information.

- Parameters include: Kh, Fillable Porosity, Leakage

Calibration Metrics: Success of calibration will include statistical evaluation of the results including the following metrics.

- Correlation coeff (R)
- Coeff of Determination (R²)
- Mean error (ME)
- Mean Absolute Error (MAE)
- Root Mean Square Error (RMSE)
- Nash-Sutcliffe Model Efficiency Coeff (N-S)

3.3.2 Model Validation

The model simulation results will be assessed for accuracy and reasonableness with historic water levels, if any, available in the study area 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. This is a qualitative assessment of the model results versus historic flood documentation as a whole.

3.3.3 Design Storm Simulations

The CONSULTANT shall simulate the following 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
- 100-year, 5-day events using the DISTRICT's 120-hour distribution

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

If directed by the COUNTY, 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.

To delineate the 100-year floodplain, a rainfall event of duration longer than 1-day may be used if historic water levels developed in **Task 2.1.6** provide evidence that longer durations better represent the 100-year flood risk.

3.3.5a Floodplain Delineation

The CONSULTANT shall delineate the floodplain based on digital topographic information and model predicted peak stages of 100-year and 500-year storm event(s). The final product of this task shall be floodplain mapping that meets FEMA standards for updating the existing DFIRMs. Approach of mapping transition zones shall be documented in **Task 3.3.6 - Floodplain Justification Report**.

3.3.5b Floodway Development (NOT INCLUDED)

3.3.6 Floodplain Justification Report

The CONSULTANT shall document the efforts involved in **Tasks 3.3.1 through 3.3.5**, and merge with the discussion into the Watershed Evaluation report to develop this Floodplain Justification Report.

3.3.7 Sea-level Rise (SLR) Scenarios

The CONSULTANT will model and map the six scenarios for sea-level rise (SLR) shown below. As part of the SLR scenario evaluations, the CONSULTANT will modify the boundary conditions and initial stages, as appropriate. Long term simulations may be used to produce groundwater (GW) surfaces based on exceedance probabilities – one for historical tides and another for historical tides plus SLR. These GW surfaces could also be used as initial groundwater table (GWT) surfaces (e.g., 25% exceedance)". Note: At the Direction of the County, the adjacent available models will be used within simulating the referenced SLR scenarios. Only the coastal boundary to the Roosevelt Creek watershed will be revised to reflect the SLR scenarios below.

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Scenario	Storm Event	SLR Scenario
1	100-year 24-hr	Intermediate-Low Scenario (1.9 ft. of SLR from 2000-2100)
2	100-year 24-hr	Intermediate Scenario (3.9 ft. of SLR from 2000-2100)
3	100-year 24-hr	High Scenario (8.5 ft. of SLR from 2000-2100)
4	25-year 24-hr	Intermediate-Low Scenario (1.9 ft. of SLR from 2000-2100)
5	25-year 24-hr	Intermediate Scenario (3.9 ft. of SLR from 2000-2100)
6	25-year 24-hr	High Scenario (8.5 ft. of SLR from 2000-2100)

3.3.8 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.

3.3.9 Project Management and Quality Assurance/Control

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 3.3 Deliverables

- A. *Floodplain Justification Report*
- B. *100-Year & 500-Year Flood Depth Grid*
- C. *Model Input / Output Files*

D. Project Specific QA/QC Document

E. Updated GWIS Geodatabase

3.4 Peer Review of Watershed Model Development and Floodplain Delineation

3.4.1 Peer Review Meeting and Presentation

Draft Peer Review 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 Model Development and Floodplain Delineation tasks 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.

Final Peer Review Presentation: The CONSULTANT will address and incorporate the COUNTY's and DISTRICT's comments into the final PowerPoint presentation. The CONSULTANT will then deliver the presentation in an in-person meeting 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.

3.4.2 Peer Review Communication

During the peer review process, the peer review consultant may seek clarification and request additional information from the CONSULTANT. Responses and/or additional information requested from the CONSULTANT, if any, shall be transmitted to the peer review consultant and County PM within 5 business days.

The CONSULTANT may seek clarification from the peer review consultant after receiving comments. Clarification requested from the peer review consultant, if any, shall be provided to the CONSULTANT and County PM within 5 business days.

3.4.3 Meeting - Discuss Approach to Responding to COUNTY/DISTRICT/Peer Review Comments

One web-based meeting with the COUNTY and the DISTRICT will be held to discuss comments on the watershed evaluation and the approach to address them.

3.5 Approved Floodplain Analysis Deliverables for Preliminary Floodplain Open House

3.5.1 Revised Deliverables

Within sixty (60) days of the meeting to present peer review comments (**Task 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. This scope of work and associated fee estimate assumes changes to the model will be limited and that re-calibration and re-verification will not be required.

3.5.2 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.

3.5.3 Project Management and Quality Assurance/Control

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 3.5 Deliverables

- A. *Responses to Comments Geodatabase*
- B. *Revised Deliverables*
- C. *Project Specific QA/QC Document*

3.6 Preliminary Floodplain Open House and Response to Public Comments

3.6.1 Preliminary Floodplain Open House

The CONSULTANT will assist the COUNTY with conducting a preliminary floodplain open house. Assistance consists of preparing meeting materials, such as pdfs of floodplain maps, and attendance of up to three (3) professionals at one meeting, 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 provide up to four (4) 24" x 36" mounted hard copy maps (e.g. Foamboard). Additionally, the CONSULTANT will develop a web-based map that depicts the floodplains that will be presented at the open house.

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 to the CONSULTANT. The CONSULTANT will compile the public comments in a Comments geodatabase.

The CONSULTANT shall review and provide the COUNTY with responses to public comments and update Task 3.5 deliverables as necessary. Response to public comments will not include providing copies of floodplain maps.

3.6.3 Meeting - Discuss Approach to Responding to Public Comments

After the CONSULTANT has provided the COUNTY with a compiled public response database, the CONSULTANT will conduct a web-based meeting to discuss the approach to revising deliverables considering the public comments.

Task 3.6 Deliverables

- A. Attendance at Public Open House
- B. Response to Public Comments
- C. Approach to revising deliverables meeting

3.7 Final Approved Floodplain Analysis Deliverables

3.7.1 Revised Deliverables

Within thirty (30) days after the completion of Task 3.6, the CONSULTANT shall resubmit the full floodplain analysis deliverables to the COUNTY in final format, including floodplain transition zones. This scope of work and associated fee estimate assumes changes to the model will be limited to the hours shown in the fee schedule and that re-calibration and re-verification will not be required.

3.7.2 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.

3.7.3 Project Management and Quality Assurance/Control

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 3.7 Deliverables

- A. *Sign and Sealed Floodplain Justification Report*
- B. *PowerPoint Presentation*
- C. *Revised Final Deliverables*
- D. *Project Specific QA/QC Document*

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

4.1 FPLOS Determination and Flood Damage Estimation

4.1.1 Methodology Meeting

A meeting will be conducted between the COUNTY, the CONSULTANT, and the DISTRICT, if needed, to discuss the methodology to be used to evaluate flood protection level-of-service and flood damage estimates for each basin. It is anticipated that the COUNTY's level-of-service, as defined in the Comprehensive Plan or elsewhere in County regulations, will be used as the basis for the FPLOS determination.

4.1.2 FPLOS Determination

The CONSULTANT will designate the flood protection level-of-service (FPLOS) throughout the watershed based on the methodology and criterion agreed upon during **Task 4.1.1**. The CONSULTANT will create a GWIS feature class documenting the results of the FPLOS analysis. The FPLOS documentation will also include an estimate of the number of habitable structures within floodplain areas by reviewing aerial photography.

After the FPLOS determination is complete, the CONSULTANT will analyze structure and roadway flood damages. Damage estimates for structure and roadway flooding will be analyzed independently. The CONSULTANT will work with the COUNTY to evaluate if the damage calculations in the DISTRICT BCA tool will be sufficient. If needed, limited updates to the spreadsheet tool will be made prior to completing the damage estimates.

4.1.3 FPLOS Analysis Report

The CONSULTANT shall document the efforts involved in **Tasks 4.1.1 through 4.1.2** in the FPLOS Analysis Report.

4.1.4 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.

4.1.5 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

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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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 4.1 Deliverables

- A. *FPLOS analysis report*
- B. *Flood depth grids for LOS design storms*
- C. *Model input/output files for design storms required by FPLOS determination methodology*
- D. *Geodatabase containing:*
 - a. *Model simulation results*
 - b. *Inundation polygons*
 - c. *FPLOS designations*
- E. *Flood damage estimate spreadsheets*
- F. *Project specific QA/QC document*

4.2 Surface Water Resource Assessment (SWRA) and Best Management Practices (BMPs) of Water Quality

4.2.1 Surface Water Resource Assessment Approach - Water Quality

Some waterbody identification (WBIDs) numbers within the Roosevelt Creek watershed have been determined to be impaired due to water quality standard exceedances.

Although there are tools available to evaluate individual BMPs (e.g., BMPTrains) and generalized pollutant loading can be evaluated in spreadsheets or GIS, ICPR4's water quality module tracks the movement of pollutants for entire watersheds incorporating dynamic hydraulic and groundwater interactions along the way. An unlimited number of BMPs can be included in the drainage network. The methodology generates pollutant loads from catchments based on Event Mean Concentrations (EMCs) for user defined constituents and then delivers the loads to nodes. Links then move the pollutants through the drainage system removing pollutants through groundwater seepage and other user-defined removal mechanisms.

SWRA Approach Development: The CONSULTANT will develop an approach to the surface water resource assessment (SWRA) that is specific to the watershed and submit this approach to the COUNTY for approval before beginning the surface water resource assessment analysis task. This memorandum will also present the data compilation and data analysis methodology.

Meeting to Discuss Approach: The CONSULTANT will conduct a web-based meeting with the COUNTY, the DISTRICT, and other stakeholders to discuss the analysis of the available data and the recommended approach to conducting the SWRA. The CONSULTANT shall discuss with the COUNTY the list of pollutants to be assessed. Pollutants to be assessed will include, but not be limited to the following:

- Total Nitrogen (TN)
- Total Phosphorus (TP)
- Total Suspended Solids (TSS)

The consultant will document the discussions at this meeting and submit them to the COUNTY in the form of meeting minutes (draft then final).

SWRA Approach Revisions: The CONSULTANT will revise the SWRA Approach memorandum based on the results of the discussion with the COUNTY and the DISTRICT.

4.2.2 Water Quality Assessment

Detailed Data Collection and Analysis/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. The Roosevelt Creek 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 nonpoint discharges, extent of existing stormwater runoff treatment, and base flow. The assessment will include a comparison against criteria (e.g., NNC), as well as a discussion of the appropriateness of the criteria. As part of a subsequent task, the assessment will be used along with the pollutant loading model to guide in the development of water quality BMPs. The CONSULTANT anticipates collecting data for the following sources from the COUNTY and listed regulatory agencies:

- Pinellas County rain and stream gages, if available (and USGS)
- Pinellas County Phase-I NPDES-MS4 permit
- SWFWMD's Water Management Information System (WMIS)

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- SWFWMD Potentiometric Elevation Data
- FDEP's Storage and Retrieval (STORET) Database
- FDEP's Watershed Information Network (WIN) Database
- FDEP's Waterbody Identification (WBID) basin shapefiles for WBIDs within the watershed
- FDEP's Impaired Water Rule (IWR) Database
- FDEP Wastewater Facility Regulation (WAFR)
- US Geological Survey (USGS) National Water Information System (NWIS)
- Florida Department of Health (FDOH) septic tank GIS Database
- Pinellas County Sanitary Sewer Service Area Map/Atlas
- Event Mean Concentrations (FDEP and SWFWMD)
- Water quality sampling information
- Water Quality Data (COUNTY)

Field Reconnaissance: The CONSULTANT will conduct up to two (2) days of field reconnaissance to identify potential sources of pollutant loads not readily available as part of the desktop assessment as well as to identify potential BMP locations.

4.2.3 Existing Conditions Pollutant Loading Analysis

The CONSULTANT will develop pollutant loading estimates for total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) using the water quality module of ICPR4. This will involve a long-term simulation (probably 15-20 years) to estimate average annual loads. Pollutant loads will be reported and mapped by subbasin. The budget for this task assumes:

- Drainage subbasin delineations are sufficiently detailed (outfall basis or small sub-area basis) that further delineation is not needed
- ERP coverages and high-resolution aerials allow us to quickly assign a standard BMP on those served areas
- Existing BMPs will be assumed as: None, Wet Detention with std. 14-day residence time, Dry Ret (1/2" treatment)

The data collection, data analyses, model development methodology, results, and interpretation of results will be summarized in **Task 4.2.4**.

4.2.4 SWRA of Water Quality Report

The CONSULTANT shall document the efforts involved in **Tasks 4.2.1 through 4.2.3** in a SWRA of Water Quality report.

4.2.5 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.

4.2.6 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

Task 4.2 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

4.3 Alternatives Analysis and Recommendations (FPLOS and SWRA)

4.3.1 Alternatives Analysis and Project Ranking

Site Selection Meeting: A remote meeting, unless otherwise specified, will be conducted between the CONSULTANT, the COUNTY, and the DISTRICT to select a list of locations where alternatives analysis will be performed. The CONSULTANT shall prepare a preliminary list of locations prior to the meeting. The selection shall be based on, but not limited to, the following:

- FPLOS Designation
- Water Quality Impairments
- Natural Systems Restoration areas
- Documented Flooding Problems and Complaints
- Drainage System Classification (Regional vs. Intermediate)
- Anticipated Flood Damage
- Logical Precedence (Downstream vs. Upstream)
- Availability of property/Right of way

Conceptual BMP Development, Analysis, and Ranking: The CONSULTANT will develop best management practices (BMP) alternatives analysis for up to fifteen (15) BMPs in the watershed. The

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CONSULTANT shall recommend projects that address flooding and SLR, improve water quality, and restore/create natural systems, where possible. The CONSULTANT will model the selected BMPs using ICPR, if appropriate, and will estimate the pollutant load reductions for the BMPs. The gross cost to reduce the pollutant loads will be estimated using a single estimated dollars-per-pound removed per constituent. The CONSULTANT will rank the alternatives using the COUNTY's ranking tool. The ranking may also include an analysis of the proposed project for one of the SLR/Rainfall Depth scenarios in **Task 3.3.7**. The CONSULTANT will not provide construction plans or apply for conceptual ERP permits for the proposed BMPs. 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.

Note: The BCA and FPLOS will only be conducted for the most viable (ranked) alternatives.

Documentation: The CONSULTANT shall document the results of the analyses in the Alternatives Analysis and Recommendations Report.

4.3.2 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

4.3.3 Project Management and QA/QC

Bi-Weekly Progress Meetings: A remote web-based meeting (or phone call), unless otherwise specified, will be conducted on a bi-weekly basis between the COUNTY and the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned. Written bi-weekly progress updates will also be provided via email.

Monthly Progress Meetings: A remote meeting, unless otherwise specified, will be conducted on a monthly basis between the COUNTY, the DISTRICT, the CONSULTANT. During each meeting the CONSULTANT Project Manager shall report the work completed, actual progress as compared to the performance schedule in the TWA, work planned for the next month, upcoming milestones, project issues, any deficiencies and the recovery actions completed and planned.

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 project schedule. Details must include any deficiencies and the recovery actions completed and planned.

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.

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Task 4.3 Deliverables

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

V. COMPENSATION

Basic Services:

For the BASIC SERVICES provided for in this Agreement, the COUNTY agrees to pay the CONSULTANT as follows:

- A lump sum fee of six hundred forty-eight thousand, six hundred seventy-seven dollars and zero cents (\$648,677.00) for:

Watershed Management Plan Tasks		Cost
1.0	Project Development	\$13,498.00
2.0	Watershed Evaluation	\$247,383.00
3.0	Floodplain Analysis	\$248,213.00
4.0	FPLOS Determination, SWRA, Drainage Improvement Alternatives Analysis and Recommendations	\$139,583.00
Total		\$648,677.00

Contingency Services:

For any CONTINGENCY SERVICES performed, the COUNTY agrees to pay the CONSULTANT, a negotiated fee based on the assignment, up to a maximum amount not to exceed sixty-four thousand, eight hundred sixty-eight dollars and zero cents (\$64,868.00). Contingency services are subject to the prior written approval by the COUNTY.

Total Agreement:

Total agreement amount is seven hundred thirteen thousand, five hundred forty-five dollars and zero cents (\$713,545.00).

Roosevelt Creek WMP Fees	Cost
Basic Services	\$648,677.00
Contingency	\$64,868.00
Total	\$713,545.00

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VI. PROJECT SCHEDULE

CONSULTANT shall commence professional services upon written receipt of Notice to Proceed (NTP) from COUNTY. Based on the schedule below, the project completion is anticipated to take twenty-seven (27) consecutive calendar months from the notice to proceed. An updated project schedule in Microsoft Project format will be provided to the COUNTY within 30 days of the Notice to Proceed. The schedule assumes a 30-day turnaround for the COUNTY to review deliverables.

Task Number	Task Description	Start Month/yr	End Month/yr
1.0	Project Development	Nov 2020	Jan 2021
1.1	Kickoff Meeting	Nov 2020	Dec 2020
1.2	Data Collection and Initial Evaluation	Nov 2020	Jan 2021
1.3	Draft Project Plan	Dec 2020	Dec 2020
1.4	Final Project Plan	Dec 2020	Jan 2021
1.5	Project Management and Quality Assurance/Quality Control (QA/QC)	Nov 2020	Jan 2021
2.0	Watershed Evaluation	Nov 2020	Nov 2021
2.1	Assembly and Evaluation of Watershed Data	Nov 2020	June 2021
2.1.1	Drainage Pattern and Watershed Boundary	Nov 2020	Jan 2021
2.1.2	DEM Review, Topographic Void Update, and Hydro-correction	Jan 2021	Mar 2021
2.1.3	Areas of Development	Jan 2021	Feb 2021
2.1.4	Initial GIS Processing	Mar 2021	Mar 2021
2.1.5	Hydrologic Characteristics and Recharge	Feb 2021	Feb 2021
2.1.6	Historical Water Levels	Jan 2021	Jan 2021
2.1.7	Existing Model Data Migration	Jan 2021	Feb 2021
2.1.8	Existing Model Data QC Review	Feb 2021	Feb 2021
2.1.9	Preliminary Hydro-, Model-, and HEP Network Development	Feb 2021	Mar 2021
2.1.10	Initial Desktop Acquisition	Mar 2021	June 2021
2.1.11	Data Acquisition Plan	June 2021	June 2021
2.1.12	Task Memorandum	June 2021	June 2021
2.1.13	Pre-Submittal Meeting	June 2021	June 2021
2.1.14	Project Management and QA/QC	Jan 2021	June 2021
2.2	Hydrologic and Hydraulic Feature Database	June 2021	July 2021

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Task Number	Task Description	Start Month/yr	End Month/yr
2.2.1	Acquisition of Data	June 2021	July 2021
2.2.2	HydroNetwork Development	July 2021	July 2021
2.2.4	Hydrologic Feature Database	June 2021	June 2021
2.2.5	Pre-Submittal Meeting	July 2021	July 2021
2.2.6	Project Management and QA/QC	June 2021	July 2021
2.3	Preliminary Model Features	July 2021	Sept 2021
2.3.1	Additional GIS Processing	July 2021	July 2021
2.3.2	Preliminary Model Schematic	July 2021	Aug 2021
2.3.3	Model Parameterization Approach	Aug 2021	Aug 2021
2.3.4	Watershed Evaluation Report	Aug 2021	Sept 2021
2.3.5	Pre-Submittal Meeting	Sept 2021	Sept 2021
2.3.6	Project Management and QA/QC	July 2021	Sept 2021
2.4	Peer Review of Watershed Evaluation	Aug 2021	Oct 2021
2.4.1	Peer Review Kick-off Meeting and Presentation	Aug 2021	Sept 2021
2.4.2	Peer Review Communication	Sept 2021	Oct 2021
2.4.3	Meeting to Discuss Approach to Responding to COUNTY/DISTRICT/Peer Review Cmets	Oct 2021	Oct 2021
2.5	Final Approved Watershed Evaluation Deliverables	Sept 2021	Nov 2021
2.5.1	Revised Deliverables	Oct 2021	Nov 2021
2.5.2	Pre-Submittal Meeting	Nov 2021	Nov 2021
2.5.3	Project Management and QA/QC	Sept 2021	Nov 2021
3.0	Watershed Management Plan - Floodplain Analysis	Nov 2021	Dec 2022
3.1	Watershed Model Parameterization	Nov 2021	Feb 2022
3.1.1	Acquisition of Additional Model Parameters	Nov 2021	Nov 2021
3.1.2	Development of Model Specific Geodatabase	Nov 2021	Jan 2022
3.1.3	Model Setup, Debug, and Stabilization	Jan 2022	Feb 2022
3.1.4	Pre-Submittal Meeting	Feb 2022	Feb 2022
3.1.5	Project Management and QA/QC	Nov 2021	Feb 2022
3.2	Final Approved Watershed Model Parameterization Deliverables	Feb 2022	Mar 2022
3.2.1	Revised Deliverables	Feb 2022	Mar 2022

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Task Number	Task Description	Start Month/yr	End Month/yr
3.2.2	Pre-Submittal Meeting	Mar 2022	Mar 2022
3.2.3	Project Management and Quality Assurance/Control	Feb 2022	Mar 2022
3.3	Watershed Model Development and Floodplain Delineation	Feb 2022	July 2022
3.3.1	Model Calibration and Verification	Feb 2022	Apr 2022
3.3.2	Model Validation	Apr 2022	Apr 2022
3.3.3	Design Storm Simulations	Apr 2022	Apr 2022
3.3.4	Multi-Day Event Sims and Rainfall Justification	Apr 2022	Apr 2022
3.3.5	Floodplain Delineation	June 2022	June 2022
3.3.6	Floodplain Justification Report	June 2022	July 2022
3.3.7	Sea-level Rise (SLR) Scenarios	June 2022	July 2022
3.3.8	Pre-Submittal Meeting	July 2022	July 2022
3.3.9	Project Management and QA/QC	Mar 2022	July 2022
3.4	Peer Review of Watershed Model Development and Floodplain Delineation	July 2022	Sept 2022
3.4.1	Peer Review Meeting and Presentation	July 2022	July 2022
3.4.2	Peer Review Communication	July 2022	Aug 2022
3.4.3	Meeting - Discuss Approach to Resp. to COUNTY/DISTRICT/Peer Review Cmts	Aug 2022	Sept 2022
3.5	Approved Floodplain Analysis Deliverables for Preliminary Floodplain Open House	July 2022	Sept 2022
3.5.1	Revised Deliverables	Aug 2022	Sept 2022
3.5.2	Pre-Submittal Meeting	Sept 2022	Sept 2022
3.5.3	Project Management and QA/QC	July 2022	Sept 2022
3.6	Preliminary Floodplain Open House and Response to Public Comments	Sept 2022	Dec 2022
3.6.1	Preliminary Floodplain Open House	Sept 2022	Sept 2022
3.6.2	Response to Public Comments	Sept 2022	Dec 2022
3.6.3	Meeting - Discuss Approach and Responding to Public Cmts	Nov 2022	Dec 2022
3.7	Final Approved Floodplain Analysis Deliverables	Sept 2022	Dec 2022
3.7.1	Revised Deliverables	Dec 2022	Dec 2022
3.7.2	Pre-Submittal Meeting	Dec 2022	Dec 2022

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Task Number	Task Description	Start Month/yr	End Month/yr
3.7.3	Project Management and QA/QC	Sept 2022	Dec 2022
4.0	Watershed Management Plan - FPLOS Determination, Alternatives Analysis and Recommendations	Nov 2022	Mar 2023
4.1	FPLOS Determination	Nov 2022	Feb 2023
4.1.1	Methodology Meeting	Nov 2022	Nov 2022
4.1.2	FPLOS Determination	Dec 2022	Jan 2023
4.1.3	FPLOS Analysis Report	Jan 2023	Jan 2023
4.1.4	Pre-Submittal Meeting	Jan 2023	Feb 2023
4.1.5	Project Management and QA/QC	Dec 2022	Feb 2023
4.2	Surface Water Resource Assessment (SWRA) and BMPs of Water Quality	Nov 2022	Feb 2023
4.2.1	Surface Water Resource Assessment Approach - Water Quality	Nov 2022	Dec 2022
4.2.2	Water Quality Assessment	Dec 2022	Dec 2022
4.2.3	Existing Conditions Pollutant Loading Analysis	Dec 2022	Jan 2023
4.2.4	SWRA of Water Quality Report	Jan 2023	Jan 2023
4.2.5	Pre-Submittal Meeting	Jan 2023	Jan 2023
4.2.6	Project Management and QA/QC	Jan 2023	Feb 2023
4.3	Alternatives Analysis and Recommendations (FPLOS and SWRA)	Feb 2023	Mar 2023
4.3.1	Alternatives Analysis and Project Ranking	Feb 2023	Mar 2023
4.3.2	Pre-Submittal Meeting	Feb 2023	Mar 2023
4.3.3	Project Management and QA/QC	Feb 2023	Mar 2023

VII. INVOICES

Invoice Number	Task Deliverables	Invoice Amount
1.	<u>Tasks 1.1, 1.3, and 1.5</u> <ul style="list-style-type: none"> • Kickoff Meeting Minutes • Draft Project Plan 	\$6,157.00
2.	<u>Tasks 1.2, 1.4, and 1.5</u> <ul style="list-style-type: none"> • Final Project Plan 	\$7,341.00
3.	<u>Tasks 2.1.1 and 2.1.14</u> <ul style="list-style-type: none"> • Preliminary watershed boundary 	\$2,319.25
4.	<u>Tasks 2.1.3, 2.1.6, and 2.1.14</u> <ul style="list-style-type: none"> • Areas of Development • Reference Documents 	\$14,974.25

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Invoice Number	Task Deliverables	Invoice Amount
	<ul style="list-style-type: none"> • Historic Water Levels • QA/QC Documentation 	
5.	<u>Tasks 2.1.7, 2.1.8, and 2.1.14</u> <ul style="list-style-type: none"> • Existing GWIS (Converted & Reviewed) • QA/QC Documentation 	\$4,692.25
6.	<u>Tasks 2.1.2, 2.1.5, and 2.1.14</u> <ul style="list-style-type: none"> • Project DEM & topographic information • Soils map • Landuse map 	\$13,353.25
7.	<u>Tasks 2.1.9 and 2.1.14</u> <ul style="list-style-type: none"> • Preliminary Hydro-, Model-, and HEP Networks • QA/QC Documentation 	\$16,415.25
8.	<u>Tasks 2.1.10, and 2.1.14</u> <ul style="list-style-type: none"> • Updated GWIS (data capture and field data acquisition needs) • QA/QC Documentation 	\$15,141.25
9.	<u>Tasks 2.1.4, 2.1.10 and 2.1.14</u> <ul style="list-style-type: none"> • Initial GIS Catchments • QA/QC Documentation 	\$17,285.25
10.	<u>Tasks 2.1.11, 2.1.12, 2.1.13, and 2.1.14</u> <ul style="list-style-type: none"> • Data acquisition locations • Task Memorandum • Pre-Submittal Meeting 	\$13,214.25
11.	<u>Tasks 2.2.1, and 2.2.6</u> <ul style="list-style-type: none"> • Field Reconnaissance & Survey Data ~ 50% 	\$27,255.00
12.	<u>Tasks 2.2.1, and 2.2.6</u> <ul style="list-style-type: none"> • Field Reconnaissance & Survey Data ~ 50% 	\$27,255.00
13.	<u>Tasks 2.2.1, 2.2.2, 2.2.4, 2.2.5, and 2.2.6</u> <ul style="list-style-type: none"> • Updated GWIS (Model, HEP, & Hydro Networks) • Updated landuse map • Lookup Tables • Pre-Submittal Meeting • QA/QC Documentation 	\$24,232.00
14.	<u>Tasks 2.3.1, 2.3.2, 2.3.3, and 2.3.6</u> <ul style="list-style-type: none"> • Updated GWIS (Preliminary model features) • Refined topographic information • Approach documentation • QA/QC documentation 	\$30,599.00
15.	<u>Tasks 2.3.4, 2.3.5, and 2.3.6</u> <ul style="list-style-type: none"> • Watershed Evaluation Report 	\$12,329.00
16.	<u>Tasks 2.4.1 and 2.5.3</u> <ul style="list-style-type: none"> • Peer Review Kickoff Meeting Presentation 	\$5,267.33
17.	<u>Tasks 2.4.2, 2.4.3, and 2.5.3</u> <ul style="list-style-type: none"> • Peer Review Communications • Approach to Response Meeting Minutes 	\$7,711.33
18.	<u>Tasks 2.5.1, 2.5.2, and 2.5.3</u> <ul style="list-style-type: none"> • Revised Watershed Evaluation Deliverables • Response to Comments Geodatabase • QA/QC Documentation 	\$15,339.34

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Invoice Number	Task Deliverables	Invoice Amount
19.	<u>Tasks 3.1.1, 3.1.2, and 3.1.5</u> <ul style="list-style-type: none"> • Updated GWIS, including the following parameterization updates: <ul style="list-style-type: none"> ○ TC ○ Bridges • Storm Selection • QA/QC Documentation 	\$16,543.67
20.	<u>Tasks 3.1.2 and 3.1.5</u> <ul style="list-style-type: none"> • Updated GWIS, including the following parameterization updates: <ul style="list-style-type: none"> ○ Node Storage ○ Channels ○ Structural parameters • QA/QC Documentation 	\$16,083.67
21.	<u>Tasks 3.1.2 and 3.1.5</u> <ul style="list-style-type: none"> • Updated GWIS, including the following parameterization updates: <ul style="list-style-type: none"> ○ Boundary Conditions ○ Overland Flow Weirs ○ Rainfall Excess Parameters • QA/QC Documentation 	\$14,376.68
22.	<u>Tasks 3.1.2 and 3.1.5</u> <ul style="list-style-type: none"> • Updated GWIS, including the following parameterization updates: <ul style="list-style-type: none"> ○ Initial Conditions ○ Groundwater • Updated Watershed Evaluation report 	\$12,069.33
23.	<u>Tasks 3.1.2 and 3.1.5</u> <ul style="list-style-type: none"> • Incorporation of St. Pete GWIS • QA/QC Documentation 	\$3,018.33
24.	<u>Tasks 3.1.3, 3.1.4, and 3.1.5</u> <ul style="list-style-type: none"> • Model Input/Output Files • Level-pool Floodplains • QA/QC Documentation 	\$18,630.33
25.	<u>Tasks 3.2.1, 3.2.2, and 3.2.3</u> <ul style="list-style-type: none"> • Revised Watershed Model Parameterization Deliverables • Response to Comments Geodatabase • QA/QC Documentation 	\$20,008.00
26.	<u>Tasks 3.3.1, 3.3.2, and 3.3.9</u> <ul style="list-style-type: none"> • Model Input/Output Files (Post-Calibration) • QA/QC Documentation 	\$20,291.60
27.	<u>Tasks 3.3.3, 3.3.4, and 3.3.9</u> <ul style="list-style-type: none"> • Model Input/Output Files (Design Storms) • QA/QC Documentation 	\$8,436.60
28.	<u>Tasks 3.3.5 and 3.3.9</u> <ul style="list-style-type: none"> • 100-Year Flood Depth Grid • Updated GWIS (Floodplains) • Project QA/QC Documentation 	\$27,194.60
29.	<u>Tasks 3.3.6 and 3.3.9</u>	\$13,203.60

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Invoice Number	Task Deliverables	Invoice Amount
	<ul style="list-style-type: none"> Floodplain Justification Report 	
30.	<u>Tasks 3.3.7, 3.3.8, and 3.3.9</u> <ul style="list-style-type: none"> Model Input/Output Files (SLR Scenarios) Pre-Submittal Meeting 	\$17,877.60
31.	<u>Tasks 3.4.1 and 3.5.3</u> <ul style="list-style-type: none"> Peer Review Meeting Presentation 	\$4,030.33
32.	<u>Tasks 3.4.2, 3.4.3, 3.5.3</u> <ul style="list-style-type: none"> Peer Review Communications Approach to Response Meeting 	\$8,861.33
33.	<u>Tasks 3.5.1, 3.5.2, and 3.5.3</u> <ul style="list-style-type: none"> Revised Deliverables Response to Comments Geodatabase QA/QC Documentation 	\$20,376.33
34.	<u>Tasks 3.6.1 and 3.7.3</u> <ul style="list-style-type: none"> Public Open House 	\$7,816.33
35.	<u>Tasks 3.6.2, 3.6.3, and 3.7.3</u> <ul style="list-style-type: none"> Response to Comments Approach to Revising Deliverable Meeting 	\$6,063.33
36.	<u>Tasks 3.7.1, 3.7.2, and 3.7.3</u> <ul style="list-style-type: none"> Signed and Sealed Floodplain Justification Report Revised Deliverables Pre-Submittal Meeting QA/QC Documentation 	\$13,331.33
37.	<u>Tasks 4.1.1 and 4.1.5</u> <ul style="list-style-type: none"> Methodology Meeting Minutes 	\$5,610.00
38.	<u>Tasks 4.1.2 and 4.1.5</u> <ul style="list-style-type: none"> Flood Depth Grids for LOS Storms Model Input/Output Files Geodatabase containing: <ul style="list-style-type: none"> Model simulation results Inundation polygons FPLOS designations Flood Damage Estimates QA/QC Documentation 	\$18,858.00
39.	<u>Tasks 4.1.3, 4.1.4, and 4.1.5</u> <ul style="list-style-type: none"> FPLOS Analysis Report Pre-Submittal Meeting 	\$18,047.00
40.	<u>Task 4.2.1 and 4.2.6</u> <ul style="list-style-type: none"> Meeting minutes Approach Memorandum 	\$10,067.50
41.	<u>Tasks 4.2.2 and 4.2.6</u> <ul style="list-style-type: none"> Geodatabase/Water Quality Assessment Data 	\$16,021.50
42.	<u>Tasks 4.2.3 and 4.2.6</u> <ul style="list-style-type: none"> Pollutant Loading Model/GIS files QA/QC Documentation 	\$24,111.50
43.	<u>Tasks 4.2.4, 4.2.5, and 4.2.6</u> <ul style="list-style-type: none"> SWRA Report Pre-Submittal Meeting 	\$14,209.50

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Invoice Number	Task Deliverables	Invoice Amount
44.	<ul style="list-style-type: none"> • QA/QC Documentation <u>Tasks 4.3.1 and 4.3.3</u> <ul style="list-style-type: none"> • Model input/output files for proposed conditions • Pollutant load model GIS files • Geodatabase containing: <ul style="list-style-type: none"> ○ Site locations ○ Locations of final recommended projects ○ Model simulation results for proposed conditions ○ Inundation polygons for proposed conditions • QA/QC Documentation 	\$15,302.00
45.	<u>Tasks 4.3.1, 4.3.2, and 4.3.3.</u> <ul style="list-style-type: none"> • Alternatives analysis and recommendations report • Pre-Submittal Meeting 	\$17,356.00