wood.

May 29, 2018

Alice Rankeillor, PE
City of Gainesville Public Works Department, Stormwater Division
405 NW 39th Avenue
Gainesville, Florida 32627

Sent via email: RankeilloAI@cityofgainesville.org

Re: Scope of Work: Hogtown Creek, Possum Creek, and Hogtown Prairie Watersheds
Hydrologic and Hydraulic Simulation
City of Gainesville Public Works Department

Dear Ms. Rankeillor:

Wood Environment & Infrastructure Solutions, Inc. (Wood) submits the attached scope of work for hydrologic and hydraulic simulation of flood hazards in Hogtown Creek, Possum Creek, and Hogtown Prairie Watersheds. Simulation described in the attached scope of work is necessary to subsequently consider retrofit or re-design of flood mitigation structures in Florida Park and Mason Manor, and to obtain a letter of map revision from the Federal Emergency Management Agency (FEMA) to reflect contemporary flood hazards. We are very excited to serve the City of Gainesville, in these iconic watersheds.

We submit the attached scope of work at your request, following several telephone conversations and emails. The attached scope of work supersedes and updates a similar draft scope of work, dated April 20, 2018.

Our team includes Jeffrey King, Dustin Atwater, Michael Kelley, Brad Heilwagen, and Tiffany Davies. King and Atwater live in Gainesville and work in Wood's Gainesville office. Dr. King has over 20 years of experience with hydrologic and hydraulic simulation, including several years working in-house for FEMA's National Flood Insurance Program in Washington DC, and a decade as a research hydrologist with the U.S. Geological Survey. Mr. Atwater has over 10 years of experience with geographic information systems and ArcHydro, including work as an employee of the City of Gainesville managing the stormwater database. Mr. Kelley has over 20 years of experience designing and constructing geotechnical structures. Mr. Heilwagen was the project manager for an Alachua County FEMA Flood Insurance Rate Map update, holds the Association of State Floodplain Managers Certified Floodplain Manager designation, and has conducted several FEMA studies in the southeastern United States. Mr. Heilwagen will peer-review analyses, documents, letters, and other products.

In our April 6 conversation, the City of Gainesville requested that Wood offer a cursory, order-of-magnitude, construction cost estimate—to satisfy City budget purposes—for the Florida Park levee and Mason Manor floodwall. We estimate about $2M construction cost for the Florida Park levee and about $500k for the Mason Manor floodwall. Our estimate is not based on sufficient investigation to accurately estimate cost. We will deliver a more rigorous estimate in a subsequent project.

Wood serves municipal clients from 12 offices in Florida. Our Gainesville office has served clients for more than 50 years. We have a full staff in Gainesville to complete this project.

Please let us know if you have any questions or wish to refine the scope. Thank you for this opportunity and we look forward to working with you on this important project.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.

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Scope of Work

Hogtown Creek, Possum Creek, and Hogtown Prairie Watersheds

Hydrologic and Hydraulic Simulation

Table of Contents

Introduction

Hogtown Creek and tributaries drain surface water in the City of Gainesville to Haile Sink (figs. 1 and 2). Surface water infiltrates into the Upper Floridan aquifer through Haile Sink. Possum Creek drains to Hogtown Creek in Loblolly Woods—a forested floodplain—upstream of Northwest 34th Street. For the purposes of the present scope of work, we designate the area that drains to Haile Sink downstream of Southwest 20th Avenue as the Hogtown Prairie Watershed, the area that drains to Possum Creek as the Possum Creek Watershed, and the remainder of the area that drains to Haile Sink as the Hogtown Creek Watershed.

Hogtown and Possum Creeks flow through Loblolly Woods. In 2016, the City of Gainesville re-established more natural floodplain connectivity in Loblolly Woods, by stabilizing Possum Creek and Hogtown Creek culverts under Northwest 8th Avenue, and by installing new culverts under Northwest 8th Avenue, between Northwest 23rd Street and Northwest 34th Street. Several Gainesville neighborhoods, including Florida Park and Mason Manor, bound Loblolly Woods.

In September 2017, Hurricane Irma caused flood problems in Gainesville, including in Florida Park and Mason Manor. The National Hurricane Center estimated that Hurricane Irma was the fifth costliest U.S. Atlantic hurricane in history at $53.4 billion. MetStat estimated that Hurricane Irma had an annual exceedance probability (AEP) that ranged from 0.2-percent to 0.5-percent in Alachua County; or from 200-year to 500-year average recurrence interval. AEP is the probability that a flood metric—such as elevation or flow rate—is exceeded in any given year. Recurrence interval and return period are the average number of years between the exceedance of a flood metric. For example, a 1-percent AEP flood elevation will be exceeded, on average, once every 100 years. Although unlikely, multiple episodic events with relatively small AEPs can occur in successive years, or in the same year.

The Mason Manor floodwall did not protect from inundation, land north of the floodwall, between Northwest 10th Avenue and the floodwall (photographs 1 through 6, appendix B). Houses in Florida Park (near 2254 Northwest 11th Avenue) were inundated where a constructed berm or levee failed or was circumvented (photographs 7 through 17, appendix B). One primary motivation for this project is to consider retrofit or re-design of these flood mitigation structures, in Mason Manor and Florida Park, with a subsequent project.

The Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP) delineates Special Flood Hazard Areas (SFHAs) in the City of Gainesville. The NFIP designates the base flood as the flood with a one-percent AEP. The base flood elevation (BFE) is the water-surface elevation that occurs during the base flood. An SFHA is the area inundated by the base flood. Flood elevations may increase where a floodplain is obstructed by debris or encroached by land alteration typically associated with construction of houses, buildings, or other infrastructure. The regulatory floodway is an area in the SHFA that must remain unobstructed and un-encroached to discharge the base flood without cumulatively increasing BFEs along the conveyance by more than a designated height. In the City of Gainesville, regulatory floodways were delineated to limit the maximum BFE increase to one foot.

FEMA first delineated SFHAs in the Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds in 1983 (table 1 in appendix D), using a 1978 step-backwater computation by the U.S. Geological Survey. Flood hazards were further studied in specific locations with step-backwater computations using the U.S. Army Corps of Engineers HEC–2 model or U.S. Department of Agriculture Soil Conservation Service WSP–2 model.

FEMA and Suwanee River Water Management District recently updated the Alachua County Flood Insurance Study (FIS), including incorporated areas of the City of Gainesville. However, the revised FIS did not use new methods to assess flood hazards in the Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds. The revised FIS adopted historic SFHAs, some from the 1980s, in parts of these watershed.

Gainesville has changed considerably since the 1983 FIS. Several significant projects have occurred in Hogtown and Possum Creeks since 1983, including but not limited to the 8th Avenue project in 2016 and a Florida Department of Transportation sedimentation basin in Hogtown Creek near Northwest 34th Street. Gainesville is more urban today than in 1983. Urbanization likely caused watershed hydrology to change, such that the flood hazard risk assessment conducted in 1983 may not accurately reflect risk associated with contemporary flood hazards.

Objectives

The objective of the project will be to assess existing flood hazards in the Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds with contemporary hydrologic and hydraulic analyses.

The City of Gainesville will address the following objectives with subsequent projects:

1. Consider retrofit or re-design of flood mitigation structures in Florida Park and Mason Manor, at locations that were flooded by Hurricane Irma, using the contemporary flood hazard assessment described in the present scope of work.
2. Request a letter of map revision (LOMR) from FEMA's NFIP to revise SFHAs and BFEs shown on Flood Insurance Rate Maps (FIRMs) to reflect contemporary hydrologic and hydraulic analyses. If flood mitigation structures in item 1 are constructed, we will request that revised SFHAs and BFEs also reflect these structures, after construction is complete. If flood mitigation structures in item 1 are not constructed, we will request that revised SFHAs and BFEs reflect contemporary conditions.

A LOMR is an official modification of the NFIP's FIRM and supporting documentation, establishing new BFEs, SFHAs, and other flood hazard areas. With a LOMR, the City of Gainesville can regulate development within the floodplain according to a contemporary hydrologic and hydraulic simulation.

Approach

Wood will conduct the project in the following four tasks:

Task 1. Collect resource information

Task 2. Survey

Task 3. Modify 2017 digital elevation model and analyze the model with ArcHydro

Task 4. Simulate watershed hydrology and creek hydraulics

We will schedule a kickoff meeting with City of Gainesville within 10 working days of project initiation. We will attend one meeting near the end of task 4. For the purposes of project budget, meetings are assumed to be typical, face-to-face, client-contractor meetings, in which staff from the City of Gainesville and Wood attend to discuss each task. Typically, additional preparation is necessary for meetings attended by the public, at which technical presentations and presentation materials are more refined.

Product:

- Meeting minutes
- Monthly progress emails

Wood will update the City of Gainesville with emails and in telephone conversations, when necessary, between issuance of formal, monthly progress emails.

Wood will attend or host public meetings at any stage in the project. Our attendance, role, and compensation must be detailed with a separate scope of work, external to the present scope of work.

We will assess flood hazards in Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds by collecting resource information, surveying watersheds, modifying a digital elevation model (DEM), and simulating watershed hydrology and creek hydraulics.

Task 1: Collect Resource Information

Wood has collected preliminary data (appendix A). Preliminary data include watershed boundary delineations (fig. 2), effective FEMA SFHAs (fig. 3), areas of uniform soil composition (fig. 4), wetlands (fig. 5), areas of uniform land use (fig. 6), and areas of uniform hydrologic soil response to infiltration and runoff (fig. 7). If warranted, preliminary data will be revised during the project to reflect contemporary conditions. Other relevant data will also be collected—following project initiation—including but not limited to the following data:

- Watershed and sub-basin boundaries
- Orthophotography
- As-built data for water control structures and other hydrologic and hydraulic features
- Precipitation data
- Precipitation statistics
- Hurricane Irma high-water-mark locations and elevations
- Conveyance polylines, such as stream centerlines and bank lines for wide streams

- Public Land Survey System areas and lines
- Hydraulic cross sections in conveyances
- Stormwater infrastructure data
- Water conveyance structure data that characterize culverts, bridges, and weirs
- City of Gainesville geographic information
- Alachua County geographic information
- Stormwater permits
- City of Gainesville comprehensive land use plans
- Alachua County comprehensive land use plans
- Existing ICPR simulation
- Effective NFIP flood hazard simulations
- 2017 LiDAR data

We will coordinate with the City of Gainesville to discuss flood prone areas and areas affected by Hurricane Irma. We will request data collected during Hurricane Irma, to be used in task 4 for simulation calibration and subsequent analyses. We will create an ArcGIS geodatabase of flood data, including but not limited to flood stage, flood flow rates, and pictures.

Products:

- Letter report that briefly describes task products
- Data inventory
- ArcGIS geodatabase of geographic data
- Data archive of other data

Task 2: Survey

Wood will tour and photograph selected areas in Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds. Two staff will tour and photograph Hogtown Prairie Watershed for two days; two staff will tour and photograph Hogtown Creek Watershed for four days; and two staff will tour and photograph Possum Creek Watershed for three days. We will verify selected data by physical inspection and measurement. We will field verify watershed and subbasin boundaries and other topographic control on surface-water runoff. We will identify hydraulic cross sections and water conveyance structures that require elevation survey. We will verify selected hydrologic and hydraulic information from task 1 during the survey. Verification may be with detailed elevation survey, or with visual verification, as necessary.

We will procure detailed elevation survey for twenty water conveyance structures and twenty hydraulic cross sections. Cited structures and cross sections are total for all three watersheds, not total for each watershed.

Products:

- Letter report that briefly describes task products
- Survey inventory
- ArcGIS geodatabase of geographic data
- Survey archive for other data
- Signed and sealed documents that detail twenty water conveyance structure surveys and twenty hydraulic cross section surveys

This scope of work includes elevation survey for twenty water conveyance structures and twenty hydraulic cross sections in task 2. These surveys and as-built data for water control structures and pipes provided by the City of Gainesville, will satisfy data needs to simulate Hogtown Prairie, Hogtown Creek, and Possum Creek Watershed hydrology and associated creek hydraulics, necessary to consider retrofit or re-design of flood mitigation structures in Florida Park and Mason Manor.

With a subsequent project, Wood will use the simulation and other products described in the present scope of work to request a letter of map revision (LOMR) from FEMA's NFIP. The LOMR will revise SFHAs and BFEs shown on Flood Insurance Rate Maps (FIRMs) to reflect contemporary hydrologic and hydraulic analyses. Additional survey will be necessary, in the subsequent project, to satisfy FEMA's requirements to issue a LOMR. We will describe and specify additional survey in the scope of work associated with the subsequent project.

Task 3: Modify 2017 Digital Elevation Model and Analyze with ArcHydro

The City of Gainesville obtained a LiDAR DEM in 2017 that details Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds. The City of Gainesville will provide Wood with a DEM that reflects bottom elevations for creeks and other conveyances, and ponds and other still-water bodies. The DEM will be compared to contemporary aerial images to identify areas where the DEM does not reflect current conditions, such as may occur with voids in topographic information. We will review as-built data to determine if the DEM must be adjusted to reflect contemporary conditions.

We will adjust the DEM to reflect roadway culverts, stormwater pipes, and ditches from the geodatabase of municipal separate storm sewer systems, and to reflect other data from tasks 1 and 2 into a hydro-enforced DEM to aid hydrologic and hydraulic simulation in task 4. This hydro-enforced DEM will be created with the Environmental Systems Research Institute ArcHydro Terrain Preprocessing toolset. We will use the hydro-enforced DEM and the ArcHydro toolset to delineate catchment boundaries in the Hogtown Prairie, Hogtown Creek, and Possum Creek Watersheds. These catchments and the ICPR node link schematic will then be analyzed with the ArcHydro Watershed Processing toolset. The final product of this analysis will be revised watershed and sub-watershed boundary delineations.

Products:

- Letter report that briefly describes task products
- Modified DEM
- ArcHydro geodatabase containing the following elements:
  - Flow direction grid
  - Flow accumulation grid
  - Stream grid
  - Catchment polygons
  - Sub-watershed polygons
  - Watershed polygons

Task 4: Simulate Watershed Hydrology and Creek Hydraulics

Wood will simulate watershed hydrology and creek hydraulics with the Interconnected Channel and Pond Routing (ICPR) model version 4, approved for use in the NFIP on March 18, 2018 (appendix E).

Wood will simulate watershed hydrology and creek hydraulics forced by Hurricane Irma. We will incorporate data from tasks 1, 2, and 3. We will calibrate the simulation to high-water-mark locations and elevations in simulated watersheds; water-surface elevation in Haile Sink; and to measured stage and flow rate in Possum Creek at Northwest 16th Avenue and Hogtown Creek at Northwest 16th Avenue. Calibration with high-water-mark elevations, or measured water-surface elevation and measured flow rate is a requirement of LOMR requests with ICPR. Calibration ensures that the simulation is accurate. We will map areas inundated by the Hurricane Irma simulation, by intersecting simulated water-surface elevations with a DEM. Inundated-area delineations will be smoothed with an ArcGIS algorithm or with another computer-based algorithm, to eliminate a pixelated character. The simulation will also be calibrated to ensure area inundated by the simulation correlates with the City's database of flood complaints. We will discuss model calibration with the City, to ensure that the calibration satisfies the City's future use of the simulation.

Flood hazard information, SHFAs, BFEs, and flood mitigation structure design in subsequent projects will be based on simulation of synthetic storms with specific AEPs, as required by permit and regulatory authorities. Flood hazard information, SHFAs, BFEs, and flood mitigation structure design in subsequent projects will not be exclusively based on the Hurricane Irma simulation.

We will simulate watershed hydrology and creek hydraulics forced by a rainfall intensity with a 4-percent AEP rainfall frequency (25-year average recurrence interval), and 24-hour duration. This synthetic-storm simulation will support a request for an Environmental Resource Permit (ERP) from the St. Johns River Water Management District (SJRWMD) made and funded in a subsequent project. The ERP will be necessary to retrofit or re-design flood mitigation structures. In support of the subsequent ERP request, simulation in the present project will conform to section 373.4131 of the Florida Statutes, and chapters 62-330, 40C-1, 40C-4, 40C-8, 40C-41, 40C-42 and 40C-44 of the Florida Administrative Code.

In support of the LOMR request made and funded in a subsequent project, simulation in the present project will conform to governing laws, regulations, and guidance associated with the NFIP, including Title

44 Code of Federal Regulations, sections 59 through 80 (summarized in figure A).

Effective flow rates are peak flow rates for selected AEPs published by the NFIP in the FIS for Alachua County and incorporated areas, which are currently used for flood hazard risk assessment and floodplain management. Effective flow rates in Alachua County were based on statistical analyses at discharge gages and regional regression equations. In the present project, we will simulate flood hazards forced by 10-percent, 2-percent, 1-percent, and 0.2-percent AEP floods. The 1-percent AEP storm is the base flood. We will simulate watershed hydrology and creek hydraulics forced by published intensity-duration-frequency relationships for several durations, including but not limited to the 24-hour duration. To determine the governing storm duration—in support of a request for a LOMR made and funded in a subsequent project—we will compare one or more of the following:

- Simulated peak water-surface elevation to statistical analyses at Haile Sink
- Simulated peak flow rates to statistical analyses for one or more of the following data sets: Possum Creek at Northwest 16th Avenue, Hogtown Creek at Northwest 16th Avenue, Hogtown Creek at Southwest 20th Avenue
- Simulated peak flow rates to regional regression equations
- Simulated peak flow rates to effective flow rates
- Simulated peak water-surface elevations to base flood elevations and effective water-surface elevations for other AEPs

Effective flow rates, BFEs, other AEP water-surface elevations, or data sets may be discounted in comparisons, if we determined that statistically non-stationary watershed hydrology exists, such that effective or other data no longer reflect the associated contemporary AEPs.

In the present project, we will also simulate the regulatory floodway with HEC-RAS (version 5.0.3), approved for use in the NFIP. Regulatory floodway simulation is required by FEMA to issue a LOMR. Regulatory floodways cannot be simulated with ICPR.

We will generate model subbasin boundaries or breaklines with the DEM and ArcHydro. We will map SFHAs and areas inundated by a flood with a 0.2-percent AEP by intersecting simulated water-surface elevations with a DEM. SFHA boundary delineations will be smoothed with an ArcGIS algorithm, or another computer-based algorithm, to eliminate pixelated, stepwise delineations.

The primary objectives of task 4 are to create simulations necessary to consider and support retrofit or re-design of flood mitigation structures, funded by a subsequent project; and to create documentation to support a LOMR request made and funded in a subsequent project.

PART A: GENERAL REQUIREMENTS

ELEMENTS
NARRATIVE: Please provide a written description about the purpose of the request and the scope of the proposed/as-built project and the methodology used to analyze the project effects.
MT-2 APPLICATION FORMS: Please provide completed forms applicable to your request. Ensure that MT-2 Form 1 was signed by the requester, certifying engineer, and each community affected by the revision.
HYDROLOGIC ANALYSIS: If applicable, please provide a FEMA acceptable hydrologic analysis in digital format, drainage area map and associated backup information (e.g., calculations used to determine lag time, CN and loss values as well as landuse and soil maps). FEMA-acceptable models can be accessed at www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/numerical-models-meeting-minimum-requirements.
HYDRAULIC ANALYSIS: Please provide a FEMA acceptable hydraulic analysis in digital format. FEMA-acceptable models can be accessed at www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/numerical-models-meeting-minimum-requirements.
CERTIFIED TOPOGRAPHIC WORK MAP: Please provide a certified topographic work map that meets the mapping requirements outlined in MT-2 Form 2. If available, please provide digital Computer-Aided Design (CAD) or Geographic Information System (GIS) data that is spatially referenced.
ANNOTATED FIRM: Please submit a revised FIRM, at the scale of the effective FIRM, which shows the revised boundary delineation of the base floodplain, 0.2-percent-annual-chance floodplain, and regulatory floodway and how it ties into the boundary delineation shown on the effective FIRM at the downstream and upstream ends of the revised reach.
REVIEW FEE PAYMENT: Please include the appropriate review fee payment. The current fee schedule is available on the FEMA Web site at https://www.fema.gov/flood-map-related-fees.
MEET 65.10 REQUIREMENT: If the request intends to show that a berm/levee/flood wall provides flood protection, please submit all of the data requirements outlined in Section 65.10 of the NFIP regulations.
OPERATION AND MAINTENANCE PLAN: If the request involves a berm, levee, flood wall, dam, and/or detention basin project, please submit an officially adopted maintenance and operation plan.
PROPOSED/AS-BUILT PLANS: If applicable, please submit proposed/as-built plans, certified by a registered Professional Engineer, for all the project elements.
FLOODWAY NOTICE: If the revision result in changing or establishing floodway boundaries, please provide floodway public notice or a statement by your community that it has notified all affected property owners, in compliance with NFIP regulation Subparagraph 65.7(b)(1).
PROPERTY OWNER NOTIFICATION: If the revision result in any widening/shifting/establishing of the base floodplain and/or any BFE increases/establishing BFEs, please provide copy of the individual legal notices sent to all the property owners affected by any increases in the flood hazard information.

Figure A. Summary of selected elements of National Flood Insurance Program rules that govern requests for Letters of Map Revision (MT-2 form set; Title 44 Code of Federal Regulations, sections 59 through 80).

Products:

- Report that describes watershed hydrology and creek hydraulic simulation, assumptions, field investigation, other simulation input, and simulation results.
- For ERP purposes in a subsequent project, ICPR simulation of a synthetic storm forced by a rainfall intensity for a 4-percent AEP frequency (25-year average recurrence interval) and 24-hour duration
- For LOMR purposes in a subsequent project, calibrated ICPR simulation of Hurricane Irma
- Comparative analyses that justify governing rainfall duration

- For LOMR purposes in a subsequent project, ICPR simulation of the following rainfall events for the governing duration:
  - Ten-percent AEP rainfall depth
  - Two-percent AEP rainfall depth
  - One-percent AEP rainfall depth
  - One-fifth-of-one-percent AEP rainfall depth
- For LOMR purposes in a subsequent project, HEC-RAS simulation of the regulatory floodway
- Maps that show areas inundated by the simulation of Hurricane Irma
- Maps that show effective and simulated SFHAs, and the effective floodway
- ArcGIS geodatabase of geographic input from the ICPR simulation
- ArcGIS geodatabase of geographic input from the HEC-RAS simulation
- ArcGIS geodatabase of effective and simulated SFHAs, 0.2-percent AEP floodplains, effective floodways, and simulated areas inundated by Hurricane Irma

Wood will not request a LOMR from FEMA's NFIP or an ERP from SJRWMD, based exclusively on products from task 4. Simulations in task 4 will be used in subsequent projects to consider and support retrofit or re-design of flood mitigation structures, and in subsequent projects to create documentation to support a LOMR request.

The Mason Manor floodwall flood mitigation structure is in the Possum Creek Watershed, about two-thirds of a mile upstream of the confluence of Possum and Hogtown Creeks. The Florida Park levee flood mitigation structure is in the Hogtown Creek Watershed about one mile upstream of the confluence of Possum and Hogtown Creeks. Both structures are likely influenced by flood hazards in both watersheds. Restated: flood hazards in the Hogtown Creek Watershed must be simulated to fully understand flood hazards at the Mason Manor floodwall, in the Possum Creek Watershed; and flood hazards in the Possum Creek Watershed must be simulated to fully understand flood hazards at the Florida Park levee, in the Hogtown Creek Watershed.

The NFIP conditionally approves proposed flood mitigation structures, and other proposed activities that may change SFHAs, with Conditional LOMRs, or CLOMRs. Conditional LOMRs do not change effective flood hazard information, SFHAs, or BFEs. Conditional LOMRs provide partial assurance that if, for example, a flood mitigation structure is constructed, FEMA will revise effective flood hazard information, SFHAs, and BFEs in a proposed manner, to reflect the constructed structure. Conditional LOMRs guide decision making, but do not guarantee specific outcomes. We will discuss a possible CLOMR with the City after task 2.1. Preparation of a CLOMR application, and associated application fees are not included in the budget for the present scope of work.

The following activities are not part of the present project:

- Retrofit or re-design of the Florida Park levee or Mason Manor floodwall
- Costs analyses and benefit analyses associated with a choice to construct a flood mitigation structure, or a choice to not construct a flood mitigation structure
- Revision to hydrologic and hydraulic simulations from task 4 to reflect retrofit or re-design or the Florida Park levee and Mason Manor floodwall
- Detailed survey of the Florida Park levee and surrounding area or Mason Manor floodwall and surrounding area, necessary to retrofit or re-design the levee or floodwall
- Submission of data to the U.S. Army Corps of Engineers, in support of the Army Corps' Rehabilitation and Inspection Program
- Submission of data to FEMA's NFIP, in support of a LOMR request
- Detailed flood hazard analyses of effective Zone-A SFHAs

Work associated with these seven bulleted activities must be funded by subsequent projects.

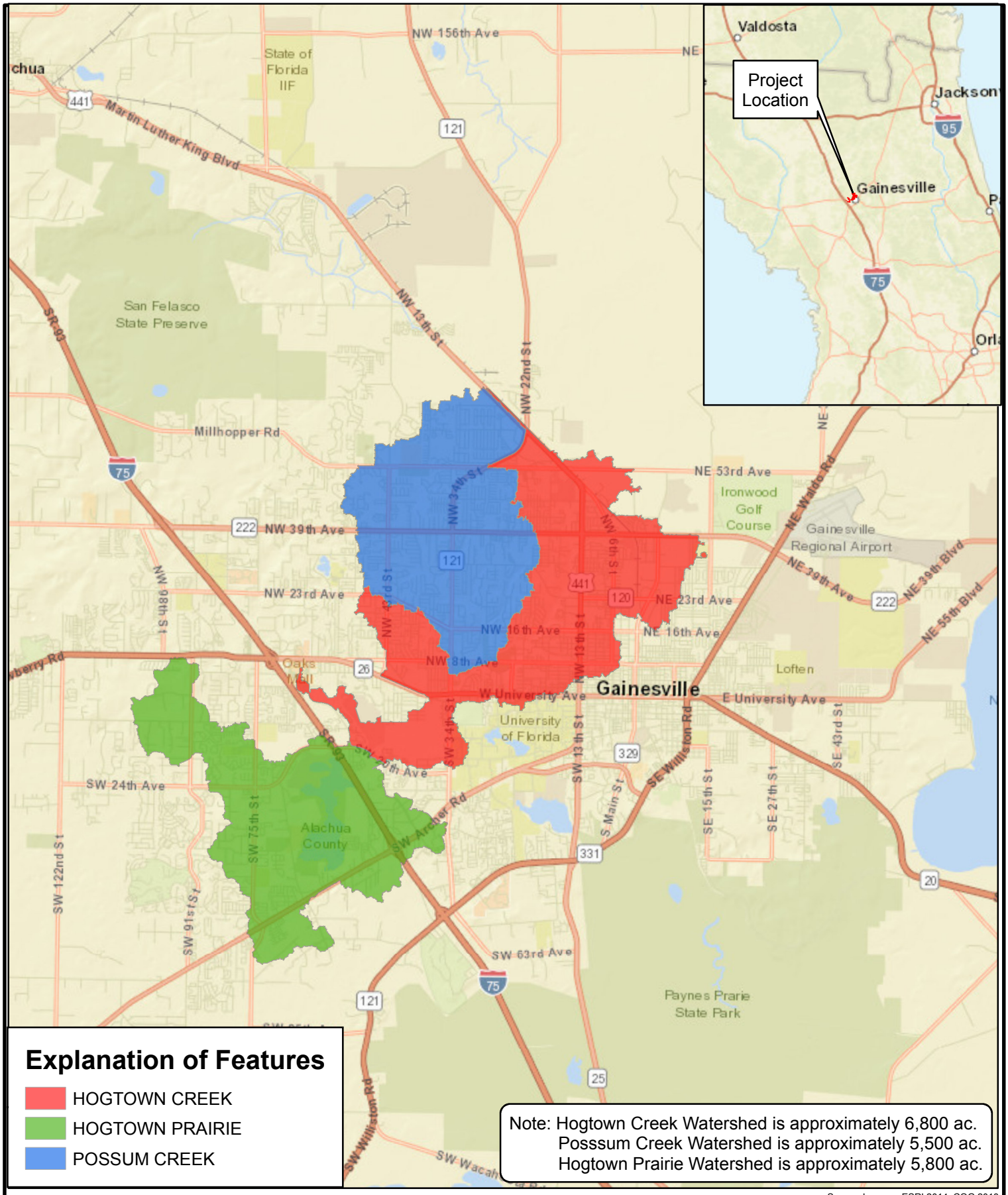
Schedule

Work described in the present scope of work will require about 8 months to complete, from notice to proceed to publication of work products (appendix C).

Budget

Work described in the present scope of work will require $199,934 to complete.

Appendix A: Figures



Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Project Location Map

Drawn	Date	Gainesville Florida Project No.	wood.	Figure 1
NMB	3/9/2018			
Checked	Date			
DLA	3/9/2018			

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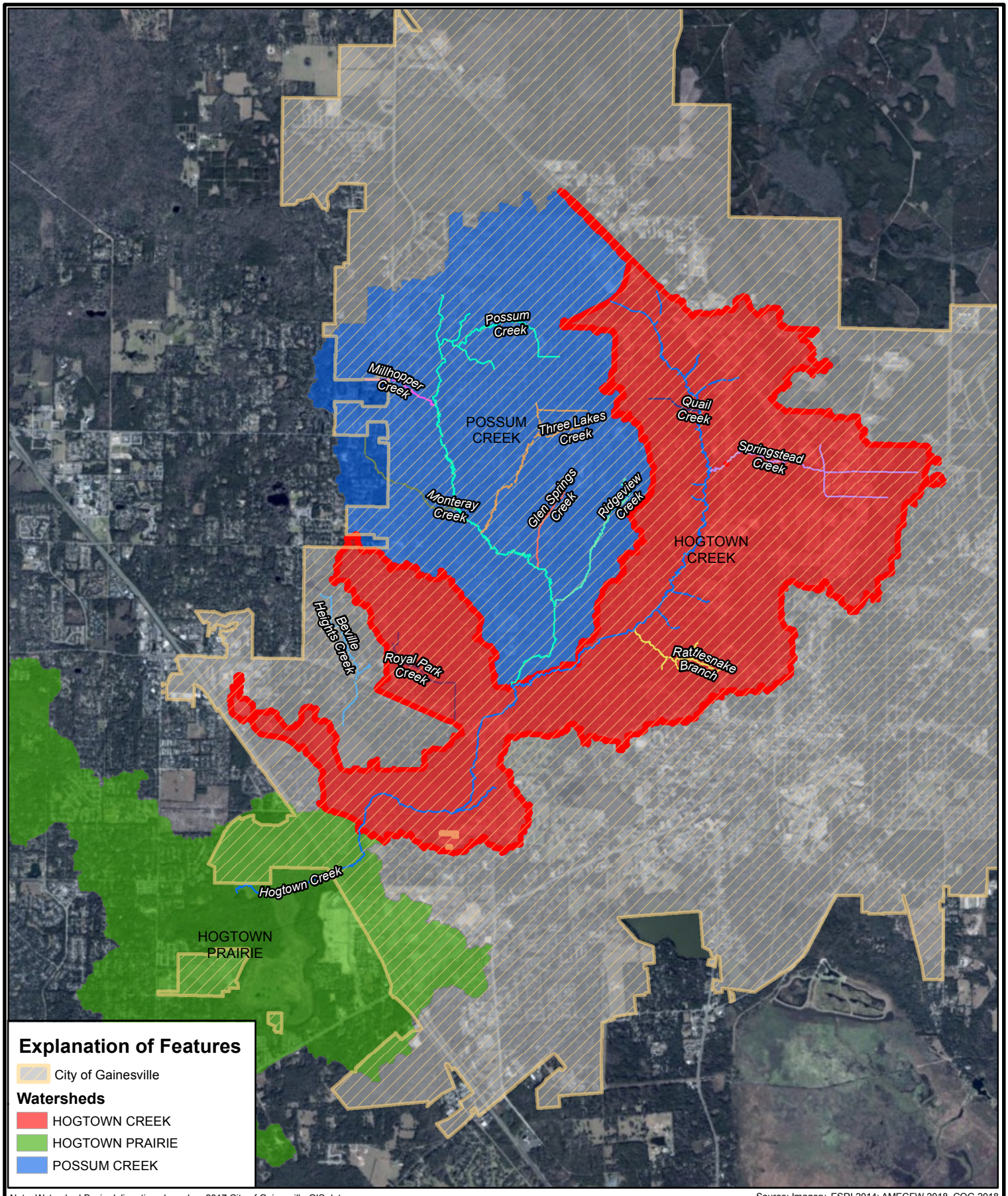

Note: Watershed Basin delineations based on 2017 City of Gainesville GIS data.

Source: Imagery, ESRI 2014; AMECFW 2018, COG 2018

N

1 inch = 6,000 feet

0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Watershed Delineation Map

Drawn	Date
NMB	3/16/2018
Checked	Date
DLA	3/16/2018

Gainesville Florida Project No.

wood.

Figure 2

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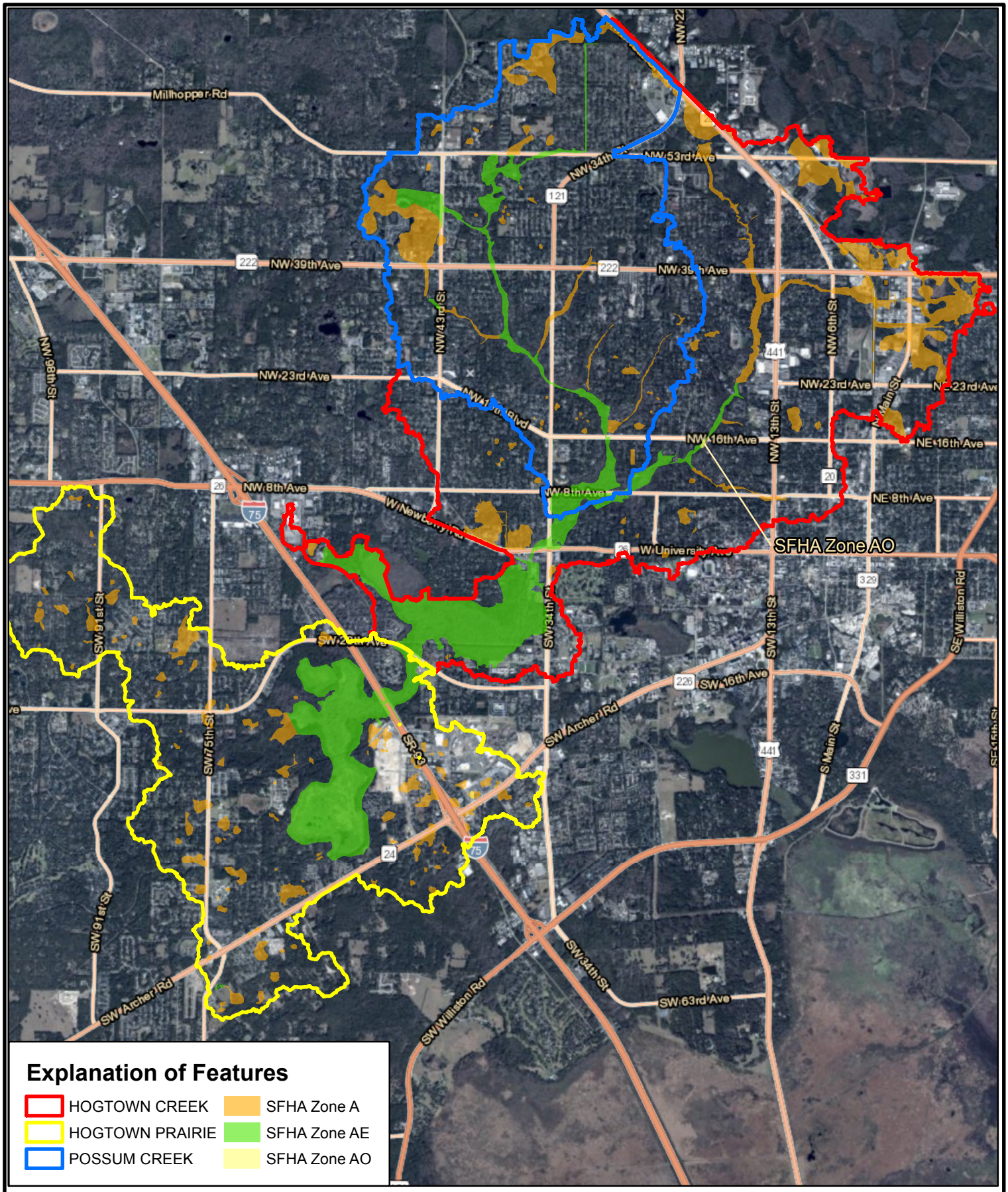

Source: Imagery, ESRI 2014; AMECFW 2018; FEMA 2017

N

1 inch = 6,000 feet

0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

FEMA Special Flood Hazard Area Zone Map

Drawn	Date	*Gainesville Florida Project No.*	wood.	Figure 3
NMB	3/16/2018			
Checked	Date			
DLA	3/16/2018			

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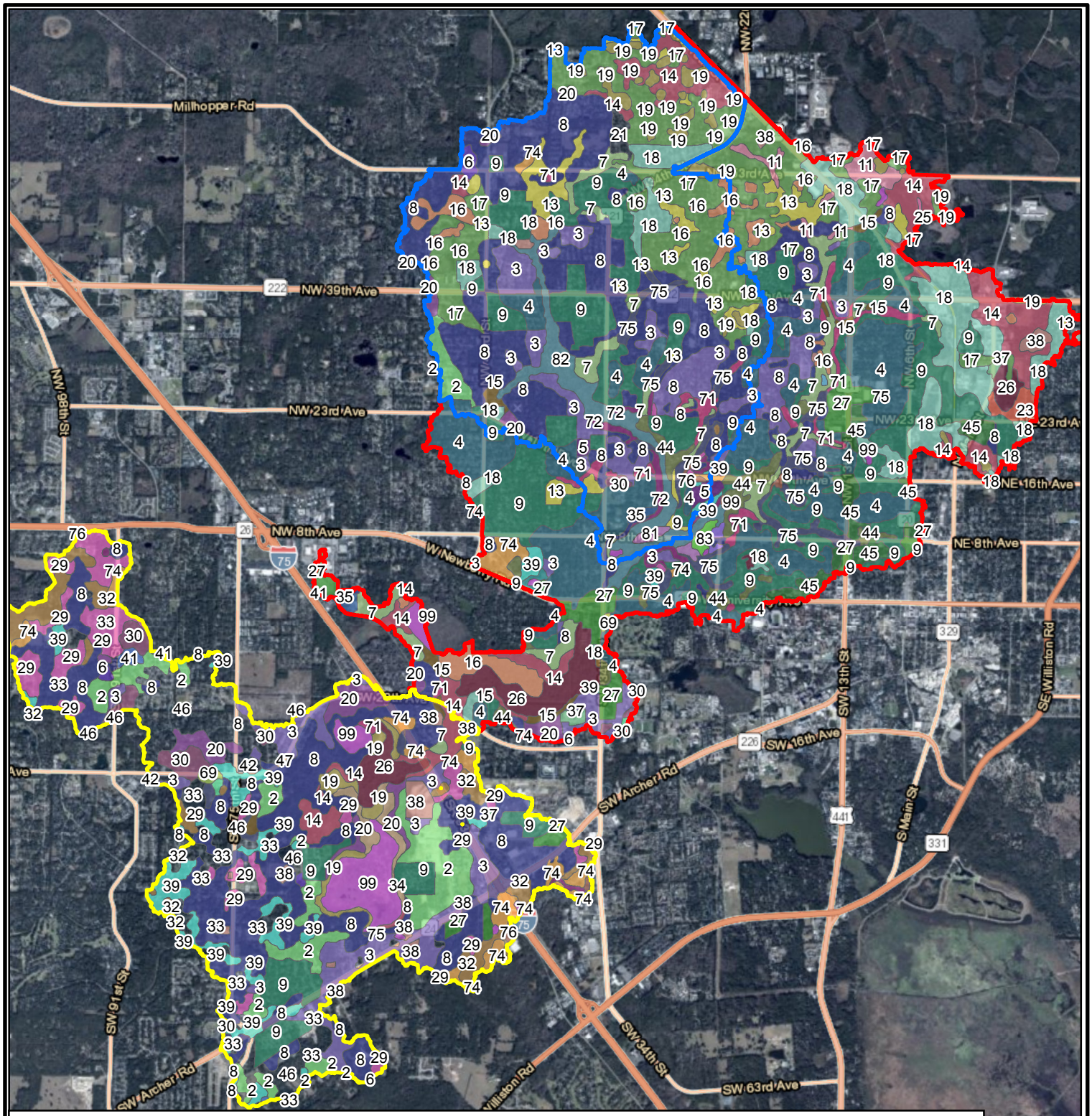


Explanation of Features

- HOGTOWN CREEK
- HOGTOWN PRAIRIE
- POSSUM CREEK
- 2; CANDLER FINE SAND, 0 TO 5 PERCENT SLOPES
- 3; ARREDONDO FINE SAND, 0 TO 5 PERCENT SLOPES
- 4; ARREDONDO-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 5; FORT MEADE FINE SAND, 0 TO 5 PERCENT SLOPES
- 6; APOPKA SAND, 0 TO 5 PERCENT SLOPES
- 7; KANAPAHA SAND, 0 TO 5 PERCENT SLOPES
- 8; MILLHOPPER SAND, 0 TO 5 PERCENT SLOPES
- 9; MILLHOPPER-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 11; RIVIERA SAND
- 13; PELHAM SAND
- 14; POMONA SAND
- 15; POMPANO SAND
- 16; SURRENCY SAND
- 17; WAUCHULA SAND
- 18; WAUCHULA-URBAN LAND COMPLEX
- 19; MONTEOCHA LOAMY SAND
- 20; TAVARES SAND, 0 TO 5 PERCENT SLOPES
- 23; MULAT SAND
- 25; POMONA SAND, DEPRESSIONAL
- 26; SAMSULA MUCK
- 27; URBAN LAND
- 28; CHIPLEY SAND
- 29; LOCHLOOSA FINE SAND, 2 TO 5 PERCENT SLOPES
- 30; KENDRICK SAND, 2 TO 5 PERCENT SLOPES
- 32; BIVANS SAND, 2 TO 5 PERCENT SLOPES
- 34; PLACID SAND, DEPRESSIONAL
- 35; GAINESVILLE SAND, 0 TO 5 PERCENT SLOPES
- 36; ARENTS, 0 TO 5 PERCENT SLOPES
- 37; ZOLFO SAND
- 38; PITS AND DUMPS
- 39; BONNEAU FINE SAND, 2 TO 5 PERCENT SLOPES
- 41; PEDRO FINE SAND, 0 TO 5 PERCENT SLOPES
- 44; BLICHTON-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 45; URBAN LAND-MILLHOPPER COMPLEX
- 69; ARREDONDO FINE SAND, 5 TO 8 PERCENT SLOPES
- 71; MILLHOPPER SAND, 5 TO 8 PERCENT SLOPES
- 72; LOCHLOOSA FINE SAND, 5 TO 8 PERCENT SLOPES
- 74; BLICHTON SAND, 2 TO 5 PERCENT SLOPES
- 75; BLICHTON SAND, 5 TO 8 PERCENT SLOPES
- 76; BIVANS SAND, 5 TO 8 PERCENT SLOPES
- 78; NORFOLK LOAMY FINE SAND, 5 TO 8 PERCENT SLOPES
- 81; STARKE SAND, FREQUENTLY FLOODED
- 82; PELHAM, PLUMMER, AND MASCOTTE SOILS, OCCASIONALLY FLOODED
- 83; PICKNEY SAND, FREQUENTLY FLOODED
- 84; OCILLA, ALAPAHA, AND MANDARIN SOILS, OCCASIONALLY FLOODED
- 99; WATER

Source: Imagery, ESRI 2014; AMECFW 2018; NRCS 2016

N

1 inch = 6,000 feet

0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

NRCS Soils Map

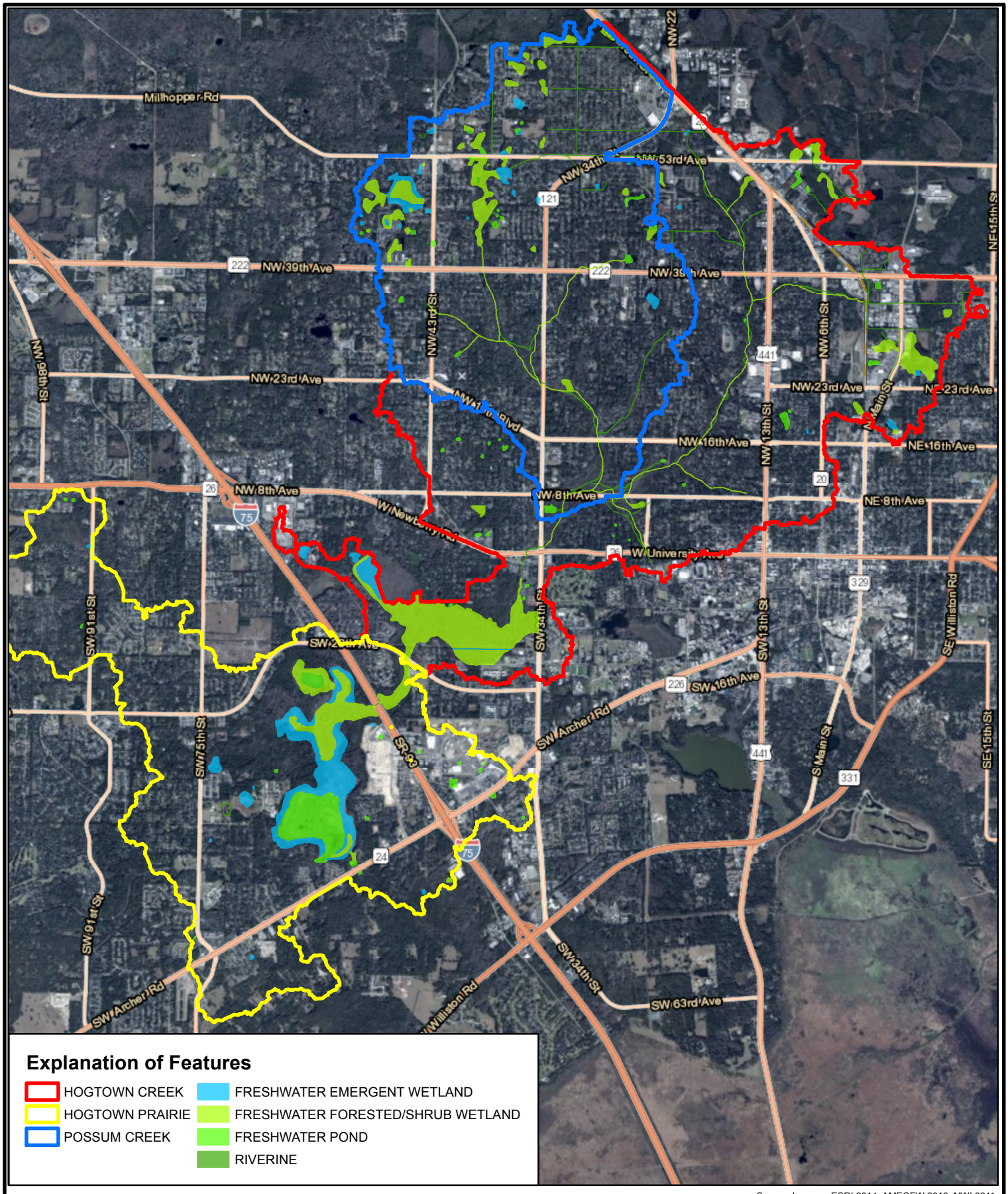
Drawn	Date
NMB	3/9/2018
Checked	Date
DLA	3/9/2018

Gainesville Florida Project No.

wood.

Figure 4

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 4 Soils Map.mxd dustin.atwater Date Saved: 2/12/2018 3:05:06 PM



Explanation of Features

- HOGTOWN CREEK
- HOGTOWN PRAIRIE
- POSSUM CREEK
- FRESHWATER EMERGENT WETLAND
- FRESHWATER FORESTED/SHRUB WETLAND
- FRESHWATER POND
- RIVERINE

Source: Imagery, ESRI 2014; AMECFW 2018; NWI 2011

N

1 inch = 6,000 feet

0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

National Wetland Institute Map

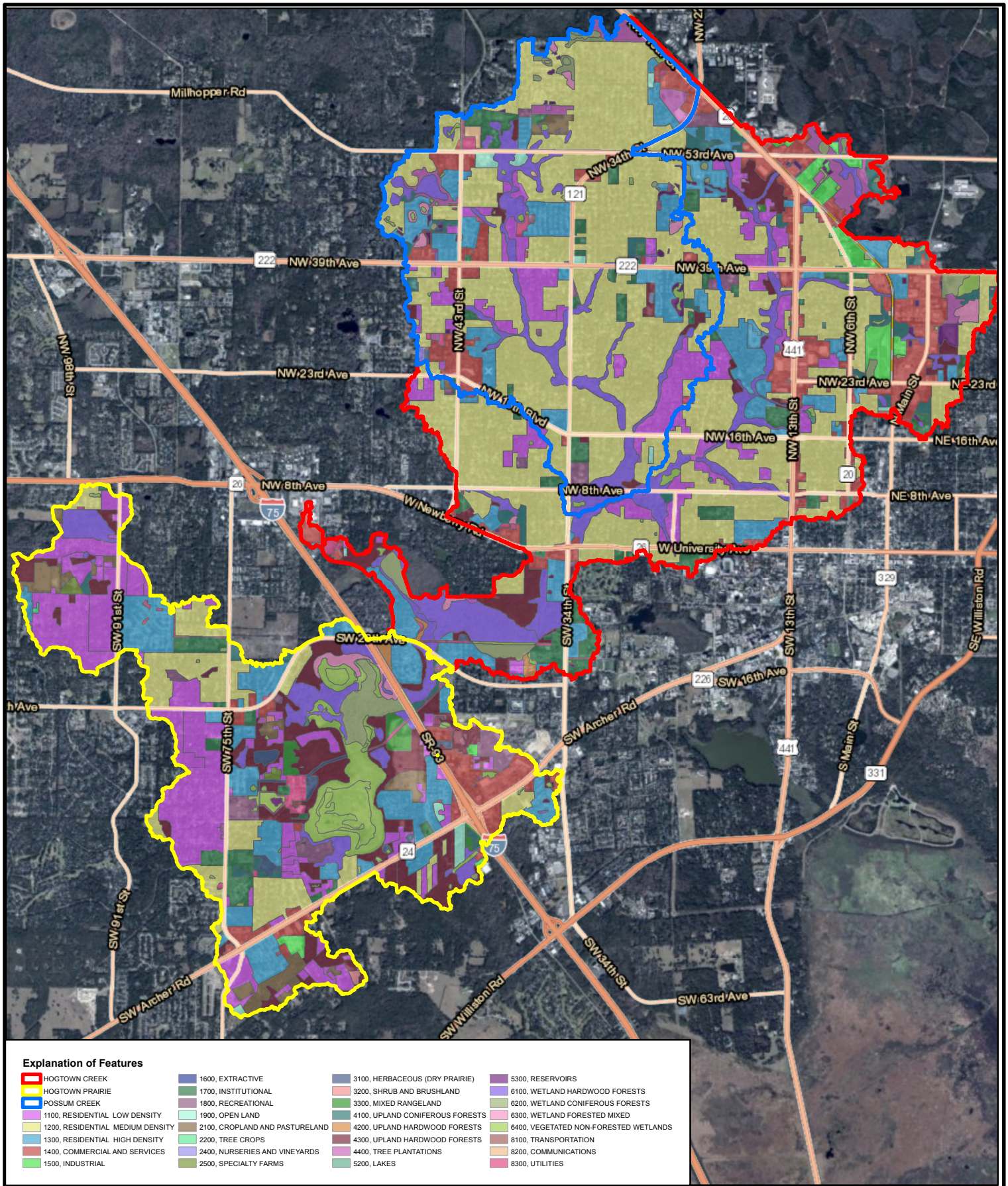
Drawn	Date
NMB	3/9/2018
Checked	Date
DLA	3/9/2018

Gainesville Florida Project No.

wood.

Figure 5

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 5 NWI Map.mxd dustin.atwater Date Saved: 3/9/2018 4:02:43 PM



Explanation of Features

- HOGTOWN CREEK
- HOGTOWN PRAIRIE
- POSSUM CREEK
- 1100, RESIDENTIAL LOW DENSITY
- 1200, RESIDENTIAL MEDIUM DENSITY
- 1300, RESIDENTIAL HIGH DENSITY
- 1400, COMMERCIAL AND SERVICES
- 1500, INDUSTRIAL
- 1600, EXTRACTIVE
- 1700, INSTITUTIONAL
- 1800, RECREATIONAL
- 1900, OPEN LAND
- 2100, CROPLAND AND PASTURELAND
- 2200, TREE CROPS
- 2400, NURSERIES AND VINEYARDS
- 2500, SPECIALTY FARMS
- 3100, HERBACEOUS (DRY PRAIRIE)
- 3200, SHRUB AND BRUSHLAND
- 3300, MIXED RANGELAND
- 4100, UPLAND CONIFEROUS FORESTS
- 4200, UPLAND HARDWOOD FORESTS
- 4300, UPLAND HARDWOOD FORESTS
- 4400, TREE PLANTATIONS
- 5200, LAKES
- 5300, RESERVOIRS
- 6100, WETLAND HARDWOOD FORESTS
- 6200, WETLAND CONIFEROUS FORESTS
- 6300, WETLAND FORESTED MIXED
- 6400, VEGETATED NON-FORESTED WETLANDS
- 8100, TRANSPORTATION
- 8200, COMMUNICATIONS
- 8300, UTILITIES

Source: Imagery, ESRI 2014; AMECFW 2018; SJRWMD 2016

N

1 inch = 6,000 feet

0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Land Use Map

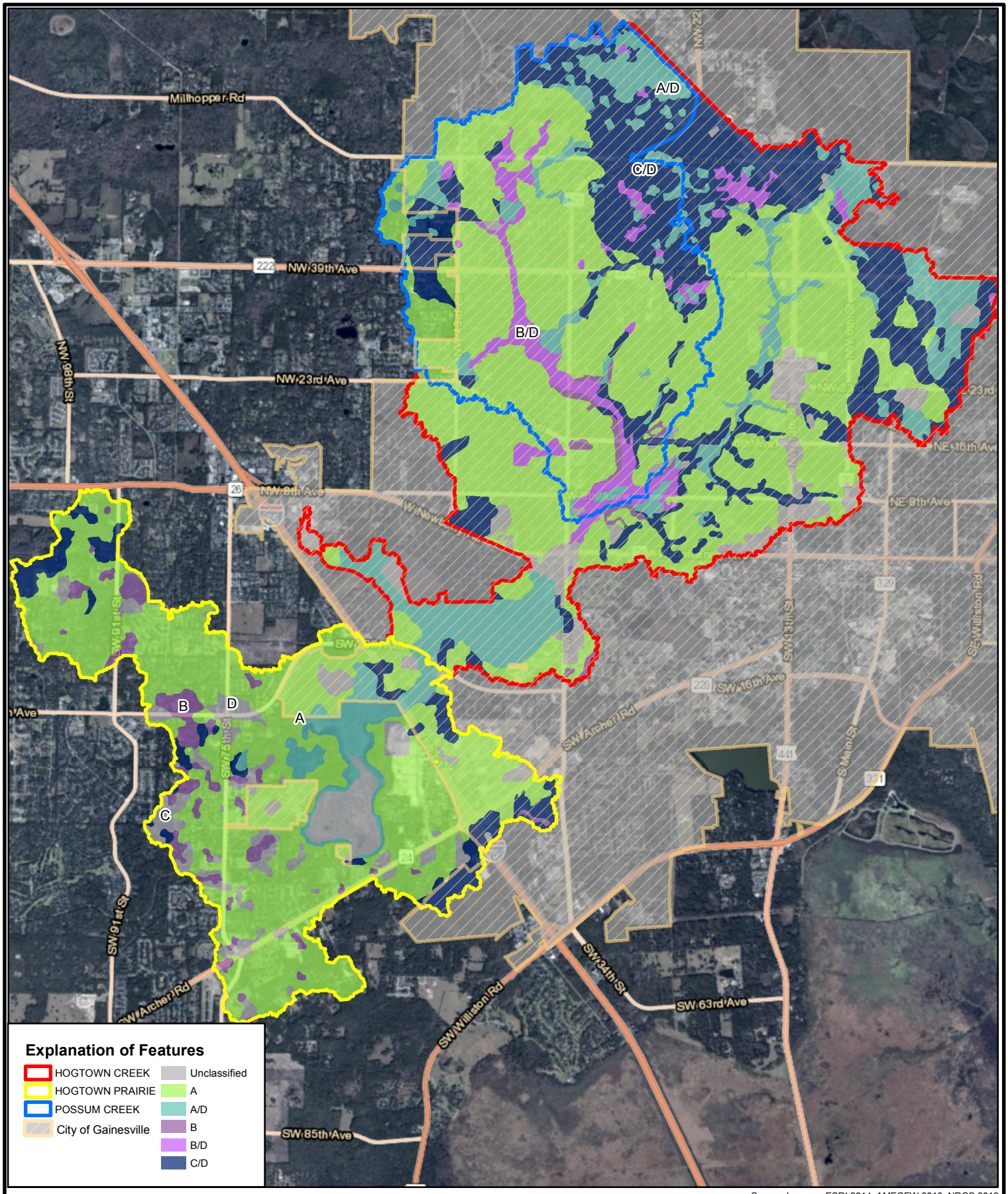
Drawn	Date
NMB	3/9/2018
Checked	Date
DLA	3/9/2018

Gainesville Florida Project No.

wood.

Figure 6

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 6 Land Use Map.mxd dustin.atwater Date Saved: 3/9/2018 4:05:55 PM



Source: Imagery, ESRI 2014; AMECFW 2018; NRCS 2012

N

1 inch = 6,000 feet

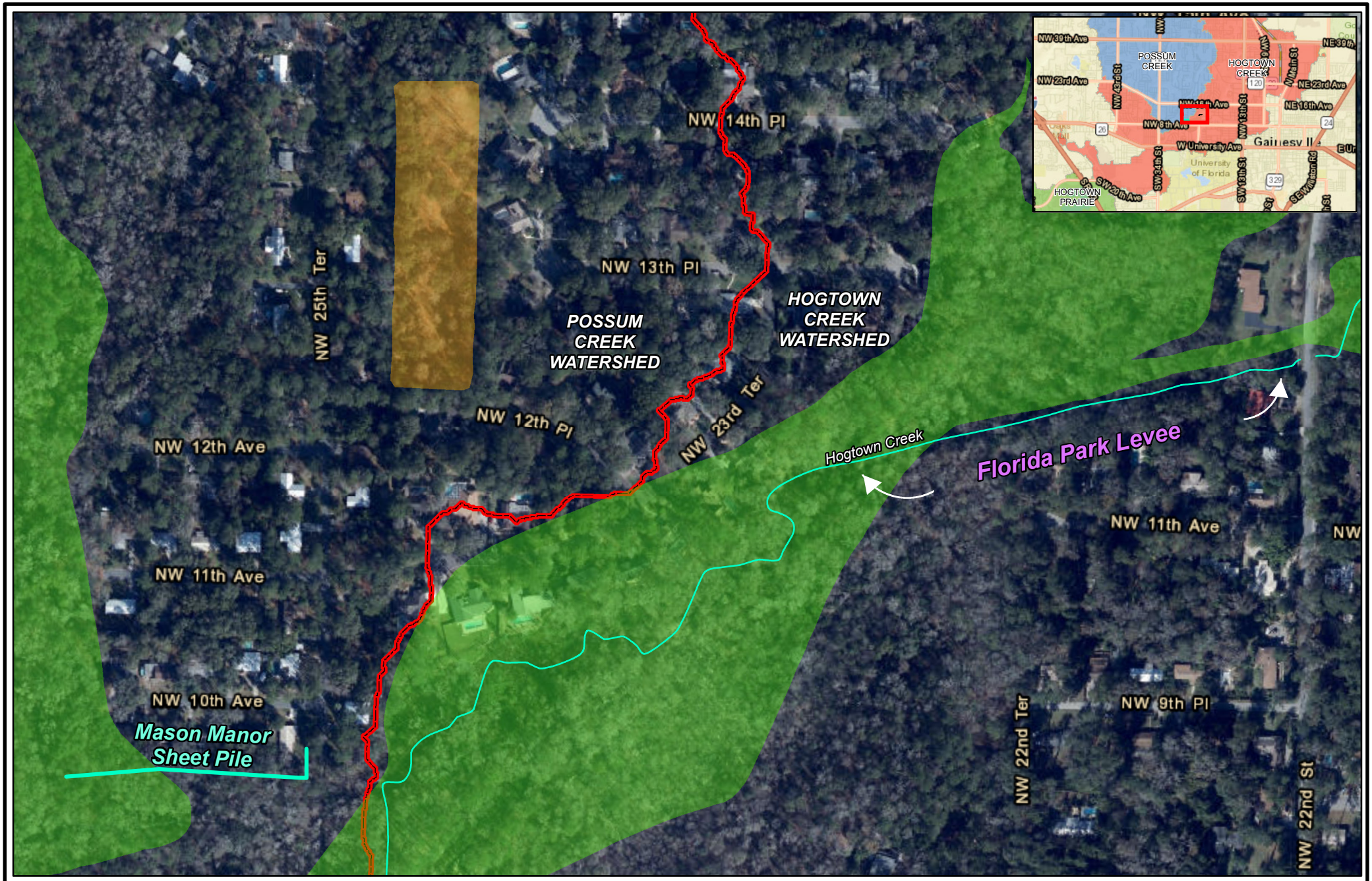
0 3,000 6,000 12,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Hydrologic Soil Groups Map

Drawn	Date	Gainesville Florida Project No.	wood.	Figure 7
NMB	3/16/2018			
Checked	Date			
DLA	3/16/2018			

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 7 Hydrologic Soil Groups Map.mxd dustin.atwater Date Saved: 3/9/2018 3:42:34 PM



Source: Imagery, ESRI 2014; AMECFW 2018; FEMA 2017

Explanation of Features

- Watershed Boundary
- Hogtown Creek
- SFHA Zone A
- SFHA Zone AE

N

1 inch = 300 feet

0 150 300 600 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Damaged Flood Mitigation Structures; FEMA SFHA Map

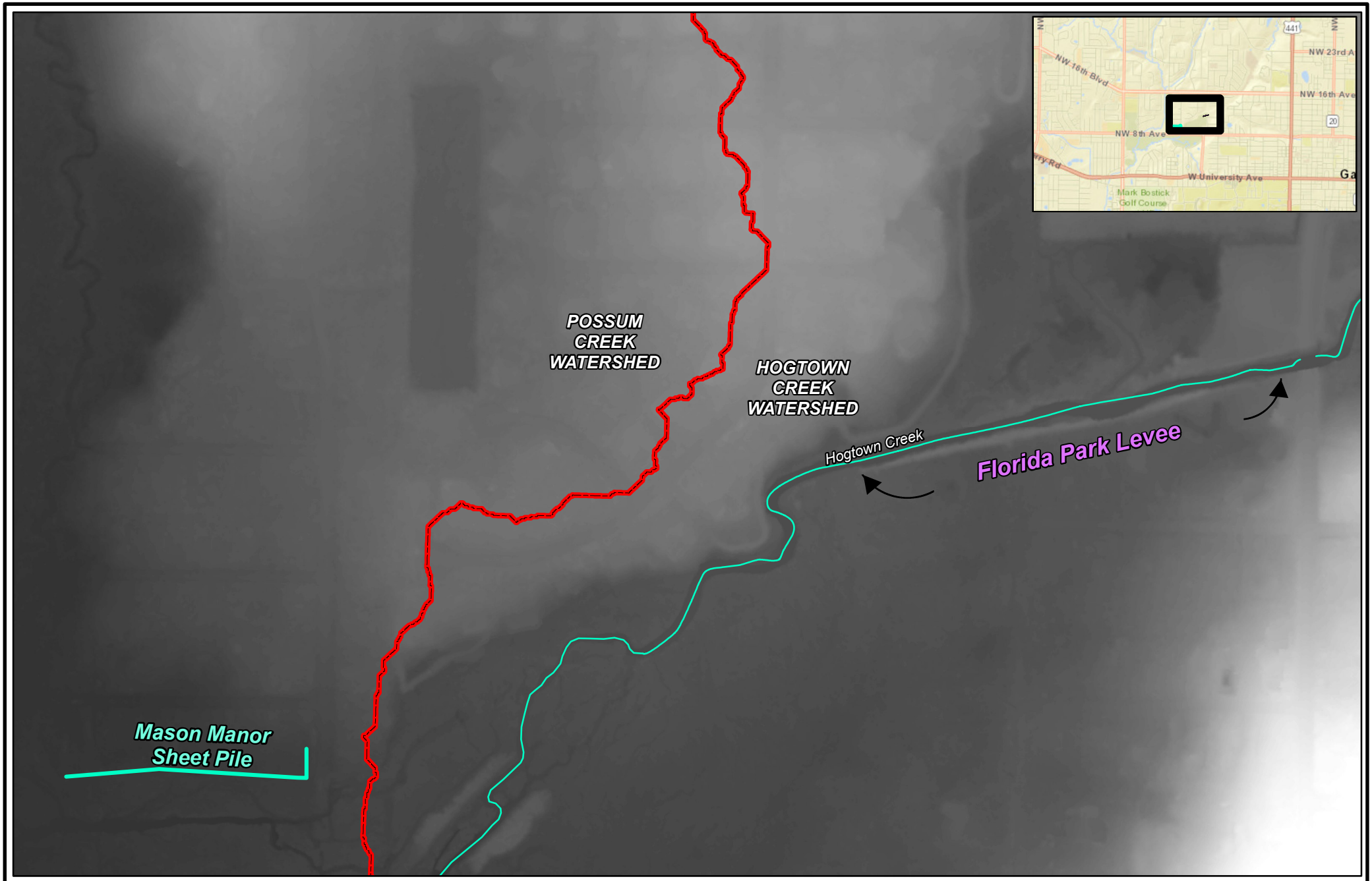
Drawn	Date
NMB	3/16/2018
Checked	Date
DLA	3/16/2018

Gainesville Florida Project No.

wood.

Figure 8

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 8 Damaged Structures FEMA SFHA Zone Map.mxd dustin.atwater Date Saved: 3/12/2018 2:12:53 PM



Source: City of Gainesville 2017; AMECFW 2018

Explanation of Features

- Watershed Boundary
- Hogtown Creek

Elevation Ft. (NAVD 88)

High : 156.308

Low : 80.0124

N

1 inch = 300 feet

0 150 300 600 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Damaged Structures Digital Elevation Model Map

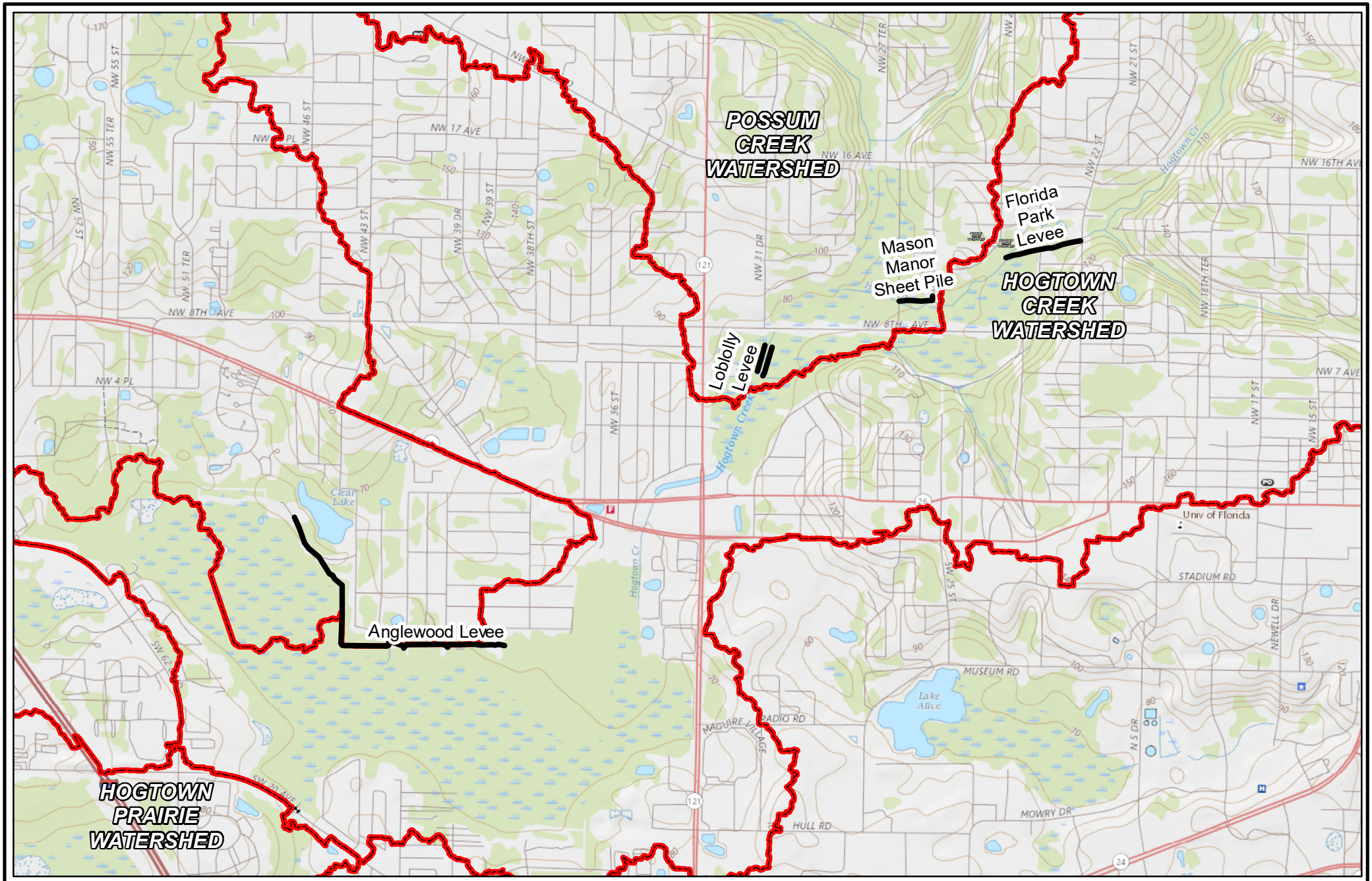
Drawn	Date
NMB	3/12/2018
Checked	Date
DLA	3/12/2018

Gainesville Florida Project No.

wood.

Figure 9

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Figure 9 Damaged Structures Digital Elevation Model Map.mxd dustin.atwater Date Saved: 3/12/2018 2:03:04 PM



Source: City of Gainesville 2018; AMECFW 2018

N

1 inch = 2,000 feet

0 500 1,000 2,000 Feet

Hogtown Creek, Possum Creek & Hogtown Prairie Watersheds

Flood Mitigation Structures

Drawn	Date
JNK	4/6/2018
Checked	Date
DLA	4/6/2018

Gainesville Florida Project No.

wood.

Figure 10

Path: P:\EAT\2018\Proposals\City of Gainesville\Hogtown Creek WMP\GIS\MXD\Flood Mitigation Structures.mxd Jeffrey.King Date Saved: 4/6/2018 2:58:06 PM

Appendix B: Photographs

Photograph 1. Flooded house in Mason Manor, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 2. Flooded house in Mason Manor, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 3. Mason Manor floodwall, eastern terminus, facing north at the southern end of Northwest 25th Terrace toward the intersection of Northwest 25th Terrace and Northwest 10th Avenue. Photograph by Wood in March 2018.

Photograph 4. Mason Manor floodwall, about 100 meters west of Northwest 25th Terrace, facing west toward an undermined part of the sheet pile wall. Hurricane Irma floodwater likely deposited white sand on the north side of the undermined section, in September 2017. Photograph by Wood in March 2018.

Photograph 5. Mason Manor floodwall, about 100 meters west of Northwest 25th Terrace, facing northwest at an undermined part of the sheet pile wall. Hurricane Irma floodwater likely deposited white sand on the north side of the undermined section, in September 2017. Photograph by Wood in March 2018.

Photograph 6. Mason Manor floodwall, about 100 meters west of Northwest 25th Terrace, facing west at an undermined part of the sheet pile wall. Hurricane Irma floodwater likely deposited white sand on the north side of the undermined section, in September 2017. Photograph by Wood in March 2018.

Photograph 7. Felled tree in Hogtown Creek, near Florida Park Levee, north of the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 8. Flooded house in Florida Park, north of the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 9. Flooded house in Florida Park, north of the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 10. Floodwater at the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 11. Floodwater at the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 12. Floodwater at the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

Photograph 13. Floodwater at the western end of Northwest 11th Avenue, after Hurricane Irma, September 2017. Photograph from City of Gainesville Public Works database.

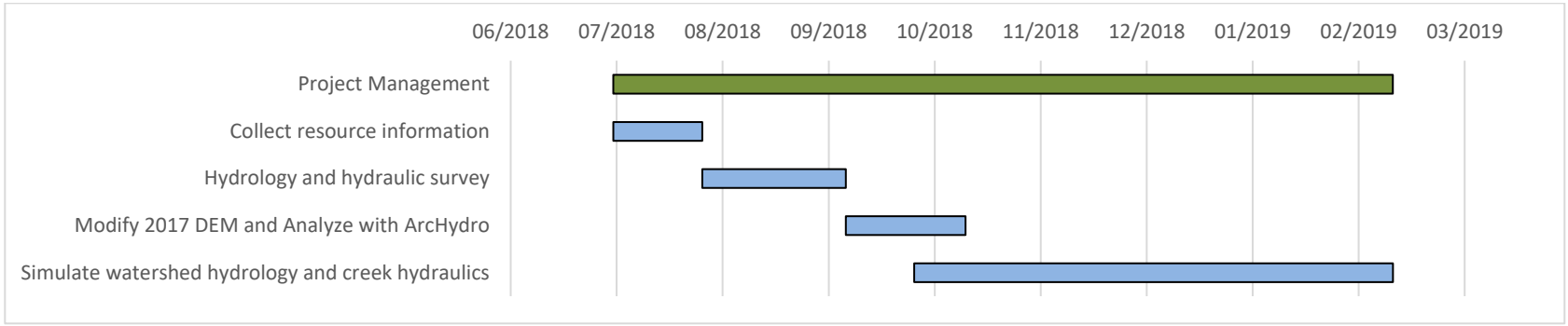
Photograph 14. Florida Park, Northwest 11th Avenue, about 150 meters west of the intersection of Northwest 11th Avenue and Northwest 22nd Street, facing west. Hurricane Irma floodwater likely deposited white sand on properties on the western end of Northwest 11th Avenue, in September 2017. Photograph by Wood in March 2018.

Photograph 15. Florida Park, Northwest 11th Avenue, about 180 meters west of the intersection of Northwest 11th Avenue and Northwest 22nd Street, facing northwest. Hurricane Irma floodwater likely deposited white sand on properties on the western end of Northwest 11th Avenue, in September 2017. Photograph by Wood in March 2018.

Photograph 16. Loblolly Woods, about 100 meters northwest of the western end of Northwest 11th Avenue, near Florida Park, facing southwest on top of a constructed earthen embankment on the south bank of Hogtown Creek. The top of the embankment is about 5 meters above the bed of Hogtown Creek. The top of the embankment is about 2 meters wide. Embankment side slope on the southern side of the embankment, near the photographed location is about 1 vertical to 1 horizontal. Embankment side slope on the northern side of the embankment, near the photographed location is likely steeper than 1 vertical to 1 horizontal. Photograph by Wood in March 2018.

Photograph 17. Loblolly Woods, about 100 meters northwest of the western end of Northwest 11th Avenue, near Florida Park, facing southwest on top of a constructed earthen embankment on the south bank of Hogtown Creek. The top of the embankment is about 5 meters above the bed of Hogtown Creek. The embankment is about one half eroded. Photograph by Wood in March 2018.

Appendix C: Schedule



Project management tasks.
Wood tasks.

Appendix D: Table

Table 1. History of Federal Emergency Management Agency National Flood Insurance Program flood hazard risk assessment on Hogtown Creek, Possum Creek, and Millhopper Creek, City of Gainesville, Florida.

Flood Source	Revision Type	Year	Study Identification Number or LOMR Case Number	Study Contractor	Hydrology	Hydraulics	Status	Data Available?	Notes (reach info as needed)
Hogtown Creek	Study	1983	125107-19830119	USGS	Gage data and Log-Pearson III	USGS Step Backwater	Effective	Yes	XS H-Q match XS F-O in 2006 Countywide FIS
Possum Creek (Hogtown Creek Tributary 1)	Study	1983	125107-19830119	USGS	Gage data and Log-Pearson III	USGS Step Backwater	Effective	Yes	XS A-K match in 2006 Countywide FIS
Millhopper Creek (Hogtown Creek Tributary 2)	Study	1983	125107-19830119	USGS	Gage data and Log-Pearson III	USGS Step Backwater	Effective	Partial	XS A-G match in 2006 Countywide FIS
Hogtown Creek	Study	1984	120001-19840928	USGS	Gage data and Log-Pearson III	USGS Step Backwater	Superseded	Partial	HYDROLOGY: 10- and 100-year peak discharges taken from North Central Florida Regional Planning Council drainage study / HYDRAULICS: Profile only, no floodway computed due to stream channel conditions
Millhopper Creek (Hogtown Creek Tributary 2)	Study	1984	120001-19840928	USGS	Gage data and Log-Pearson III	USGS Step Backwater	Effective	Partial	XS A-D match XS H-K in 2006 Countywide FIS
Possum Creek (Hogtown Creek Tributary 1)	LOMR	1985	FL_SWEARINGEN 19851024	City of Gainesville Public Works Department		USGS E-431	Conditional	No	

Flood Source	Revision Type	Year	Study Identification Number or LOMR Case Number	Study Contractor	Hydrology	Hydraulics	Status	Data Available?	Notes (reach info as needed)
Millhopper Creek (Hogtown Creek Tributary 2)	Study	1993	125107-19930217	Neel-Schaffer, Inc.	Regression Equation	USACE HEC-2	Effective	Partial	XS A-G match in 2006 Countywide FIS
Hogtown Creek	LOMR	1995	95-04-335P	City of Gainesville Public Works Department	Other (See Notes)	USDA SCS WSP-2	Dropped	Yes	
Hogtown Creek	LOMR	1996	96-04-183P	CH2M Hill	Other (See Notes)	USACE HEC-2	Incorporated	Yes	HYDROLOGY: HYMO hydrologic modeling / Follows up 95-04-335P
Millhopper Creek (Hogtown Creek Tributary 2)	LOMR	?	894122	Barry Rutenberg & Associates, Inc.			Effective	Yes	

Appendix E: Federal Emergency Management Agency approval letter for ICPR version 4, dated March 5, 2018

U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472

FEMA

March 5, 2018

Carl Spirio, P.E.
State Drainage Engineer
Florida Department of Transportation
605 Suwannee Street
Tallahassee, Florida 32399

Dear Mr. Spirio:

Thank you for your letter dated October 31, 2017, to the Department of Homeland Security, Federal Emergency Management Agency (FEMA), endorsing the certification of the Interconnected Channel and Pond Routing Version 4 (ICPR4) model for use in National Flood Insurance Program (NFIP) applications. FEMA also received approval of ICPR4 from the Florida Natural Resources Conservation Service and the Southwest Florida Water Management District. We appreciate your efforts to seek FEMA's acceptance of the ICPR4 computer model. FEMA has received a signed document from the software developer, Streamline Technologies Inc., granting conditional permission for FEMA to disclose the source codes and user manual for this product.

FEMA agrees that the ICPR4 computer model meets the minimum requirements for use in NFIP mapping in the State of Florida. The program will be added to FEMA's list of locally accepted models, and it will be certified as two-dimensional modeling software for hydrologic and hydraulic modeling.

Please note that this letter is used as the basis for updating FEMA's list of accepted models. Therefore, as we make updates to our list, please feel free to reference and include this letter in any NFIP mapping projects using this model.

If you need additional information or assistance, please contact Brian Koper of my staff in Washington, DC, either by telephone at (202) 646-3085 or by email at Brian.Koper@fema.dhs.gov.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

cc: Kristen Martinenza, P.E., CFM, FEMA Region IV
Peter J. Singhofen, P.E., Streamline Techologies, Inc.