KESHAVARZ
& ASSOCIATES
CIVIL ENGINEERING | SURVEYING | CONSULTING

Town of Loxahatchee Groves (Town)
155 F Road
Loxahatchee Groves, FL 33470

March 16th, 2023
revised June 12th, 2023
Project No. 23-1436

Attention: Ms. Francine Ramaglia, Town Manager

Reference: **Town of Loxahatchee Groves Resiliency Vulnerability Assessment**

Dear Ms. Ramaglia,

Based upon your request and with utmost pleasure, Keshavarz & Associates, Inc. (Consultant) is presenting you with this proposal to perform professional services to assess the vulnerability of critical assets served by the Town of Loxahatchee Groves' (Town) drainage system.

Background

Loxahatchee Farms was established in 1917, with 6,500 acres as an agricultural community. Approximately 30 miles of canals were installed to provide drainage conveyance and irrigation demand for this community. In as much as the Town has maintained its rural character throughout the years as it has evolved from a farming community to an agricultural residential community, the drainage system has not yet been formally surveyed, assessed or evaluated by the Town for its current purposes and function. The last known drainage study was conducted by the Loxahatchee Groves Water Control District in 2000 with the purpose of identifying improvements to enhance flood protection for targeted areas and ensure compliance with South Florida Water Management District (SFWMD) Surface Water Management System Permit No. 50-01682-S, issued in 1988. Topographic information for this study was based on the limited sources available at the time, but no Town-wide survey (aerial or LiDAR) was conducted or used in the analysis.

In 2014, the Florida Department of Environmental Protection (FDEP) requested that the Town obtain permit coverage under the National Pollution Discharge Elimination System (NPDES) for the municipal separate storm sewer system (MS4) within the limits of the Town of Loxahatchee Groves. Keshavarz & Associates, Inc. successfully advocated on behalf of the Town to postpone implementation of the NPDES permitting requirements. However, preparations for meeting the requirements should continue as this requirement is on the horizon. Issuance of a mandate for compliance with the NPDES requirements could result in a costly acceleration of necessary measures.

In 2017, the Federal Emergency Management Agency (FEMA) updated their flood insurance rate maps (FIRM) based on the C-51 Basin Rule Re-Evaluation undertaken by the SFWMD in 2015. FEMA established a special flood hazard area (SFHA) with a base flood elevation of 17.6' NAVD (North American Vertical Datum of 1988). An estimated 42.5% of the Town's surface area is located within the SFHA. Keshavarz & Associates, Inc. was able to work with FEMA to redefine the flood hazard area and exclude over 200 structures from requiring additional flood insurance.

Since then, Palm Beach County (PBC) has acquired county-wide LiDAR information that may help further justify a reduction in a portion of the Town area classified as being located within the SFHA.

In 2021 and in 2022, Keshavarz & Associates, Inc. applied for State funding on behalf of the Town through the Resilient Florida Grant program for a town-wide Vulnerability Assessment (380.093 F.S.) to inventory, evaluate and assess the Town's surface water management system facilities, identify critical concerns, and provide recommendations for improvements. In 2023, the Florida Department of Environmental Protection (FDEP) awarded grant funding to the Town for the Vulnerability Assessment, including survey acquisition of components and facility locations and visual assessment of operational conditions.

Upon completion of this effort, the Town will be positioned to transition management of its stormwater infrastructure to a more cost-efficient and technology-based approach. The Vulnerability Assessment will document the locations of key stormwater components and elements of critical infrastructure including culverts, bridges, canals, roads, and other operational assets. Stormwater modeling and analysis of the acquired survey data will strategically pinpoint areas of greater vulnerability, identify projects for improvements, repairs and enhancements, and assist the Town's administration with prioritization of future expenditures.

The completed survey will allow the Town to coordinate more efficiently with consultants and agencies regarding planned projects, component locations, and operational conditions. The information will also support mapping and public outreach opportunities via presentation of the collected data and proposed action plans. This information is also valuable for the pursuit of funding assistance from agencies tasked with supporting infrastructure development, stormwater management, flood control, and resiliency in response to natural events, as well as qualifying for specific funding programs conducted by those agencies.

Available topographic information and methods for acquisition have improved significantly in the two-decade interim since the last study in 2000. A more accurate analysis can be completed in less time than was previously possible by applying current processing and visual imaging capabilities to available topographic data and supplementing it with site-specific data collection. In addition to improving stormwater management capabilities within the context of the Town's internal operations, the digital mapping and modeling framework also provides a foundation for compliance with the future NPDES requirements for maintenance, monitoring, and reporting. An updated analysis can be used to reevaluate the FEMA SFHA boundary, and conditions under the SFWMD permit which may affect future planning, expansion, and improvements in the system.

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Scope of Work

Task 1. Project Management, Orientation, Research, Meetings and General Coordination

1.1 Project Management and Correspondence:

Consultant's project management responsibilities range from internal to external methods and approaches affecting the general advancement of the project. Included in this task is the Consultant's continual quality assurance and control efforts as the work proceeds. This task includes general correspondence, coordination and data exchange with the Town and others as necessary and as needed throughout the project.

1.2 Project Orientation, Research:

The Consultant shall research, review and study record drawings, geographic information system (GIS) database information, and other pertinent information of the existing facilities within the Town rights-of-ways / drainage system corridors.

1.3 Kick-off Meeting:

The Consultant will develop an overall project management plan and address initial actions and then conduct a kick-off meeting for the project to discuss the project scope, project goals, schedule, key milestones, and deliverables in order to develop a consistent project approach. The Consultant will prepare the agenda for the meetings and will issue meeting summaries following the meeting.

1.4 Grant Reporting and Assistance:

The Consultant shall work with the Town's Grant Manager, a member of Town staff assigned by the Town to comply with the grant requirements. The Consultants shall provide quarterly progress reports and payment request forms to the Town in conformance with the grant requirements.

1.5 Conduct Steering Committee Meetings:

The Consultant shall facilitate bi-annual steering committee meetings throughout the duration of the project. The Consultant shall prepare agendas, conduct the meetings and shall issue meeting summaries following each meeting. The purpose of the steering committee meetings is to assist in reviewing the goals of the project, review draft materials, provide input for study direction, assist in identifying geographic context, appropriate modeling methodologies, assist in identifying available data and resources, identify relevant assets, and review project findings and recommendations as recommended by FDEP for successful implementation of this assessment. Up to five (5) steering committee meetings are included with this proposal.

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1.6 Public Outreach Meetings:

Based on the recommendations of FDEP, two public outreach meetings will be conducted for the implementation of this assessment. The purpose of the first meeting is to allow the public to provide input during the initial data collection stages, to include input on preferred methodologies, data for analyzing potential flooding and/or sea level rise impacts, guiding factors to consider, and critical assets important to the community. The purpose of the second meeting is to allow the public to provide community-specific input on the results of the analyses and to reconsider methodologies and assumptions used in the analysis. Additionally, during this meeting, the Grantee will encourage the public to prioritize focus areas of flooding, and the critical assets in preparation for the development of adaptation strategies and project development.

The Consultant shall attend and participate in these meetings and shall prepare a presentation and exhibits in support of the meetings. However, notifications, agenda, summaries, and conducting the meeting shall be performed by others.

Task 2. Asset Inventory & Condition Assessment

2.1. Drainage Culverts:

The Consultant shall locate all known and visible drainage culverts and bridges within and discharging into the Town canal system utilizing survey grade GPS equipment to locate the upstream and downstream limits of these drainage assets. Pipe size, material as well as the top of pipe and/or invert elevation for the drainage culverts will be acquired in the field. It should be noted that it is expected that a percentage of the acquired drainage pipes will be in a deteriorated state due to rust, age, maintenance, etc. and therefore, the pipe size may need to be estimated. For bridges, the road elevation, material, span and low member elevation will be acquired.

The Consultant shall upload the data obtained in the field into a GIS database that will be used for inventory, modeling, assessment, and future maintenance and reporting purposes. An assessment form and location map for each found facility will be generated and provided to the Town for field verification, additional inventory and assessment purposes. As a part of the Town's in-kind services, the Town will assess the found condition of the existing facilities as good, fair or poor and will include the date of installation, if known, document the owner of the facility and associated Town permit, if applicable, as well as collect one or more photograph(s) of the asset to depict the location, immediate surroundings, and condition of the asset.

Based on the data provided by the Town as indicated above, the Consultant shall update the GIS database to include the date of last inspection, condition, recommended action (if any), and date of next scheduled inspection if no additional action is recommended.

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2.2. Canal Sections:

Acquire topographic cross-sectional information of the Town maintained canals adjacent to the main roadways as listed below:

Road	Mileage	Description
A Road	2.0	Okeechobee Boulevard to North Road
B Road	2.0	Okeechobee Boulevard to North Road
C Road	2.0	Okeechobee Boulevard to North Road
D Road	2.0	Okeechobee Boulevard to North Road
E Road	2.0	Okeechobee Boulevard to North Road
F Road	1.0	Okeechobee Boulevard to North Road
G Road West	0.5	25th Street North to North Road
Folsom Road	0.5	Okeechobee Boulevard to 25th Street North
G Road East	0.5	25th Street North to North Road
North Road	2.0	A Road to E Road
South North Road	1.50	E Road to G Road East
25th Street North	0.5	G Road West to G Road East
Total	16.50	

Cross sections of the canals will be obtained at approximately 500’ intervals. The cross sections will include the limits of roadway and/or apparent maintenance access within 30’ from the canal top of bank on either side of the canal. The edge of pavement/rock road, top of bank, edge of water elevation, grade breaks and bottom of the canal will be acquired as well as the depth of any muck or silt material encountered within the canal. The results of the field acquisition will be uploaded to AutoCAD and cross-sections of the existing canals will be drafted for each location at a scale of 1”=20’.

Consultant shall coordinate with other Town consultants for the acquisition of the canal cross sections south of Okeechobee Boulevard.

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Task 3. Existing Conditions Hydraulic and Hydrological Model

The Consultant shall develop an existing conditions hydraulic and hydrological model of the Town's existing surface water management system utilizing ICPR, interconnected channel and pond routing model. The most recent publicly available digital elevation model, PBC LiDAR flown in 2018, will be utilized as the basis for the model to establish exiting drainage basin boundaries, stage-storage tabulations, boundary conditions, etc. The information obtained within Task 2 will be added to the model to represent the current conditions of the Town's canal system and hydraulic links (culverts) within the drainage system. Boundary / tailwater conditions will be calibrated based on the tailwater analysis conducted by the SFWMD for C-51 Basin Rule Re-Evaluation. The existing conditions model will be routed using various design storm events to identify potential risks to Town's existing assets for the 10 year, 25 year and 100 year storm events.

Task 4. Proposed Conditions Hydraulic and Hydrological Modeling

The Consultant shall evaluate and model various improvements within the Town's surface water management system to:

1. Evaluate depth of flooding for the following scenarios as required by the grant:
    a. Tidal flooding, including future high tide flooding
    b. Current and future storm surge flooding utilizing available National Oceanic and Atmospheric Administration or Federal Emergency Management Agency storm surge data.
    c. Rainfall induced flooding (10 year, 25 year and 100 year storm events)
    d. Compound flooding (combination of storm surge and rainfall induced flooding)
    e. A minimum of two sea level rise scenarios
    f. A minimum of two planning horizons for years 2040 and 2070

Task 5. Vulnerability Assessment Report

Consultant shall prepare a Technical Memorandum detailing the assessment and analysis summarizing the data collection, existing conditions model development, methodologies of the vulnerability scenarios, interpretations of results, recommendations for surface water management system improvements and potential regulatory or ordinance improvements.

Task 6. Final Report

Consultant shall prepare a final report in accordance with FDEP Grant requirements summarizing the Vulnerability Assessment in no more than five (5) pages including the following sections: Executive Summary, Methodology, Outcome and Further Recommendations.

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Reimbursable Expenses

Reproduction of documents, mileage for site visits, prints, modeling software, etc.

Assumptions:

1. The Town will be the Grant Applicant with Consultant in the role of support. A member of Town staff will be assigned as the Grant Manager. The Grant Manager will be responsible for coordination and correspondence with the Grantee and will provide all necessary documentation, reporting, exhibits, etc. as required by the Grantee. The Consultant will assist the Grant Manager by providing pertinent information, invoices, reports, exhibits etc. as outlined in the scope of services to the Grant Manager for their communication and reporting efforts with the Grantee.
2. The Town will be responsible for documentation and reporting of Town staff and resources as in-kind services and or matching funds as required by the grant.

Schedule:

The following schedule is based on the grant work plan provided to FDEP by the Town. The completion date listed for each task is the date of approval by FDEP, all required deliverables, reports, exhibits, studies, etc. must be presented, reviewed and approved by FDEP in order to be deemed comple.

Task	Duration (Calendar Days)
Kick Off Meeting	9/30/2023
Assemble Steering Committee	10/31/2023
Conduct Steering Committee Meetings	9/30/2025
Public Outreach Meeting #1	12/31/2023
Acquire Background Data	6/30/2024
Exposure Analysis	10/31/2024
Sensitivity Analysis	12/31/2024
Public Outreach Meeting #2	3/31/2025
Identify Focus Areas	6/30/2025
Final Vulnerability Assessment Report, Maps, and Tables	7/31/2025

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Our fees for the services outlined above shall be as follows:

Task 1 – Preliminary Design and Consulting Services	$	47,590.00
Task 2 – Asset Inventory & Condition Assessment	$	129,020.00
Task 3 – Existing Conditions Hydraulic and Hydrological Model	$	78,320.00
Task 4 – Proposed Conditions Hydraulic and Hydrological Modeling . . .	$	60,540.00
Task 5 – Vulnerability Assessment Report	$	25,480.00
Task 6 – Final Report	$	7,200.00
Task 8 - Reimbursable Expenses	$	3,200.00
BASE TOTAL	**$**	**351,350.00**

Please refer to the attached "Manhour Summary" for detail of the lump sum fees referenced above.

FEES: Lump Sum fees are fixed amounts to be paid for the services indicated in the Schedule of Compensation. Lump Sum fees do *not* include Direct Expenses. Direct Expenses shall be paid for in accordance with the approved Time & Expense Rates within the "Agreement for Professional Services" executed on January 10th, 2023.

ADDITIONAL SERVICES: Services authorized by CLIENT, other than those specifically set forth in the "Scope of Services", shall be considered additional services for which CLIENT shall compensate CONSULTANT on a "Time and Expenses" basis or as otherwise agreed by the parties. Additional services include revisions to work previously performed that are required because of a change in the data, criteria, or information furnished to CONSULTANT, a change in the scope or concept of the project initiated by CLIENT, and/or services that are required due to changes in the requirements of public agencies, after work under this Agreement has commenced. CONSULTANT shall request and CLIENT will execute a "Change of Scope Memorandum" before such work is started.

As a notice to proceed, kindly provide our office with the appropriate Purchase Order. We certainly appreciate the opportunity to present you with this proposal. Upon authorization, we will do our utmost to be an effective member of your team of professionals.

Respectfully,
KESHAVARZ & ASSOCIATES, INC.

Randy Wertepny, P.E.
Vice President

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KESHAVARZ & ASSOCIATES, INC.
Town of Loxahatchee Groves

June 12, 2023
KA Project No. 23-1436

Town of Loxahatchee Groves Resiliency Vulnerability Assessment

MANHOUR SUMMARY

PROJECT ORIENTATION, RESEARCH, MEETINGS & GENERAL COORDINATION	***Principal Engineer $/hr***	***Project Director $/hr***	***Project Manager $/hr***	***Project Engineer $/hr***	***Principal Surveyor $/hr***	***Survey Crew $/hr***	***Senior Technician $/hr***	***Admin. $/hr***	**Totals by Task**
	$260.00	$230.00	$180.00	$120.00	$180.00	$160.00	$110.00	$90.00	
Project Management, Research, Data Exchange and Project Orientation throughout the 10 month duration of the project.	8	20						12	$7,760.00
Kick-off Meeting: Preparation of project work plan and facilitate meetings with Town staff, prepare agenda and issue meeting summaries	4	8	12					4	$5,400.00
Grant Reporting and Assistance, preparation of quarterly progress reports and payment requests in conformance with grant requirements	4	12	12					8	$6,680.00
Conduct Steering Committee Meetings: faciltiate up to five (5) steering committee meetings, prepare agenda, host meeting and issue meetings summaries	5	40	40					5	$18,150.00
Public Outreach Meetings: Participate in two (2) public outreach meetings, preparation of exhibits, presentation materials for each meeting.	4	20	20					4	$9,600.00
TOTAL Hours for Task	25	100	84	0	0	0	0	33	$47,590.00
FEE Estimate	$6,500.00	$23,000.00	$15,120.00	$0.00	$0.00	$0.00	$0.00	$2,970.00	**$47,590.00**
ASSET INVENTORY & CONDITION ASSESSMENT									
Drainage Facility Field Acquisition - locate all drainage culverts and bridges within the Town's canal system (30 miles), it is estimated that there are 600 culverts/bridges within and discharging into the Town's canal system		6			24	240			$44,100.00
Data Processing and Conversion of Data into GIS data base, generate report for Town staff for condition assessment; updated GIS database with results provided by Town	8	12	96				20	8	$25,040.00
Canal Cross Section Field Acquisition - acquire cross sections of the Town's canal system at 500' intervals north of Okeechobee Boulevard; up to 200 cross sections, draft sections in CAD		8			48	240	100		$59,880.00
TOTAL Hours for Task	8	26	96	0	72	480	120	8	$129,020.00
FEE Estimate	$2,080	$5,980	$17,280	$0	$12,960	$76,800	$13,200	$720	**$129,020.00**
EXISTING CONDITIONS HYDRAULIC AND HYDROLOGICAL MODEL									
Develop existing conditions model within ICPR utilizing PBC LiDAR information. Generate basin boundaries based on data collection and LiDAR information, calculate state storage information for each basin, set up TOC, CN and other basin characteristics for each basin, establish boundary conditions, and discharge links. Up to 100 nodes / basins are included with this effort.	20	80	212	120				24	$78,320.00
TOTAL Hours for Task	20	80	212	120	0	0	0	24	$78,320.00
FEE Estimate	$5,200	$18,400	$38,160	$14,400	$0	$0	$0	$2,160	**$78,320.00**
PROPOSED CONDITIONS HYDRAULIC AND HYDROLOGICAL MODELING									
Evaluate depth of flooding scenarios as required by the grant including tidal flooding, current and future storm surge, rainfall induced flooding, compound flooding with a minimum of two sea level rise scenarios and two planning horizons for 2040 and 2070.	10	44	88	36				14	$34,140.00
Preparation of exhibits to depict the results of the analysis and modeling efforts, add results to GIS database geospatially located in accordance with the grant criteria	6	36	70	24				12	$26,400.00
TOTAL Hours for Task	16	80	158	60	0	0	0	26	$60,540.00
FEE Estimate	$4,160	$18,400	$28,440	$7,200	$0	$0	$0	$2,340	**$60,540.00**
VULNERABILITY ASSESSMENT REPORT									
Consultant shall prepare a technical memorandum detailing the assessment and analysis summarizing the data collection, existing conditions model development, methodologies of the vulnerability scenarios, interpretations of results, recommendations for surface water management system improvements and potential regulatory or ordinance improvements.	6	20	80	32				12	$25,480.00
TOTAL Hours for Task	6	20	80	32	0	0	0	12	$25,480.00
FEE Estimate	$1,560	$4,600	$14,400	$3,840	$0	$0	$0	$1,080	**$25,480.00**
FINAL REPORT									
Consultant shall prepare a final report in accordance with FDEP Grant requirements sul	4	8	20					8	$7,200.00
TOTAL Hours for Task	4	8	20	0	0	0	0	8	$7,200.00
FEE Estimate	$1,040	$1,840	$3,600	$0	$0	$0	$0	$720	**$7,200.00**
TOTAL PROFESSIONAL SERVICES					**$348,150.00**				
Reimbursable (Printing, Reproduction, Mileage, etc.)					**$2,000.00**				
Reimbursable (ICPR 4 Modeling Software License)					**$1,200.00**				
TOTAL FEE					**$351,350.00**				