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DATE: November 2, 2022
TO: Consultants Submitting Proposals for the 2023 Watershed Studies
FROM: James M. Wolfe, P.E., City Engineer
SUBJECT: **Request for Proposals**

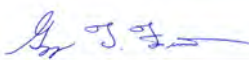
The City of Madison Engineering Division is requesting consultant proposals for watershed modeling for the John Nolen Drive and Warner Park Watersheds. Please refer to the RFPs for pertinent information and dates. The following items are included with the RFPs and considered part of it:

- Appendix A: Contract for Purchase of Services
- Exhibit 1-2: Watershed Specific Information
- Exhibit 3: Data provided by City
- Exhibit 4: City of Madison Modeling Guidance
- Exhibit 5: Final Report Outline and GIS Deliverables

The RFP responses for both watersheds are due in pdf format via email to the office of the City Engineer, Attn: Caroline Burger, by 4:00 p.m., December 1, 2022, at cburger@cityofmadison.com. Consultants may respond one, two or all RFPs. Selections are anticipated to be made by January 11, 2022.

Questions regarding this project shall be directed to Caroline Burger at cburger@cityofmadison.com.

Sincerely,



For:
James M. Wolfe, P.E., City Engineer

JMW: cb
cc: Janet Schmidt, City Engineering

CITY OF MADISON

REQUEST FOR PROPOSALS



Title: WATERSHED STUDIES – JOHN NOLEN DRIVE AND
WARNER PARK

City Agency: Engineering Division

Due Date: December 1, 2022
4:00 PM CST

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1 NOTICE TO PROPOSERS

1.1 Summary of Services Requested

The City of Madison (City) is seeking proposals from a firm or team (Consultant) for advanced watershed modeling and planning services for John Nolen Drive and Warner Park Watersheds in the City of Madison, WI. This Request for Proposals (RFP) is intended to solicit information from interested firms including qualifications of project team and key personnel, project understanding and potential challenges, previous related project experience, level of effort, and schedule of services. City of Madison Engineering staff will use submitted RFP responses to select the Consultant the watershed.

The RFP is the in the process to develop actionable mitigation measures in each watershed to meet the City's goals of reducing damages associated with flooding events, prioritizing for flood mitigation projects and providing enough guidance to budget for the construction of projects identified in the watershed plans. Phase 1 is for model development, analysis of existing conditions, and conceptual level mitigation alternatives. Phase 2 is anticipated to cover more detailed modeling of preferred mitigation measures and cost-benefit and design feasibility analyses. Phase 3 is anticipated to cover final modeling, mitigation alternative refinement, and report documentation.

The City has budgeted approximately \$400,000.00 for the two studies combined.

1.2 Summary

The City of Madison, like many communities, has seen a recent increase in extreme flood events. This increase has occurred most notably in Madison since 2016, when a large and intense rain event in late July caused extensive flooding of public and private property on Madison's west side. Large events in July 2017 and June 2018 caused similar flooding, again largely focused on Madison's west side.

On August 20, 2018, Dane County experienced an unusual precipitation event that caused flooding in excess of that seen in any of the prior events mentioned. Rain gages monitoring that event registered between 3-4" of precipitation on Madison's east side and 8-10" of precipitation on its west side over (approximately) a 12-hr period. Many of Madison's west side neighborhoods experienced flash flooding, resulting in millions of dollars in property damage.

In response to the damage incurred due to recent extreme rainfall events, as well as the likely increasing frequency of such events due to global climate change, the Madison Common Council authorized the City of Madison Engineering Division (City Engineering) to develop watershed models and plans for watersheds of greatest concern in the Madison area. Specific watershed information is included in Exhibits 1-2.

1.3 Project Area

The watersheds included in this RFP process are listed below. Specific watershed information is found in:

- Exhibit 1: John Nolen Drive
- Exhibit 2: Warner Park

It is expected that the CONSULTANT complete site investigations to become familiar with the watershed.

1.4 Important Dates

Deliver Proposal no later than the due time and date indicated below. The City will reject late Proposals:

Issue Date: November 2, 2022
Questions Due Date: November 11, 2022
Answers Posted Date: November 15, 2022

Proposal Due Date: December 1, 2022, 4:00 PM CST

1.5 Format

Submit Proposal as identified in distinct parts within the Proposal package.

Submit one electronic copy of all materials via email by the due date and time. Clearly mark each proposal with the watershed study it is for. Maximum allowable file size to be emailed is 17 MB. If proposed materials are larger than 17 MB, make arrangements to send proposal via a large file sharing system.

The City will not consider illegible Proposals.

Elaborate Proposals (i.e., expensive artwork), beyond that sufficient to present a complete and effective Proposal, are not necessary or desired.

1.6 Delivery of Proposals

Delivery of electronic files: City of Madison Engineering Division
Watershed Studies – John Nolen Drive and Warner Park
Attn: Caroline Burger
cburger@cityofmadison.com
City County Building, Room 115
210 Martin Luther King Jr. Blvd.
Madison, WI 53703

1.7 Standard Terms & Conditions

Proposers are responsible for reviewing this attachment prior to submission of their Proposals. City of Madison Standard Terms and Conditions are the minimum requirements for the submission of Proposals.

1.8 Appendix A: Sample Contract for Purchase of Services

Proposers are responsible for reviewing this attachment prior to submission of their Proposals. The Sample Contract for Purchase of Services shall serve as the basis of the contract resulting from this RFP. The terms of this template contract shall become contractual obligations following award of the RFP. By submitting a proposal, Proposers affirm their willingness to enter into a contract containing these terms.

1.9 Affirmative Action Notice

If Contractor employs 15 or more employees and does aggregate annual business with the City of \$50,000 or more for the calendar year in which the PO and/or Contract is in effect, Contractor shall file, within thirty (30) days from the PO/Contract effective date and BEFORE RELEASE OF PAYMENT, an Affirmative Action Plan designed to ensure that Contractor provides equal employment opportunity to all and takes affirmative action in its utilization of applicants and employees who are women, minorities and/or persons with disabilities. A sample affirmative action plan, Request for Exemption forms, and instructions are available at: www.cityofmadison.com/civil-rights/contract-compliance/vendors-suppliers/forms or by contacting a Contract Compliance Specialist at the City of Madison Affirmative Action Division at (608) 266-4910. Vendors must register for an account to complete the required forms online, here: <https://elam.cityofmadison.com/citizenaccess>

Contractor shall also allow maximum feasible opportunity to small business enterprises to compete for any subcontracts entered into pursuant to this PO/Contract.

Job postings: All Contractors who employ 15 or more employees (regardless of the dollar amount of this contract or their annual aggregate business with the City) must notify the City of all external job openings at locations in Dane County, Wisconsin, and agree to interview candidates referred by the City or its

designated organization. Job posting information is available at: <http://www.cityofmadison.com/civil-rights/programs/referrals-and-interviews-for-sustainable-employment-raise-program>. Instructions for Contractors: http://www.cityofmadison.com/civil-rights/documents/RaISE_Job_Posting_Instructions.pdf

The complete set of Affirmative Action requirements for this purchase can be found in **Section 13 of Appendix A – Sample Contract for Purchase of Services**.

1.10 City of Madison Contact Information

The City of Madison is the
procuring agency: Caroline Burger
City of Madison Engineering Division
cburger@cityofmadison.com

For questions regarding
Affirmative Action Plans please
contact: Contract Compliance
Department of Civil Rights
City-County Bldg., Room 523
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
PH: (608) 266-4910
dcr@cityofmadison.com

The City employs spam filtering that occasionally blocks legitimate emails, holding them in ‘quarantine’ for four calendar days. The contacts listed in this RFP will acknowledge all emails received. Proposers not receiving acknowledgement within twenty-four hours shall follow-up via phone with specific information identifying the originating email address for message recovery.

1.11 Inquiries and Clarifications

Proposers finding any significant ambiguity, error, conflict, discrepancy, omission, or other deficiency in this RFP document shall immediately notify the City and request clarification. In the event that it is necessary to provide additional clarification or revision to the RFP, the City will post addenda – see 1.12 below. Proposers are strongly encouraged to check for addenda regularly.

Proposals should be as responsive as possible to the provisions stated herein. Exceptions are not permitted. The City of Madison reserves the right to disqualify any and all bids that are non-responsive or that include exceptions.

Any questions regarding the submittal process and/or aspects of the RFP may be made via e-mail to Caroline Burger at cburger@cityofmadison.com. Only email communications will be accepted.

An acknowledgement of receipt of the questions will be emailed to the Consultant as the questions are received. No questions will be accepted after 4:00 p.m. (CDT) November 11, 2022. All questions and responses will be sent and posted no later than November 15, 2022 by 4:00 p.m.

1.12 Addenda

In the event that it is necessary to provide additional clarification or revision to the RFP, the City will provide an addendum to all consultants. The addendum will be provided via email to the contact listed on the RFP. If other group members would like to be included on the email for addendum it's the consultant's responsibility to identify those persons wishing to receive the email.

1.13 Local Vendor Preference

The City of Madison has adopted a local preference purchasing policy granting a scoring preference to local suppliers. Only suppliers registered as of the bid's due date will receive preference. Learn more and register at the City of Madison website: www.cityofmadison.com/business/localPurchasing.

1.14 Acceptance/Rejection of Proposals

The City reserves the right to accept or reject any or all Proposals submitted, in whole or in part, and to waive any informalities or technicalities, which at the City's discretion is determined to be in the best interests of the City. Further, the City makes no representations that a contract will be awarded to any proposer responding to this request. The City expressly reserves the right to reject any and all Proposals responding to this invitation without indicating any reasons for such rejection(s).

The City reserves the right to postpone due dates and openings for its own convenience and to withdraw this solicitation at any time without prior notice.

1.15 Withdrawal or Revision of Proposals

Proposers may, without prejudice, withdraw Proposals submitted prior to the date and time specified for receipt of Proposals by requesting such withdrawal before the due time and date of the submission of Proposals. After the due date of submission of Proposals, no Proposals may be withdrawn for a period of 90 days or as otherwise specified or provided by law. Proposers may modify their Proposals at any time prior to opening of Proposals.

1.16 Non-Material and Material Variances

The City reserves the right to waive or permit cure of nonmaterial variances in the offer if, in the judgment of the City, it is in the City's best interest to do so. The determination of materiality is in the sole discretion of the City.

1.17 Public Records

Proposers are hereby notified that all information submitted in response to this RFP may be made available for public inspection according to the Public Records Law of the State of Wisconsin or other applicable public record laws. Information qualifying as a "trade secret"—defined in State of Wisconsin Statutes—may be held confidential.

Proposers shall seal separately and clearly identify all information they deem to be "trade secrets," as defined in the State of Wisconsin Statutes. Do not duplicate or co-mingle information, deemed confidential and sealed, elsewhere in your response.

S. 19.36(5)

(5) TRADE SECRETS. An authority may withhold access to any record or portion of a record containing information qualifying as a trade secret as defined in s. 134.90(1)(c).

s. 134.90(1)(c)

(c) "Trade secret" means information, including a formula, pattern, compilation, program, device, method, technique or process to which all of the following apply:

1. The information derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use.
2. The information is the subject of efforts to maintain its secrecy that are reasonable under the circumstances.

The City cannot ensure that information will not be subject to release if a request is made under applicable public records laws. The City cannot consider the following confidential: a bid in its entirety, price bid information, or the entire contents of any resulting contract. The City will not provide advance notice to Proposers prior to release of any requested record.

To the extent permitted by such laws, it is the intention of the City to withhold the contents of Proposals from public view—until such times as competitive or bargaining reasons no longer require non-disclosure, in the City's opinion. At that time, all Proposals will be available for review in accordance with such laws.

1.18 Usage Reports

Annually, the successful Proposers shall furnish to City Purchasing usage reports summarizing the ordering history for each department served during the previous contract year. The report, at a minimum, must include each and every item or service ordered during the period, its total quantities and dollars by item/service and in total. The City reserves the right to request usage reports at any time and request additional information, if required, when reviewing contract activity.

1.19 Tax Exempt

The City of Madison as a municipality is exempt from payment of federal excise taxes (Registration Number 39-73-0411-K) and State of Wisconsin taxes per Wisconsin statute 77.54(9a). Federal Tax ID #39-6005507. A completed Wisconsin Department of Revenue Form S-211 (R.2-00) can be found on the City website. Our tax-exempt number is ES 42916.

1.20 Proposers Responsibility

Proposers shall examine this RFP and shall exercise their judgment as to the nature and scope of the work required. No plea of ignorance concerning conditions or difficulties that exist or may hereafter arise in the execution of the work under the resulting contract, as a consequence of failure to make necessary examinations and investigations, shall be accepted as an excuse for any failure or omission on the part of the Proposers to fulfill the requirements of the resulting contract.

2 SCOPE OF SERVICES

This RFP covers two separate and distinct watershed studies. Consultants should draft a separate, concise proposal for each watershed study they are proposing for (except for documents specifically noted in this RFP). Consultants may propose on one or both watershed studies.

Specific tasks for this RFP have been identified below, along with the required deliverable per task. All cost estimates shall reference the specific task number or sub-task component as outlined in the **Cost Proposal** document, included with the RFP.

PHASE 1

TASK 1 Review Existing Data and Support Data Collection Plan Development

1.1 CONSULTANT will review existing data for the watershed including City-provided GIS data. City data provided is listed in *Exhibit 3*. CONSULTANT will also identify additional sources of data that will be used and/or needed for model setup/calibration.

1.2 CONSULTANT will determine where field survey data is required to complete model input requirements, or as necessary for conducting the stormwater modeling. Survey data may include: open channel cross sections, culvert crossings, pipe inverts / size, and structure rims, to provide the necessary input data for the modeling. Exact locations will be identified in collaboration with the City.

CONSULTANT will provide survey for requested locations requested in this RFP. All survey data will utilize Wisconsin County Coordinate System – Dane Zone, NAD83 (HARN). All survey data shall be referenced to NAVD 88 (pre-2007 adjustment) feet for vertical datum. Survey data shall be provided to the City in a format compatible with ArcCollector software. The City will provide a standard survey data template to the CONSULTANT.

Task 1 Deliverables:

- 1) List of data gaps and needs
- 2) Point shapefile of survey locations
- 3) Completed survey in ArcCollector format

TASK 2 Public Engagement 1

2.1 CONSULTANT will provide watershed information and two (2) staff people to help conduct Public Information Meeting #1 (PIM #1). The purpose of PIM #1 is to introduce the project and to discuss process and approach.

PIM #1 will be held at the beginning of the project. The City has developed the PowerPoint presentation for PIM #1. CONSULTANT will review the City's presentation, provide input on the presentation, and provide the City with watershed-specific statistics (including but not limited to watershed area and quantity of stormwater infrastructure) and graphics for insertion into the presentation. CONSULTANT shall be the lead presenter of the PowerPoint at PIM #1.

2.2 CONSULTANT will provide one (1) staff person and facilitate up to ten (10) focus group or stakeholder meetings, as authorized and organized by the City, with affected residents or neighborhoods. The purpose of the meetings will be to gather additional information and gain input regarding flooding impacts in specific locations. Meetings will be paid for by the Unit price for this task as identified in the Cost Proposal provided with the Proposal. The focus group or stakeholder meetings may be held in-person or virtually. Include a cost for each in the provided Cost Proposal worksheet.

The City will identify the group(s) for each meeting, arrange for a suitable location, and notify residents of the meeting. CONSULTANT will provide the materials created for PIM #1 as well as an 11x17" figure of the focus group/stakeholder's area of interest.

CONSULTANT will conduct the listening session and document the citizen comments.

Task 2 Deliverables:

- 1) Edits to City's standard PIM#1 PowerPoint presentation, including watershed-specific statistics and graphics.
- 2) Other PIM#1 presentation materials as necessary.
- 3) 11"x17" focus group area figures.
- 4) Compiled feedback and responses to questions from PIM and focus groups in written report format. This report shall include an executive summary that can be posted to the City website.

TASK 3 Develop and Calibrate Existing Conditions Model for the Watershed

CONSULTANT will conduct the hydrologic and hydraulic modeling as described in this project using Innowyze's XP-SWMM 1D and 2D software utilizing traditional hydrology (rain-on-grid is not to be used). The version of the software will be the most recent version and will not change after the calibration process. CONSULTANT shall document the version of either software used for construction of the model.

CONSULTANT will also use ArcGIS as-needed for the project; where the City is on a different version of ArcGIS than the CONSULTANT, CONSULTANT will save files to version the City is in. City is currently utilizing ArcGIS v10.7.

3.1 A Modeling Guidance document has been created for the Watershed Studies to provide for consistency in modeling among watersheds. It is understood this document will evolve as modeling tools and data change. The CONSULTANT will coordinate with City and other Consultants to update the Modeling Guidance document where appropriate for these watershed studies (see *Exhibit 4*). Coordination may be done via email or phone.

3.1.1 The Modeling Guidance document will be updated and maintained to reflect group decisions on the modeling source documents, naming conventions, standardized coordinate systems, modeling input parameters, and other factors to maximize the consistency among the models being developed for all watersheds.

3.1.2 The Modeling Guidance document will include documentation of modeling parameters and agreed-upon changes to parameters with a log of dates,

3.1.3 The Modeling Guidance document will include documentation of all other agreed-upon changes by the City and CONSULTANT.

3.1.4 The City will have final veto authority over any and all changes to the Modeling Guidance document.

3.2 For the purpose of this contract, the level of effort required shall be reflected in the assumptions made within the Modeling Guidance document, dated May 17, 2022 and provided with this RFP. Any further assumptions or changes to the Modeling Guidance document that will result in a measurable increase in the level of effort will be consulted with the City and adjustments to the contract cost will be determined prior to proceeding.

If the CONSULTANT considers the level of effort outlined in the Modeling Guidance to be insufficient to meet the City's flood mitigation goals (as outlined in the Modeling Guidance document) in some or all of the proposed model area, they are encouraged to address that in their response to this RFP.

If the CONSULTANT considers the level of effort outlined in the Modeling Guidance to be sufficient to meet the City's flood mitigation goals, but would recommend increased level of effort in some or all parts of the model to meet a different standard, they are encouraged to scope the proposal to the level of effort outlined in the Modeling Guidance document. Discussion of the increased level of effort, and its associated costs, should be included with this submittal as an Additional Task or Service in the Attachments/Appendices section of the CONSULTANT's response to this RFP (see Section 3.2 of this RFP).

- 3.3 *Exhibits 1-2* identifies areas of concern and known areas of flooding. Additional model detail shall be provided for the identified areas. The level of detail is dependent upon the specific area.

CONSULTANT TO PROVIDE AN APPROACH AND SCOPE FOR THE APPROPRIATE LEVEL OF DETAIL BASED ON THEIR PROFESSIONAL JUDGEMENT.

- 3.4 Applicable portions of the private conveyance system may be included; the expectation is that private systems and private properties will be analyzed to the extent necessary to build and calibrate the models. This effort is not intended to result in solutions to solve flooding on private property but it may be necessary in order to accurately build and calibrate the model. If additional work beyond the assumptions are required on a case by case basis, that should be noted and provided to the City for consideration of additional compensation.
- 3.5 Following the development of the existing conditions model, the CONSULTANT will calibrate the model with available data.

The City of Madison is monitoring key locations within the watershed in accordance with the joint USGS-City of Madison monitoring plan for the watershed. Monitoring began in the Spring of 2022. Monitoring data will be provided to the CONSULTANT through a City-provided login to the monitoring website. Collected data are uploaded to that website on a 24-hr basis.

- 3.5.1 The CONSULTANT is responsible for downloading required data after its collection.
- 3.5.2 CONSULTANT is expected to visit the location of each monitoring gage and familiarize themselves with the location and upstream and downstream conditions.
- 3.5.3 The number of calibration locations within the watershed shall be based on the actual number of locations successfully monitored by the USGS with qualifying rain events.
- 3.5.4 Calibration will consider applicable rainfall data collected and damage information from August 20, 2018 storm if available. It will also consider anecdotal information collected during PIM #1 or Focus Groups, debris line surveys, or other pertinent information provided by the City or the public.
- 3.5.5 CONSULTANT will complete field verification, site visits, and evaluations as necessary to verify the existing conditions model.
- 3.5.6 Calibration will be attempted for no more than three (3) 2022-2023-monitored storm events. The three (3) events will be selected by City and CONSULTANT(s). If suitable events do not occur prior to July 31, 2023, CONSULTANT and City will agree on revised schedule for both monitoring and remainder of modeling.

For purposes of this project, the model will be considered to be calibrated if the overall average model bias for water surface elevations is within +/- 5% with reasonable effort made to minimize the largest absolute error while at the same time balancing that effort with the relative importance of the model results at each monitoring site location. The largest absolute error at each monitored location is defined as +/- 25%. It is understood that there may be some circumstances where calibration cannot be accomplished. If calibration cannot be accomplished, CONSULTANT and the City will discuss and decide on an acceptable course of action.

- 3.5.7 Final calibration using field-collected data shall be complete by October 31, 2023. This schedule assumes suitable rain events are successfully monitored in 2021-2023 and the monitored data is available to CONSULTANT by July 31, 2023.
- 3.5.8 CONSULTANT will participate in one (1) in-person meeting with City staff to discuss the calibration methodology prior to creation of the existing conditions model. This may be

done in conjunction with the monthly progress meetings. Calibration parameters will be discussed and agreed upon.

- 3.5.9 CONSULTANT will complete field verification, site visits, and evaluations as necessary to complete and verify the existing conditions model.

Task 3 Deliverables:

- 1) Non-Calibrated Existing Conditions Model input files
- 2) Non-Calibrated Existing Conditions Model output files
- 3) GIS shapefiles and feature classes including:
 - a. Subbasins
 - b. Flow paths
 - c. Modeled conveyance network (pipes, structures, greenways, etc)
- 4) Flow, water level and rainfall data used for calibration
- 5) Tables and graphs to illustrate calibration
- 6) Calibrated Existing Conditions Model Input
- 7) Calibrated Existing Conditions Model Output
- 8) Documentation describing calibrations and pre-and post-calibrated parameters

TASK 4 Execute Existing Conditions Model

- 4.1 CONSULTANT will run the calibrated model for the 2-, 5-, 10-, 25-, 100-, 200-, and 500-yr, 24-hr design events using the MSE4 rainfall distribution and the rainfall depths provided by the City in the Modeling Guidance document.
- 4.2 CONSULTANT shall also run one long-duration (>24-hr) event as described in the Modeling Guidance document for the existing conditions model.
- 4.3 CONSULTANT will review model results with City Engineering staff. This meeting shall be face-to-face and may be done in conjunction with the monthly progress meetings.
- 4.4 CONSULTANT will prepare a Draft Watershed Existing Conditions Report and provide draft documents for City staff review. The City has developed an outline for the report and will provide it to the CONSULTANT. Report shall include the following:
- 1) Introduction
 - 2) Description of existing conditions.
 - 3) Current land uses and assumptions
 - 4) Land use maps
 - 5) Soils maps
 - 6) Major storm infrastructure networks
 - 7) Calibration methodology, approach, and results
 - 8) Maximum extent of flooding figures / inundation mapping under the 2-, 5-, 10-, 25-, 100-, 200-, and 500-yr, 24-hr design events
 - 9) Modeling Guidance documentation.
 - 10) Compiled feedback from Focus Groups and PIMs #1 and #2.

Task 4 Deliverables:

- 1) Color figures showing the maximum extent of flooding during each storm event. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'-0.25', 0.25'-0.5', 0.5'-1.0', 1.0'-3', and greater than 3').
- 2) Table noting the flooding depth for up to 25 locations for each design storm. Locations will be determined through coordination with City staff.
- 3) Table and figure showing structures flooded during the 100-yr storm event.
- 4) Table and figure showing streets not meeting 10-year goal.
- 5) Draft report for existing conditions.
- 6) Model files and documentation.

- 7) GIS files generated for model development. All files shall be delivered to the City on an external hard drive.

TASK 5 Public Engagement 2 (Present Existing Conditions Results and Get Feedback from Stakeholders)

5.1 CONSULTANT will provide information materials and three (3) staff people to help conduct Public Information Meeting #2 (PIM #2). The purpose of PIM #2 is to present the existing conditions modeling results and ask for public feedback regarding the results.

PIM #2 will be held following the calibration of the existing conditions model. CONSULTANT will create materials including a PowerPoint presentation and a map showing the project area. CONSULTANT shall provide draft PowerPoint presentation to the City and work with City staff to finalize the presentation.

5.2 CONSULTANT will provide one (1) staff person and facilitate up to ten (10) focus group or stakeholder meetings, as authorized and organized by the City, with affected residents or neighborhoods. The purpose of the meetings will be to gather additional information and gain input regarding flooding impacts in specific locations. The focus group or stakeholder meetings may be held in-person or virtually. Include a cost for each in the provided Cost Proposal worksheet.

The City will identify the group(s) for each meeting, arrange for a suitable location, and notify residents of the meeting. CONSULTANT will provide the materials created for PIM #2 as well as 11x17" figures of each focus group/stakeholder's area of interest.

CONSULTANT will conduct the listening session and document the citizen comments.

Task 5 Deliverables:

- 1) PIM #2 presentation in PowerPoint format.
- 2) Other PIM#2 presentation materials as necessary.
- 3) 11"x17" focus group area figures.
- 4) Compile feedback and responses to questions from PIM#2 and focus groups and provide report to the City. This report shall include an executive summary that can be posted to the City website.
- 5) Specific focus group deliverables include:
 - o Bulleted summary of information provided by focus group attendees
 - o Point shapefile/feature class showing locations that were visited during focus group
 - o If reasonable, August 2018 flood extent sketch for each focus group

PHASE 2

CONSULTANT shall not move on to Phase 2 without express direction by the City. All comments and changes as identified by the City in Phase 1 and any respective modeling, calibration and draft report modifications shall be addressed prior to starting the mitigation alternative analysis.

TASK 6 Evaluate Flood Mitigation Alternatives

6.1 Peak Flow Control

For purposes of the watershed studies, Peak Flow Control (PFC) is considered any stormwater control measure that has the ability to store or convey water, but not infiltrate water. These types of stormwater control measures could be referred to as Grey Infrastructure.

This Task has subtasks. First, the Consultant will identify possible causes of flooding in Task 6.1.1. Then, in Task 6.1.2, the Consultant will identify potential locations for solutions. Task 6.1.3 will combine Tasks 6.1.1 and 6.1.2 to develop and evaluation solutions to mitigate the potential causes.

6.1.1 Identify Causes of Flooding

The objective of this subtask is to identify the major causes of flooding, but not necessarily solve them. This will:

- Guide later sections of this scope
- Provide big picture causes such that if the solutions presented in the final report cannot be implemented, then other options targeting the issue can be developed at a later date

General causes include but are not limited to:

- Undersized surface storage – insufficient above-ground storage capacity (ponds, etc)
- Insufficient surface-to-underground conveyance capacity – insufficient inlet/pond discharge/etc. capacity to allow water to exit the above-ground system and enter the below-ground system
- Restrictions in underground system – undersized trunk line conveyance
- High tailwater at discharge point

Use the inundation maps and flooding locations table generated in Task 4, Deliverables 1 and 2 in the Scope of Work to identify problem flooding areas throughout the watershed.

Using professional judgement and drainage network properties (including but not limited to contributing area and existing storm infrastructure), identify locations where flooding occurs and the identified reason(s) for flooding throughout the watershed for the 10-yr, 25-yr, and 100-yr, 24-hour MSE4 storm events. It is understood that locations may vary in meeting the City's Goals based on the storm event.

The Consultant should use the City of Madison Flood Mitigation Goals in the Modeling Guidance Document to guide selection of the locations.

Prior to finalizing the selection of locations, the CONSULANT should meet with City staff to review locations and discuss the identified reasons for flooding.

Deliverables for this step shall include:

- 1) Color map of watershed with selected locations clearly identified for each storm event.
- 2) For each selected point, a brief description of why that point was selected for further study.

6.1.2 Develop Solutions for PFC

Step 1: Create a Model with All Potential Peak Flow Control Infrastructure.

This step creates a theoretical scenario to understand what the outcome would be if all available Peak Flow Control Infrastructure (PFCI) were implemented.

The first part of Step 1 will be to meet with City staff for a brainstorming session. Consultants should be prepared with high-level, idyllic solutions to solve flooding. For example, a solution that could solve flooding would be to install 6' x 10' box culverts under every street in a watershed. Although this could solve flooding, it may not be feasible for a particular watershed. During this meeting, high-level, idyllic solutions will be discussed and guidance will be given to the consultant on which to further evaluate.

Using the information from the meeting, maximize a PFCI in each watershed. These solutions may "oversolve" the flooding; this is okay for this step as it will be refined in subsequent steps.

Solutions offered shall not make conditions worse downstream (worse is defined as increased peak water surface elevations), unless the upstream solution is paired with a downstream solution that mitigates the worsened condition.

For this step, assume solutions may not increase peak flows to a downstream municipality.

A solution may solve flooding at multiple locations or there may be a solution for each identified location.

This model will be called the *Maximum PFCI Model*. Run the model for the 10-yr, 25-yr, 100-yr and 500-yr, 24-hour MSE4 storm events. Note: solutions do not need to be provided for the 500-year, 24-hour event. The purpose of the model run is to understand the effect the solutions have on that storm.

Deliverables for this step shall include:

- 1) A spreadsheet or list for each PFCI that includes rough sizing/dimensions where applicable (approximate storage volume required, increase in pipe size, diversion pipe size, etc.).
- 2) Color figures showing the maximum extent of flooding during each storm event. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'-0.25', 0.25'-0.5', 0.5'-1.0', 1.0'-3', and greater than 3').
- 3) Table noting the flooding depth for the locations identified during Task 4 for each design storm.
- 4) Table and figure showing structures flooded and removed during the 100-yr storm event.
- 5) Model files and documentation.
- 6) GIS files generated for model development. All files shall be delivered to the City on an external hard drive.

At this point, Consultants will pause on proposed tasks while City conducts internal meetings with City agencies including, but not limited to, the Parks, Forestry and Streets Departments and the Office of the Mayor. Consultants are not expected to attend these meetings.

Step 2: Develop PFC Solutions Model

Using the information identified in Task 6.1.1 and the information the City collects during its internal meetings, develop "feasible" solutions to solve the identified causes of flooding. Solutions could include:

- Above-ground detention basins
- Additional inlets
- Underground storage
- Enlarged greenways and pipes
- Pumping
- Locations to purchase property that is repeatedly flooded
- Other solutions the consultant deems sound

It is expected that one (1) holistic set of solutions will be developed for the watershed which include both regional solutions and local sewer upgrades.

The consultant shall develop conceptual solutions to meet the goals of the watershed studies as outlined in the Modeling Guidance. The holistic set of solutions should include conceptual solutions to meet all City Goals in all areas of the watershed unless a location(s) is explicitly discussed with City staff and removed from the solutions set.

Conceptual solutions should consider:

- Utility conflicts (using available data)
- Topographic relief (if pumps are required to get stormwater runoff to/from PFCI)
- Downstream flood impacts

- Environmental concerns (using available data including CARPC info, wetland indicators, etc)
- Permitting concerns
- Land ownership – note, GIS ownership records for ponds/greenways layer is not correct; Consultant should reference parcel data instead for those areas

This model will be called the *PFC Solutions Model*. Run the model for the 2-yr, 5-yr, 10-yr, 25-yr, 100-yr, 200-yr, and 500-yr, 24-hour MSE4 storm events. The purpose of the model run is to understand the effect the solutions have on each incremental storm event.

Develop conceptual (30%) cost estimates for each proposed PFCI included in the *PFC Solutions Model*.

Deliverables for this step shall include:

- 1) A spreadsheet or list for each PFCI that includes rough sizing/dimensions where applicable (approximate storage volume required, increase in pipe size, diversion pipe size, etc.).
- 2) Conceptual (30%) drawings (1 per PFCI) showing (if applicable):
 - a. The footprint and inlet/outlet information for storage or greenway modifications
 - b. Tie-in and required changes (increased size, decreased size, abandonment, etc) to existing storm sewer system
 - c. Locations of additional inlets
 - d. Location of pump station, pump station footprint, and inlet/outlet pipes
 - e. Locations of properties to be purchased
 - f. Utility conflicts from existing available GIS data
 - g. Known wetlands/FEMA floodplains/environmental areas of concern
- 3) Conceptual (30%) cost estimates utilizing unit costs provided by the City for items identified by the Consultant.
- 4) Color figures showing the maximum extent of flooding during each storm event. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'-0.25', 0.25'-0.5', 0.5'-1.0', 1.0'-3', and greater than 3').
- 5) Table noting the flooding depth for the 25 locations identified during Task 4.
- 6) Table and figure showing number of structures flooded and removed from flooding during the 100-year event.
- 7) Figure showing streets meeting and still not meeting goal during the 10-year storm event.
- 8) Model files and documentation.
- 9) GIS files generated for model development. All files shall be delivered to the City on an external hard drive.

6.1.3 Assess the 500-yr Storm and Potential Upgrades

The purpose of this subtask is to further understand where it may be practical to purchase property and/or where PFCI could be maximized to achieve additional flood control benefits. In some cases this may not be practical or feasible, therefore solution is considered partially theoretical.

Using the model from Task 6.1.2, Step 2 (*PFC Solutions Model*) as a base, increase the capacity of all conveyance, storage, and/or pumps in the model to relieve as much flooding as possible for the 500-yr event while staying within the ownership boundaries of the PFC devices. For example, if a PFCI is going to be proposed for an open lot owned by the City of Madison, maximize the PFCI on the land owned by the City but do not go outside those boundaries. This model is called the *Upsized PFC Solutions Model*.

The solutions may involve increase infrastructure upstream and/or downstream of the solutions identified in Task 6.1.2, Step 2, as long the solution stays within the ownership boundaries.

Run the *PFC Solutions Model* from Task 6.1.2, Step 2 for the 500-yr event. Compare the results from this model to the results of the *Upsized PFC Solutions Model* run for the 500-yr storm.

As part of the comparison, identify the location and number of buildings that are no longer inundated with the upsized PFCI. For purposes of this analysis, inundation will be identified as water touching a structure.

Prepare a conceptual (30%) cost estimate for upsized PFCI identified in Task 6.1.3.

Deliverables

- 1) Comparison of infrastructure costs between the *PFC Solutions Model* and the *Upsized PFC Solutions Model* for the 500-yr event
- 2) Count of buildings inundated in *PFC Solutions Model* compared to the *Upsized PFC Solutions Model* during the 500-yr event
- 3) Model files and documentation

6.2 Draft Watershed Proposed Solutions Report:

CONSULTANT will provide a draft document for the proposed alternatives to be reviewed by the City.

The report shall include the following:

- 1) Overview and description of the modeling approach and selection of PFC alternative locations.
- 2) Proposed solutions for deficiencies.
- 3) Maximum extent of flooding/inundation maps comparing existing and proposed alternatives.
- 4) Critical elevations in areas where structural flooding is occurring for the 500-year flood extent.
 - a. Critical elevations for structures will be based on available data provided by the City and/or from field survey work conducted by the survey firm under City contract.

Task 6 Deliverables

- 1) Color figures showing the maximum extent of flooding during each storm event for each alternative. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'- 0.25', 0.25'-0.5', 0.5'-1.0', 1.0'-3', and greater than 3').
- 2) Table noting the flooding depth for up to 25 locations identified during Task 4 for each design storm.
- 3) Table and figure showing number of structures flooded and removed from flooding during the 100-year event.
- 4) Figure showing streets meeting and still not meeting goal during the 10-year storm event.
- 5) Draft Watershed Proposed Solutions Report.

TASK 7 Public Engagement 3 (Present Mitigation Alternatives)

7.1 CONSULTANT will provide information materials and three (3) staff people to help conduct Public Information Meeting #3 (PIM #3). The purpose of PIM #3 is to present the proposed conditions selected alternative scenario and solicit public feedback.

PIM #3 will be held after the completion of the proposed conditions modeling. CONSULTANT will create materials including a PowerPoint presentation and a map showing the project area. CONSULTANT shall provide draft PowerPoint presentation to the City and work with City staff to finalize the presentation.

7.2 If authorized by the City, additional public informational meeting may be required based on feedback from the City, policy makers or the public. Additional meetings are not budgeted under the initial contract. A contract amendment for each additional meeting will be executed by the City if additional meetings are requested.

Task 7 Deliverables:

- 1) Public feedback from implemented public outreach and engagement plan.
- 2) PIM#3 Presentation in PowerPoint format.
- 3) Other PIM#3 presentation materials as necessary.
- 4) Compile feedback and responses to questions from PIM#3 and provide report to the City. This report shall include an executive summary that can be posted to the City website.

PHASE 3 – FINAL REPORT

CONSULTANT shall not move on to Phase 3 without express direction by the City. All comments and changes as identified by the City in both Phase 1 and Phase 2 and the respective modeling, alternative analysis and draft report shall be addressed prior to final preparation of the final deliverables in Task 8.

TASK 8 Prepare Detailed Written Report and Deliver Model

CONSULTANT will prepare a detailed Watershed Report that includes the existing conditions report, modeling results, maximum extent of flooding/inundation maps, and proposed mitigation alternatives, as detailed in Tasks 4 and 6.

The report shall also include an executive summary that identifies and prioritizes the recommended improvements and, if necessary, identifies improvements that would need to be completed in a specific order. A draft report will be prepared for City review, and a final report will be prepared based on City review comments.

The final report will also refine cost estimates as identified in Task 6 for the top five (5) improvements identified in the summary. The cost refinements will be based upon updated unit cost information provided by the City. The report will also include response to QA/QC comments as identified in Task 7.

The City has prepared a Report Outline and GIS Deliverables document containing the requested information and format of information. The document can be found in Exhibit 5 of this RFP.

Task 8 Deliverables:

Reports will be provided to the City as follows:

- 1) One (1) copy of a colored, bound hard copy report, including all necessary maps, exhibits, etc. as identified in the Scope of Services.
- 2) One (1) digital copy of the document in the software in which it was prepared.
- 3) One (1) digital copy of the document in PDF format.

CONSULTANT will also provide:

- 1) The final model(s), fully QA/QC'ed, to the City including the existing conditions models for the respective storms as identified in Task 4 and all alternative analyses or scenarios as identified in Task 6. The model(s) shall be provided to the City on a hard drive.
- 2) All related files used in the creation of the model shall be provided to the City as part of the final deliverables, including but not limited to GIS, CADD, topographic surveys, Access database, or Excel files.

PROJECT COORDINATION

TASK 9 Progress Meetings and Coordination

CONSULTANT will attend the kick-off meeting and up to fourteen (14) additional virtual monthly progress meetings as requested by the City and participate in preparing meeting minutes summarizing the discussions held during the meetings.

CONSULTANT will attend up to five (5) weekly virtual progress meetings as-needed and participate in preparing meeting minutes summarizing the discussions held during the meetings.

The meetings may be watershed-specific or may cover all watersheds.

CONSULTANT should expect to coordinate with other CONSULTANTS working on other watershed studies within the City of Madison.

Task 9 Deliverables: CONSULTANT will work with other CONSULTANTS to provide meeting summaries within 3 days of each meeting.

3 ROLES AND RESPONSIBILITIES

Responsibilities of the City of Madison

1. The City of Madison Engineering Division will provide the following data as provided for in *Exhibit 3: Data provided by City*
 - a. Pond data
 - b. Greenway data
 - c. Watershed/outfall data
 - d. Pipe data
 - e. Storm structure data
 - f. Citywide surface cover data (including impervious areas)
 - g. Curve number generator tool (used to supplement percent impervious calculations)
 - h. DEM & Contours
 - i. Historic flooding data
 - j. Modeling Guidance Documentation: See *Exhibit 4: City of Madison Modeling Guidance*
2. The City will coordinate and arrange for public input meetings, stake holder meetings, and focus group meetings, including posting all notices, providing translators and translating services as necessary, mailing postcards or posting information on the City's website, social media, and finding and coordinating meeting locations.
3. The City will pay all fees associated with room reservations and copying expenses related to meeting material distribution.
4. All public meetings and stake holder meetings will be attended by City staff; however, focus group meetings may only be attended by the Consultants.

Responsibilities of the Consultant

The Consultant shall be responsible for the following:

1. Provide items identified in the Scope of Work
2. Provide GIS deliverables as outlined in *Exhibit 5; Watershed Study Report Outline*
3. Provide models that City staff can run on City systems without issues.
4. Provide a detailed schedule and project updates on a monthly basis, including development of milestones.
5. Prepare minutes for all meetings. Draft meeting minutes shall be provided in digital format to the City within 3 days for review and comment by staff.
6. Provide and update active Action Items List.

SCHEDULE AND SUBMISSION CONTENT

3.1 Timeline

TIMELINE	
RFP released	November 2, 2022
Submission deadline	December 1, 2022
Selection of Consultant(s)	January 11, 2023
Anticipated Project Start/Project Kick off Meeting	March 22, 2023
Anticipated Project Completion (Phase I)	December 31, 2024

Phase	TASK	2023												2024											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Phase 1	Kick off Meeting			■																					
	1			■	■	■	■	■	■	■	■	■													
	2				■	■	■	■	■	■	■	■	■												
	3				■	■	■	■	■	■	■	■	■	■											
	4										■	■	■	■	■										
Phase 2	5												■	■											
	6														■	■	■	■	■	■	■	■	■		
	7																		■	■	■	■	■		
Phase 3	8																			■	■	■	■		

3.2 Evaluation Criteria and Submission Contents

There are no page limits for the Proposal submission. Please keep responses clear and concise. Proposals should not only include information regarding complex hydrologic and hydraulic modeling, but also the design of both green (volume control) and grey (peak flow control) infrastructure.

Evaluation Criteria

Scoring will be weighted as follows:

1. 25% for Project Understanding and Approach
2. 20% for Team Composition, Performance, and Key Personnel
3. 20% for Relevant Project Experience
4. 5% for Local Vendor Preference
5. 30% for Cost

Submission Contents

Below is a detailed list of items required in each submittal section.

1. Cover Letter – One for All Watershed Studies being Proposed On
 - a. Watershed Studies being proposed on
 - b. Lead Consultant name and mailing address
 - c. Contact person’s name, title, phone number, and email address
 - d. Signature of the individual(s) authorized to negotiate and bind the Consultant contractually

2. Project Understanding and Approach (25%) – One for Each Watershed Study
 - a. Describe the Team’s understanding of the unique conditions in the watershed and how they will be accounted for.
 - b. Describe the opportunities related to the anticipated work, including challenges or unique issues related to specific watershed conditions.
 - c. Describe how your team will ensure Racial Equity and Social Justice is a core principle throughout the duration of this project. Further explain strategies and techniques intended to encourage inclusive stakeholder engagement, just decisions making processes, and equitable environmental planning.
 - d. Describe Team’s understanding of scope of work. This scope is similar to that of the watershed studies currently underway.
 - i. If Consultant proposes to follow scope of work as stated, there is not a need to reiterate scope.
 - ii. If comments are provided on the proposed scope of work, organize comments by task number as identified in the Scope of Services.
 - iii. If proposed scope differs from what is identified in this RFP the Consultant shall identify any areas in the scope that they do not intend to follow and provide reasoning.
 - iv. Where approaches are specifically asked for, Consultant shall provide scope of work for task number.
 - v. Additional scope items should be summarized in a separate section in the Attachments/Appendices Section.
3. Team Composition, Performance, and Key Personnel (20%) - One for All Watershed Studies being Proposed On
 - a. Summarize the Consultant Team’s background and focus.
 - b. Provide a Team organizational chart that identifies a project manager and the relationship among consulting team members, including sub-consultants.
 - c. Briefly summarize the Key Personnel’s role for this project.
 - d. Where a proposal is being submitted for more than one watershed study, provide documentation showing adequate staff capacity to complete the work within the proposed schedule.
4. Relevant Project Experience (20%) - One for All Watershed Studies being Proposed On
 - a. Provide up to 5 relevant projects, including Client and Project information, Team’s responsibility in the projects, the challenges presented by each project, and the final results. Include which Key Personnel were involved.
 - b. Limit project examples to those completed within the last 10 years.
 - c. List the project year(s), Key Personnel, and Client contact person and telephone number for each.
5. Local Vendor Preference (5%)

See Section 1.13
6. Schedule, Level of Effort, and Costs (30%) - One for Each Watershed Study
 - a. Include schedule for completion by Task.
 - b. Provide information showing Team can meet schedule outlined in this RFP. For example, include percent availability for Key Personnel.
 - c. Complete attached Cost Proposal and include with submittal.
 - d. Costs to include:
 - i. List proposed costs by Main Task (1-9)
 - ii. Provide unit costs for meetings
 1. Public information meetings
 2. Stake holder or focus group meetings
 3. Monthly progress meetings with City staff

- iii. Provide a total not-to exceed dollar value for any reimbursable expenses associated with each individual task, including the type of expense, such as mileage, printing expenses, etc.
- iv. Provide detailed project budget, estimated hours by position title per task, and billing rates for all personnel to be assigned to the project.

7. Attachments/Appendices - One for All Watershed Studies being Proposed On

- a. Resumes (suggested length: 2 pages maximum per resume)
- b. References: Provide three references for the consultant team. Include the reference contact's name, address, phone number and relationship to the firm/team.
- c. Additional Tasks or Services: Consultants may offer suggestions for additional tasks to be conducted during the watershed study. Provide a summary of the tasks that were not identified in the provide Scope of Work, along with a separate line item with costs for those services they wish the City to consider.
- d. Comments on Contract Standard Terms and Conditions: The entity that would enter into the contract with the City for the RFP will need to be able to meet the City's Standard Terms and Conditions or be able to come to a mutual agreement with the City on the Standard Terms and Conditions. If they are not able to meet those conditions it may impact the City's selection. Firms should acknowledge if they are able to meet the City's Standard Terms and Conditions or if they have had experience with successfully negotiating mutually agreeable exceptions to the City's standard language.

3.3 Submittal Logistics

Submit Proposal to the following address by 4:00 p.m. on December 1, 2022:

City of Madison Engineering Division
Watershed Study – John Nolen Drive and Warner Park
Attn: Caroline Burger
cburger@cityofmadison.com

Complete submittals shall consist of one (1) electronic copy in pdf format submitted via email. Incomplete submittals shall not be considered.

4 EVALUATION OF PROPOSALS

Responses to this RFP will be reviewed by a Selection Committee chosen by the City Engineer based on the appropriateness of the Proposal, budget, and ability to meet the proposed timeline.

If necessary, the City Selection Committee may elect to interview a subset of respondents to this RFP to better understand differing proposed approaches to the projects. Each interview will be scheduled by the City following submission of all proposals. The City reserves the right to interview any subset of respondents the Selection Committee chooses for further review.

Cost Proposal - Watershed Study - John Nolen Drive

Task or Item		Cost
PHASE 1	Task 1	\$
	Task 2	
	Task 2 - PIM #1	\$
	Task 2 - Focus Group or Stakeholder Meetings	\$
	Task 3	\$
	Task 4	\$
	Task 5	
	Task 5 - PIM #2	\$
	Task 5 - Focus Group or Stakeholder Meetings	\$
	Task 6	
PHASE 2	Task 6.1	\$
	Task 6.2	\$
	Task 7	
	Task 7 - PIM #3	\$
	Task 8	\$
Task 9	\$	
Reimbursable expenses and incidentals (cost not to exceed)	\$	
TOTAL COST	\$	

Unit Costs	Cost per Progress Meeting (Virtual)	
	Cost per Public Information Meeting (Virtual)	
	Cost per Focus Group or Stakeholder Meeting (In-Person)	
	Cost per Focus Group or Stakeholder Meeting (Virtual)	

Additional Tasks	Additional Task 1	\$
	Additional Task 2	\$
	Additional Task 3	\$

Cost Proposal - Watershed Study - Warner Park

Task or Item		Cost
PHASE 1	Task 1	\$
	Task 2	
	Task 2 - PIM #1	\$
	Task 2 - Focus Group or Stakeholder Meetings	\$
	Task 3	\$
	Task 4	\$
	Task 5	
	Task 5 - PIM #2	\$
	Task 5 - Focus Group or Stakeholder Meetings	\$
	PHASE 2	Task 6
Task 6.1		\$
Task 6.2		\$
Task 7		
Task 7 - PIM #3		\$
PHASE 3	Task 8	\$
	Task 9	\$
	Reimbursable expenses and incidentals (cost not to exceed)	\$
TOTAL COST		\$

Unit Costs	Cost per Progress Meeting (Virtual)	
	Cost per Public Information Meeting (Virtual)	
	Cost per Focus Group or Stakeholder Meeting (In-Person)	
	Cost per Focus Group or Stakeholder Meeting (Virtual)	

Additional Tasks	Additional Task 1	\$
	Additional Task 2	\$
	Additional Task 3	\$



INSTRUCTIONS FOR CONTRACTOR

DO NOT ATTACH TO CONTRACT

***Your contract MUST include the following information,
or it will not be signed by the City.***

- Check one box at top of Page 1 for the type of business entity.
- Sections 3 & 4 will be completed by the City and should be complete before you sign.
- Put a name in Sec. 7.A. – person responsible for administering the contract.
- Affirmative Action:** Check the appropriate box in Sec. 13.B., Article IV and complete the appropriate online form for the box you have checked:

All contractors:

Access the online forms for Affirmative Action compliance at this link: www.cityofmadison.com/civil-rights/contract-compliance/vendors-suppliers/forms. If you do not already have an approved, current Affirmative Action Plan on file with the City of Madison, read the “*Instructions for Completing City of Madison Affirmative Action Plan*” at the above link. This will direct you to register for an account. If you already have an account you may click on the link for “*Affirmative Action Plan for Vendors and Suppliers*” to proceed. If you have never filed a plan or request for exemption, you must create an account in our online system. If you are exempt under Article IV, Sections C or D you will still need to create an account and go through some steps to confirm your exemption. Register for an account here: <https://elam.cityofmadison.com/citizenaccess>.

Affirmative Action Questions? Contact Dept. of Civil Rights, Contract Compliance: (608) 266-4910.

- Complete Sec. 15 – Official Notices. This is the name/job title/address of the person at your organization to receive legal notices under the contract.
- Signature line. A person with authority to bind the organization should sign, date, and print name and job title where shown on the signature page. Contractor signs first, City signs last.
- Print, sign and return three (3) complete, signed hard copies to the address for the City in Sec. 15 (Notices) unless otherwise instructed. (Under some circumstances, the City will accept a signed, scanned PDF of the entire contract. Please ask if you want to use this method.)
 - Make sure all exhibits/attachments are labeled and attached after the signature page, unless otherwise instructed.
 - Double-sided is OK, but all attachments should begin on a new page.
 - City will sign last, and will send you one hard copy with original signatures unless otherwise agreed.
- Enclose CERTIFICATE OF INSURANCE (C.O.I.) showing proof of insurance required by Sec. 27.

Insurance Instructions:

Certificate Holder: City of Madison
Attn: Risk Manager
210 Martin Luther King Jr. Blvd. Room 406
Madison, WI 53703

Proof of all insurance required in the contract must be shown. Use City's certificate at this link: www.cityofmadison.com/finance/documents/CertInsurance.pdf

Insurance delivery options: (a) enclose hard copy of certificate with hard copies of contract mailed to the address in Section 15 of the contract, or (b) email certificate to City Risk Manager Eric Veum at: eveum@cityofmadison.com and cc: your City contact person on the email. Call Eric Veum at (608) 266-5965 with insurance questions.

Failure to complete these steps will result in contract not being signed.

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City of Madison
CONTRACT FOR PURCHASE OF SERVICES
(Design Professionals)

1. **PARTIES.**

This is a Contract between the City of Madison, Wisconsin, hereafter referred to as the "City" and _____ hereafter referred to as "Contractor".

The Contractor is a: Corporation Limited Liability Company General Partnership LLP
(to be completed by contractor) Sole Proprietor Unincorporated Association Other: _____.

2. **PURPOSE**

The purpose of this Contract is as set forth in Section 3.

3. **SCOPE OF SERVICES AND SCHEDULE OF PAYMENTS.**

Contractor will perform the following services and be paid according to the following schedule(s) or attachment(s):

List all attachments here by name, and attach and label them accordingly.

Order of Precedence: In the event of a conflict between the terms of this Contract for Purchase of Services and the terms of any document attached or incorporated herein, the terms of this Contract for Purchase of Services shall control and supersede any such conflicting term.

4. **TERM AND EFFECTIVE DATE**

This Contract shall become effective upon execution by the Mayor, (or the Purchasing Agent, if authorized) on behalf of the City of Madison, unless another effective date is specified in the Attachment(s) incorporated in Section 3, however in no case shall work commence before execution by the City of Madison. The term of this Contract shall be insert dates or reference attachments as needed.

5. **ENTIRE AGREEMENT.**

This Contract for Purchase of Services, including any and all attachments, exhibits and other documents referenced in Section 3 (hereafter, "Agreement" or "Contract") is the entire Agreement of the parties and supersedes any and all oral contracts and negotiations between the parties. If any document referenced in Section 3 includes a statement that expressly or implicitly disclaims the applicability of this Contract for Purchase of Services, or a statement that such other document is the "entire agreement," such statement shall be deemed rejected and shall not apply to this Contract.

6. **ASSIGNABILITY/SUBCONTRACTING.**

Contractor shall not assign or subcontract any interest or obligation under this Contract without the City's prior written approval. All of the services required hereunder will be performed by Contractor and employees of Contractor.

7. **DESIGNATED REPRESENTATIVE**

- A. Contractor designates _____ as Contract Agent with primary responsibility for the performance of this Contract. In case this Contract Agent is replaced by another for any reason, the Contractor will designate another Contract Agent within seven (7) calendar days of the time the first terminates his or her employment or responsibility using the procedure set forth in Section 15, Notices.
- B. In the event of the death, disability, removal or resignation of the person designated above as the Contract agent, the City may accept another person as the Contract agent or may terminate this Agreement under Section 25, at its option.

8. **PROSECUTION AND PROGRESS.**

- A. Services under this Agreement shall commence upon written order from the City to the Contractor. This order will constitute authorization to proceed.
- B. The Contractor shall complete the services under this Agreement within the time for completion specified in the Scope of Services, including any amendments. The Contractor's services are completed when the City notifies the Contractor in writing that the services are complete and are acceptable. The time for completion shall not be extended because of any delay attributable to the Contractor, but it may be extended by the City in the event of a delay attributable to the City, or in the event of unavoidable delay caused by war, insurrection, natural disaster, or other unexpected event beyond the control of the Contractor. If at any time the Contractor believes that the time for completion of the work should be extended because of unavoidable delay caused by an unexpected event, or because of a delay attributable to the City, the Contractor shall notify the City as soon as possible, but not later than seven (7) calendar days after such an event. Such notice shall include any justification for an extension of time and shall identify the amount of time claimed to be necessary to complete the work.
- C. Services by the Contractor shall proceed continuously and expeditiously through completion of each phase of the work.
- D. Progress reports documenting the extent of completed services shall be prepared by the Contractor and submitted to the City with each invoice under Section 24 of this Agreement, and at such other times as the City may specify.
- E. The Contractor shall notify the City in writing when the Contractor has determined that the services under this Agreement have been completed. When the City determines that the services are complete and are acceptable, the City will provide written notification to the Contractor, acknowledging formal acceptance of the completed services.

9. **AMENDMENT.**

This Contract shall be binding on the parties hereto, their respective heirs, devisees, and successors, and cannot be varied or waived by any oral representations or promise of any agent or other person of the parties hereto. Any other change in any provision

of this Contract may only be made by a written amendment, signed by the duly authorized agent or agents who executed this Contract.

10. **EXTRA SERVICES.**

The City may require the Contractor to perform extra services or decreased services, according to the procedure set forth in Section 24. Extra services or decreased services means services which are not different in kind or nature from the services called for in the Scope of Services, Section 3, but which may increase or decrease the quantity and kind of labor or materials or expense of performing the services. Extra services may not increase the total Contract price, as set forth in Section 23, unless the Contract is amended as provided in Section 9 above.

11. **NO WAIVER.**

No failure to exercise, and no delay in exercising, any right, power or remedy hereunder on the part of the City or Contractor shall operate as a waiver thereof, nor shall any single or partial exercise of any right, power or remedy preclude any other or further exercise thereof or the exercise of any other right, power or remedy. No express waiver shall affect any event or default other than the event or default specified in such waiver, and any such waiver, to be effective, must be in writing and shall be operative only for the time and to the extent expressly provided by the City or Contractor therein. A waiver of any covenant, term or condition contained herein shall not be construed as a waiver of any subsequent breach of the same covenant, term or condition.

12. **NONDISCRIMINATION.**

During the term of this Contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of race, religion, marital status, age, color, sex, handicap, national origin or ancestry, income level or source of income, arrest record or conviction record, less than honorable discharge, physical appearance, sexual orientation, gender identity, political beliefs or student status. Contractor further agrees not to discriminate against any subcontractor or person who offers to subcontract on this Contract because of race, religion, color, age, disability, sex, sexual orientation, gender identity or national origin.

13. **AFFIRMATIVE ACTION.**

A. The following language applies to all contractors employing fifteen (15) or more employees (MGO 39.02(9)(c):

The Contractor agrees that, within thirty (30) days after the effective date of this Contract, Contractor will provide to the City of Madison Department of Civil Rights (the "Department"), certain workforce utilization statistics, using a form provided by the City.

If the Contract is still in effect, or if the City enters into a new Agreement with the Contractor, within one year after the date on which the form was required to be provided, the Contractor will provide updated workforce information using a second form, also to be furnished by the City. The second form will be submitted to the Department no later than one year after the date on which the first form was required to be provided.

The Contractor further agrees that, for at least twelve (12) months after the effective date of this Contract, it will notify the Department of each of its job openings at facilities in Dane County for which applicants not already employees of the Contractor are to be considered. The notice will include a job description, classification, qualifications, and application procedures and deadlines, shall be provided to the City by the opening date of advertisement and with sufficient time for the City to notify candidates and make a timely referral. The Contractor agrees to interview and consider candidates referred by the Department, or an organization designated by the Department, if the candidate meets the minimum qualification standards established by the Contractor, and if the referral is timely. A referral is timely if it is received by the Contractor on or before the date stated in the notice.

The Department will determine if a contractor is exempt from the above requirements (Sec. 13.A.) at the time the Request for Exemption in 13.B.(2) is made.

**B. Articles of Agreement, Request for Exemption, and Release of Payment:
The "ARTICLES OF AGREEMENT" beginning on the following page, apply to all contractors, unless determined to be exempt under the following table and procedures:**

NUMBER OF EMPLOYEES	LESS THAN \$50,000 Aggregate Annual Business with the City *	\$50,000 OR MORE Aggregate Annual Business with the City *
14 or less	Exempt**	Exempt**
15 or more	Exempt**	Not Exempt

*As determined by the Finance Director

**As determined by the Department of Civil Rights

(1) **Exempt Status:** In this section, "Exempt" means the Contractor is exempt from the Articles of Agreement in section 13.B.(5) of this Contract and from filing an Affirmative Action plan as required by Section IV of the Articles of Agreement. The Department of Civil Rights ("Department") makes the final determination as to whether a contractor is exempt. If the Contractor is not exempt, sec. 13.B.(5) shall apply and Contractor shall select option A. or B. under Article IV therein and file an Affirmative Action Plan.

(2) **Request for Exemption – Fewer Than 15 Employees:** (MGO 39.02(9)(a)2.) Contractors who believe they are exempt based on number of employees shall submit a Request for Exemption on a form provided by the Department within thirty (30) days of the effective date of this Contract.

(3) **Exemption – Annual Aggregate Business:** (MGO 39.02(9)(a)c.): The Department will determine, at the time this Contract is presented for signature, if the Contractor is exempt because it will have less than \$50,000 in annual aggregate business with the City for the calendar year in which the contract is in effect. CONTRACTORS WITH 15 OR MORE

EMPLOYEES WILL LOSE THIS EXEMPTION AND BECOME SUBJECT TO SEC. 13.B.(5) UPON REACHING \$50,000 OR MORE ANNUAL AGGREGATE BUSINESS WITH THE CITY WITHIN THE CALENDAR YEAR, BEGINNING IN 2019.

(4) Release of Payment: (MGO 39.02(9)(e)1.b.) All non-exempt contractors must have an approved Affirmative Action plan meeting the requirements of Article IV below on file with the Department within thirty (30) days of the effective date of this Contract and prior to release of payment by the City. Contractors that are exempt based on number of employees agree to file a Request for Exemption with the Department within thirty (30) days of the effective date and prior to release of payment by the City.

(5) Articles of Agreement:

ARTICLE I

The Contractor shall take affirmative action in accordance with the provisions of this Contract to ensure that applicants are employed, and that employees are treated during employment without regard to race, religion, color, age, marital status, disability, sex, sexual orientation, gender identity or national origin and that the employer shall provide harassment-free work environment for the realization of the potential of each employee. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training including apprenticeship insofar as it is within the control of the Contractor. The Contractor agrees to post in conspicuous places available to employees and applicants notices to be provided by the City setting out the provisions of the nondiscrimination clauses in this Contract.

ARTICLE II

The Contractor shall in all solicitations or advertisements for employees placed by or on behalf of the Contractors state that all qualified or qualifiable applicants will be employed without regard to race, religion, color, age, marital status, disability, sex, sexual orientation, gender identity or national origin.

ARTICLE III

The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining Agreement or other Contract or understanding a notice to be provided by the City advising the labor union or workers representative of the Contractor's equal employment opportunity and affirmative action commitments. Such notices shall be posted in conspicuous places available to employees and applicants for employment.

ARTICLE IV

(This Article applies to non-public works contracts.)

The Contractor agrees that it will comply with all provisions of the Affirmative Action Ordinance of the City of Madison (MGO 39.02) including the Contract compliance requirements. The Contractor warrants and certifies that one of the following paragraphs is true (check one):

- A. Contractor has prepared and has on file an affirmative action plan that meets the format requirements of Federal Revised Order No. 4, 41 CFR part 60-2, as established by 43 FR 51400 November 3, 1978, including appendices required by City of Madison ordinances or it has prepared and has on file a model affirmative action plan approved by the Madison Common Council.
- B. Within thirty (30) days after the effective date of this Contract, Contractor will complete an affirmative action plan that meets the format requirements of Federal Revised Order No. 4, 41 CFR Part 60-2, as established by 43 FR 51400, November 3, 1978, including appendices required by City of Madison ordinance or within thirty (30) days after the effective date of this Contract, it will complete a model affirmative action plan approved by the Madison Common Council.
- C. Contractor believes it is exempt from filing an affirmative action plan because it has fewer than fifteen (15) employees and has filed, or will file within thirty (30) days after the effective date of this Contract, a form required by the City to confirm exempt status based on number of employees. If the City determines that Contractor is not exempt, the Articles of Agreement will apply.
- D. Contractor believes it is exempt from filing an affirmative action plan because its annual aggregate business with the City for the calendar year in which the contract is in effect is less than fifty thousand dollars (\$50,000), or for another reason listed in MGO 39.02(9)(a)2. If the City determines that Contractor is not exempt, the Articles of Agreement will apply.

ARTICLE V

(This Article applies only to public works contracts.)

The Contractor agrees that it will comply with all provisions of the Affirmative Action Ordinance of the City of Madison, including the Contract compliance requirements. The Contractor agrees to submit the model affirmative action plan for public works Contractors in a form approved by the Director of Affirmative Action.

ARTICLE VI

The Contractor will maintain records as required by Section 39.02(9)(f) of the Madison General Ordinances and will provide the City's Department of Affirmative Action with access to such records and to persons who have relevant and necessary information, as provided in Section 39.02(9)(f). The City agrees to keep all such records confidential, except to the extent that public inspection is required by law.

ARTICLE VII

In the event of the Contractor's or subcontractor's failure to comply with the Equal Employment Opportunity and Affirmative Action provisions of this Contract or Sections 39.03 and 39.02 of the Madison General Ordinances, it is agreed that the City at its option may do any or all of the following:

- A. Cancel, terminate or suspend this Contract in whole or in part.
- B. Declare the Contractor ineligible for further City contracts until the Affirmative Action requirements are met.
- C. Recover on behalf of the City from the prime Contractor 0.5 percent of the Contract award price for each week that such party fails or refuses to comply, in the nature of liquidated damages, but not to exceed a total of five percent (5%) of the Contract price, or ten thousand dollars (\$10,000), whichever is less. Under public works contracts, if a subcontractor is in noncompliance, the City may recover liquidated damages from the prime Contractor in the manner described above. The preceding sentence shall not be construed to prohibit a prime Contractor from recovering the amount of such damage from the noncomplying subcontractor.

ARTICLE VIII

(This Article applies to public works contracts only.)

The Contractor shall include the above provisions of this Contract in every subcontract so that such provisions will be binding upon each subcontractor. The Contractor shall take such action with respect to any subcontractor as necessary to enforce such provisions, including sanctions provided for noncompliance.

ARTICLE IX

The Contractor shall allow the maximum feasible opportunity to small business enterprises to compete for any subcontracts entered into pursuant to this Contract. (In federally funded contracts the terms "DBE, MBE, and WBE" shall be substituted for the term "small business" in this Article.)

14. **SEVERABILITY.**

It is mutually agreed that in case any provision of this Contract is determined by any court of law to be unconstitutional, illegal or unenforceable, it is the intention of the parties that all other provisions of this Contract remain in full force and effect.

15. **NOTICES.**

All notices to be given under the terms of this Contract shall be in writing and signed by the person serving the notice and shall be sent registered or certified mail, return receipt requested, postage prepaid, or hand delivered to the addresses of the parties listed below :

FOR THE CITY:

(Department or Division Head)

FOR THE CONTRACTOR:

16. **STATUS OF CONTRACTOR/INDEPENDENT/TAX FILING.**

It is agreed that Contractor is an independent Contractor and not an employee of the City, and that any persons who the Contractor utilizes and provides for services under this Contract are employees of the Contractor and are not employees of the City of Madison.

Contractor shall provide its taxpayer identification number (or social security number) to the Finance Director, 210 Martin Luther King Jr. Blvd, Room 406, Madison, WI 53703, prior to payment. The Contractor is informed that as an independent Contractor, s/he may have a responsibility to make estimated tax returns, file tax returns, and pay income taxes and make social security payments on the amounts received under this Contract and that no amounts will be withheld from payments made to this Contractor for these purposes and that payment of taxes and making social security payments are solely the responsibility and obligation of the Contractor. The Contractor is further informed that s/he may be subject to civil and/or criminal penalties if s/he fails to properly report income and pay taxes and social security taxes on the amount received under this Contract.

17. **GOODWILL.**

Any and all goodwill arising out of this Contract inures solely to the benefit of the City; Contractor waives all claims to benefit of such goodwill.

18. **THIRD PARTY RIGHTS.**

This Contract is intended to be solely between the parties hereto. No part of this Contract shall be construed to add, supplement, amend, abridge or repeal existing rights, benefits or privileges of any third party or parties, including but not limited to employees of either of the parties.

19. **AUDIT AND RETAINING OF DOCUMENTS.**

The Contractor agrees to provide all reports requested by the City including, but not limited to, financial statements and reports, reports and accounting of services rendered, and any other reports or documents requested. Financial and service reports shall be provided according to a schedule (when applicable) to be included in this Contract. Any other reports or documents shall be provided within five (5) working days after the Contractor receives the City's written requests, unless the parties agree in writing on a longer period. Payroll records and any other documents relating to the performance of services under the terms of this Contract shall be retained by the Contractor for a period of three (3) years after completion of all work under this Contract, in order to be available for audit by the City or its designee.

20. **CHOICE OF LAW AND FORUM SELECTION.**

This Contract shall be governed by and construed, interpreted and enforced in accordance with the laws of the State of Wisconsin. The parties agree, for any claim or suit or other dispute relating to this Contract that cannot be mutually resolved, the venue shall be a court of competent jurisdiction within the State of Wisconsin and the parties agree to submit themselves to the jurisdiction of said court, to the exclusion of any other judicial district that may have jurisdiction over such a dispute according to any law ..

21. **COMPLIANCE WITH APPLICABLE LAWS.**

The Contractor shall become familiar with, and shall at all times comply with and observe all federal, state, and local laws, ordinances, and regulations which in any manner affect the services or conduct of the Contractor and its agents and employees.

22. **CONFLICT OF INTEREST.**

- A. The Contractor warrants that it and its agents and employees have no public or private interest, and will not acquire directly or indirectly any such interest, which would conflict in any manner with the performance of the services under this Agreement.
- B. The Contractor shall not employ or Contract with any person currently employed by the City for any services included under the provisions of this Agreement.

23. **COMPENSATION.**

It is expressly understood and agreed that in no event will the total compensation under this Contract exceed \$_____.

24. **BASIS FOR PAYMENT.**

A. **GENERAL.**

- (1) The City will pay the Contractor for the completed and accepted services rendered under this Contract on the basis and at the Contract price set forth in Section 23 of this Contract. The City will pay the Contractor for completed and approved "extra services", if any, if such "extra services" are authorized according to the procedure established in this section. The rate of payment for "extra services" shall be the rate established in this Contract. Such payment shall be full compensation for services rendered and for all labor, material, supplies, equipment and incidentals necessary to complete the services.
- (2) The Contractor shall submit invoices, on the form or format approved by the City and as may be further specified in Section 3 of this Contract. The City will pay the Contractor in accordance with the schedule, if any, set forth in Section 3. The final invoice, if applicable, shall be submitted to the City within three months of completion of services under this Agreement.
- (3) Should this Agreement contain more than one service, a separate invoice and a separate final statement shall be submitted for each individual service.
- (4) Payment shall not be construed as City acceptance of unsatisfactory or defective services or improper materials.
- (5) Final payment of any balance due the Contractor will be made upon acceptance by the City of the services under the Agreement and upon receipt by the City of documents required to be returned or to be furnished by the Contractor under this Agreement.
- (6) The City has the equitable right to set off against any sum due and payable to the Contractor under this Agreement, any amount the City determines the Contractor owes the City, whether arising under this Agreement or under any other Agreement or otherwise.
- (7) Compensation in excess of the total Contract price will not be allowed unless authorized by an amendment under Section 9, AMENDMENT.
- (8) The City will not compensate for unsatisfactory performance by the Contractor.

B. **SERVICE ORDERS, EXTRA SERVICE, OR DECREASED SERVICE.**

- (1) Written orders regarding the services, including extra services or decreased services, will be given by the City, using the procedure set forth in Section 15, NOTICES.
- (2) The City may, by written order, request extra services or decreased services, as defined in Section 10 of this Contract. Unless the Contractor believes the extra services entitle it to extra compensation or additional time, the Contractor shall proceed to furnish the necessary labor, materials, and professional services to complete the services within the time limits specified in the Scope of Services, Section 3 of this Agreement, including any amendments under Section 9 of this Agreement.
- (3) If in the Contractor's opinion the order for extra service would entitle it to extra compensation or extra time, or both, the Contractor shall not proceed to carry out the extra service, but shall notify the City, pursuant to Section 15 of this Agreement. The notification shall include the justification for the claim for extra compensation or extra time, or both, and the amount of additional fee or time requested.
- (4) The City shall review the Contractor's submittal and respond in writing, either authorizing the Contractor to perform the extra service, or refusing to authorize it. The Contractor shall not receive additional compensation or time unless the extra compensation is authorized by the City in writing.

25. **DEFAULT/TERMINATION.**

- A. In the event Contractor shall default in any of the covenants, agreements, commitments, or conditions herein contained, and any such default shall continue unremedied for a period of ten (10) days after written notice thereof to Contractor, the City may, at its option and in addition to all other rights and remedies which it may have at law or in equity against Contractor, including expressly the specific enforcement hereof, forthwith have the cumulative right to immediately terminate this Contract and all rights of Contractor under this Contract.
- B. Notwithstanding paragraph A., above, the City may in its sole discretion and without any reason terminate this Agreement at any time by furnishing the Contractor with ten (10) days' written notice of termination. In the event of termination under this subsection, the City will pay for all work completed by the Contractor and accepted by the City.

26. **INDEMNIFICATION.**

The Contractor shall be liable to and hereby agrees to indemnify, defend and hold harmless the City of Madison, and its officers, officials, agents, and employees against all loss or expense (including liability costs and attorney's fees) by reason of any claim or suit, or of liability imposed by law upon the City or its officers, officials, agents or employees for damages because of bodily injury, including death at any time resulting therefrom, sustained by any person or persons or on account of damages to property, including loss of use thereof, arising from, in connection with, caused by or resulting from the contractors and/or any subcontractor's negligent acts, errors or omissions, in the performance of this Agreement.

27. **INSURANCE**

- A. The Contractor will insure, and will require each subcontractor to insure, as indicated, against the following risks to the extent stated below. The Contractor shall not commence work under this Contract, nor shall the Contractor allow any

Subcontractor to commence work on its Subcontract, until the insurance coverage required below has been obtained and approved by the City Risk Manager, under the procedures in Section 27.C., below .

Commercial General Liability

The Contractor shall procure and maintain during the life of this Contract, Commercial General Liability insurance including, but not limited to bodily injury, property damage, personal injury, and products and completed operations (unless determined to be inapplicable by the Risk Manager) in an amount not less than \$1,000,000 per occurrence. This policy shall also provide contractual liability in the same amount. Contractor's coverage shall be primary and non-contributory and list the City of Madison, its officers, officials, agents and employees as additional insureds. Contractor shall require all subcontractors under this Contract (if any) to procure and maintain insurance meeting the above criteria, applying on a primary basis and listing the City of Madison, its officers, officials, agents and employees as additional insureds.

Automobile Liability

The Contractor shall procure and maintain during the life of this Contract Business Automobile Liability insurance covering owned, non-owned and hired automobiles with limits of not less than \$1,000,000 combined single limit per accident. Contractor shall require all subcontractors under this Contract (if any) to procure and maintain insurance covering each subcontractor and meeting the above criteria.

Worker's Compensation

The Contractor shall procure and maintain during the life of this Contract statutory Workers' Compensation insurance as required by the State of Wisconsin. The Contractor shall also carry Employers Liability limits of at least \$100,000 Each Accident, \$100,000 Disease – Each Employee, and \$500,000 Disease – Policy Limit. Contractor shall require all subcontractors under this Contract (if any) to procure and maintain such insurance, covering each subcontractor.

Professional Liability

The Contractor shall procure and maintain professional liability insurance with coverage of not less than \$1,000,000. If such policy is a "claims made" policy, all renewals thereof during the life of the Contract shall include "prior acts coverage" covering at all times all claims made with respect to Contractor's work performed under the Contract. This Professional Liability coverage must be kept in force for a period of six (6) years after the services have been accepted by the City.

- B. Acceptability of Insurers. The above-required insurance is to be placed with insurers who have an A.M. Best rating of no less than A- (A minus) and a Financial Category rating of no less than VII.
- C. Proof of Insurance Approval. The Contractor shall provide the City with certificate(s) of insurance showing the type, amount, effective dates, and expiration dates of required policies prior to commencing work under this Contract. Contractor shall provide the certificate(s) to the City's representative upon execution of the Contract, or sooner, for approval by the City Risk Manager. If any of the policies required above expire while this Contract is still in effect, Contractor shall provide renewal certificate(s) to the City for approval. Certificate Holder language should be listed as follows:
City of Madison
ATTN: Risk Management, Room 406
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
The Contractor shall provide copies of additional insured endorsements or insurance policies, if requested by the City Risk Manager.
- D. Notice of Cancellation. The Contractor and/or Insurer shall give the City thirty (30) days advance written notice of cancellation, non-renewal or material changes to any of the above-required policies during the term of this Contract.

28. **OWNERSHIP OF CONTRACT PRODUCT.**

All of the work product, including, but not limited to, documents, materials, files, reports, data, including magnetic tapes, disks of computer-aided designs or other electronically stored data or information (the "Documents"), which the Contractor prepares pursuant to the terms and conditions of this Contract are the sole property of the City. The Contractor will not publish any such materials or use them for any research or publication, other than as expressly required or permitted by this Contract, without the prior written permission of the City. The grant or denial of such permission shall be at the City's sole discretion.

The Contractor intends that the copyright to the Documents shall be owned by City, whether as author (as a Work Made For Hire), or by assignment from Contractor to City. The parties expressly agree that the Documents shall be considered a Work Made For Hire as defined by Title 17, United States Code, Section 101(2).

As further consideration for the City entering into this Contract, the Contractor hereby assigns to City all of the Contractor's rights, title, interest and ownership in the Documents, including the right to procure the copyright therein and the right to secure any renewals, reissues and extensions of any such copyright in any foreign country. The City shall be entitled to the sole and exclusive benefit of the Documents, including the copyright thereto, and whenever required by the City, the Contractor shall at no additional compensation, execute all documents of assignment of the full and exclusive benefit and copyright thereof to the City. Any subcontractors and other independent Contractors who prepare portions of the Documents shall be required by the Contractor to execute an assignment of ownership in favor of the City before commencing work.

29. **BAN THE BOX - ARREST AND CRIMINAL BACKGROUND CHECKS.** (Sec. 39.08, MGO. Applicable to contracts exceeding \$25,000.)
- A. **DEFINITIONS.**
 For purposes of this section, "Arrest and Conviction Record" includes, but is not limited to, information indicating that a person has been questioned, apprehended, taken into custody or detention, held for investigation, arrested, charged with, indicted or tried for any felony, misdemeanor or other offense pursuant to any law enforcement or military authority.
 "Conviction record" includes, but is not limited to, information indicating that a person has been convicted of a felony, misdemeanor or other offense, placed on probation, fined, imprisoned or paroled pursuant to any law enforcement or military authority.
 "Background Check" means the process of checking an applicant's arrest and conviction record, through any means.
- B. **REQUIREMENTS.** For the duration of this Contract, the Contractor shall:
- (1) Remove from all job application forms any questions, check boxes, or other inquiries regarding an applicant's arrest and conviction record, as defined herein.
 - (2) Refrain from asking an applicant in any manner about their arrest or conviction record until after conditional offer of employment is made to the applicant in question.
 - (3) Refrain from conducting a formal or informal background check or making any other inquiry using any privately or publicly available means of obtaining the arrest or conviction record of an applicant until after a conditional offer of employment is made to the applicant in question.
 - (4) Make information about this ordinance available to applicants and existing employees, and post notices in prominent locations at the workplace with information about the ordinance and complaint procedure using language provided by the City.
 - (5) Comply with all other provisions of Sec. 39.08, MGO.
- C. **EXEMPTIONS:** This section does not apply when:
- (1) Hiring for a position where certain convictions or violations are a bar to employment in that position under applicable law, or
 - (2) Hiring a position for which information about criminal or arrest record, or a background check is required by law to be performed at a time or in a manner that would otherwise be prohibited by this ordinance, including a licensed trade or profession where the licensing authority explicitly authorizes or requires the inquiry in question.
- To be exempt under sec. C.(1) or (2) above, Contractor must demonstrate to the City that there is a law or regulation that requires the hiring practice in question. If so, the contractor is exempt from this section for the position(s) in question.
30. **WEAPONS PROHIBITION.**
 Contractor shall prohibit, and shall require its subcontractors to prohibit, its employees from carrying weapons, including concealed weapons, in the course of performance of work under this Contract, other than while at the Contractor's or subcontractor's own business premises. This requirement shall apply to vehicles used at any City work site and vehicles used to perform any work under this Contract, except vehicles that are an employee's "own motor vehicle" pursuant to Wis. Stat. sec. 175.60(15m).
31. **AUTHORITY.**
 Contractor represents that it has the authority to enter into this Contract. If the Contractor is not an individual, the person(s) signing on behalf of the Contractor represents and warrants that they have been duly authorized to bind the Contractor and sign this Contract on the Contractor's behalf.
32. **COUNTERPARTS, ELECTRONIC SIGNATURE AND DELIVERY.**
 This Contract may be signed in counterparts, each of which shall be taken together as a whole to comprise a single document. Signatures on this Contract may be exchanged between the parties by facsimile, electronic scanned copy (.pdf) or similar technology and shall be as valid as original; and this Contract may be converted into electronic format and signed or given effect with one or more electronic signature(s) if the electronic signature(s) meets all requirements of Wis. Stat. ch. 137 or other applicable Wisconsin or Federal law. Executed copies or counterparts of this Contract may be delivered by facsimile or email and upon receipt will be deemed original and binding upon the parties hereto, whether or not a hard copy is also delivered. Copies of this Contract, fully executed, shall be as valid as an original.

IN WITNESS WHEREOF, the parties hereto have set their hands at Madison, Wisconsin.

CONTRACTOR:

(Type or Print Name of Contracting Entity)

By: _____
(Signature)

(Print Name and Title of Person Signing)

Date: _____

**CITY OF MADISON, WISCONSIN
a municipal corporation:**

By: _____
Satya Rhodes-Conway, Mayor

Date: _____

Approved:

David P. Schmiedicke, Finance Director

Date: _____

By: _____
Maribeth Witzel-Behl, City Clerk

Date: _____

Approved as to Form:

Eric T. Veum, Risk Manager

Date: _____

Michael Haas, City Attorney

Date: _____

For City Use Only: SIGNATURE INSTRUCTIONS FOR CONTRACTS SIGNED BY MAYOR/CLERK:

Obtain contractor's signature first. Route this contract & all of its attachments for City signatures using the City Clerk's Contract Routing Database. Include 1 copy of authorizing resolution & 1 copy of the Certificate of Insurance.

NOTE: Certain service contracts may be executed by the designee of the Finance Director on behalf of the City of Madison:

By: _____
Mary Richards, Procurement Supervisor

Date: _____

MGO 4.26(3) and (5) authorize the Finance Director or designee to sign purchase of service contracts when all of the following apply:

- (a) The funds are included in the approved City budget.
- (b) An RFP or competitive process was used, or the Contract is exempt from competitive bidding under 4.26(4)(a).
- (c) The City Attorney has approved the form of the Contract.
- (d) The Contract complies with other laws, resolutions and ordinances.
- (e) The Contract is for a period of 1 year or less, OR not more than 5 years AND the average cost is not more than \$100,000 per year, AND was subject to competitive bidding. (If over \$50,000 and exempt from bidding under 4.26(4)(a), regardless of duration of the Contract, the Common Council must authorize the Contract by resolution and the Mayor and City Clerk must sign, per 4.26(5)(b).)

Emergency Service contracts may also be signed by the designee of the Finance Director if the requirements of MGO 4.26(3)(c) are met.

For City Use Only: SIGNATURE INSTRUCTIONS FOR CONTRACT TO BE SIGNED BY FINANCE (PURCHASING):

Obtain contractor's signature first. Attach the contractor-signed contract with all attachments/exhibits and the certificate of insurance to the requisition in MUNIS.

EXHIBIT 1 – JOHN NOLEN DRIVE WATERSHED SPECIFIC INFORMATION

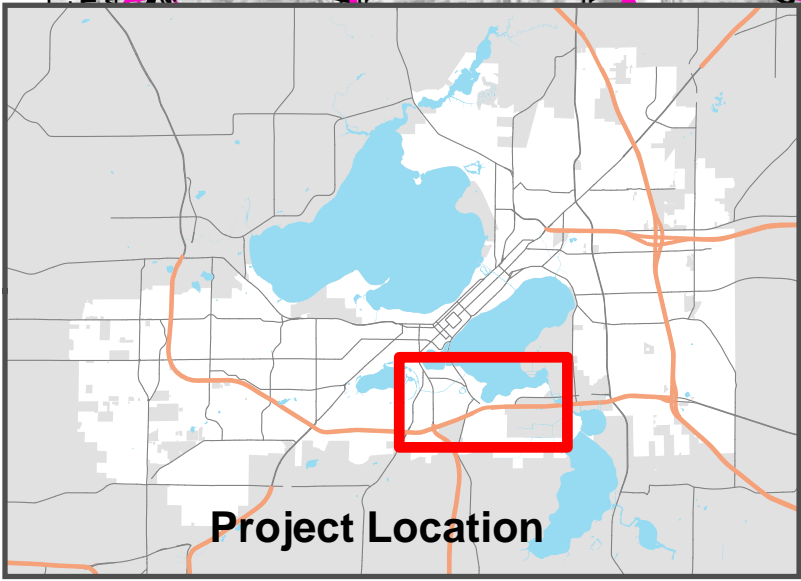
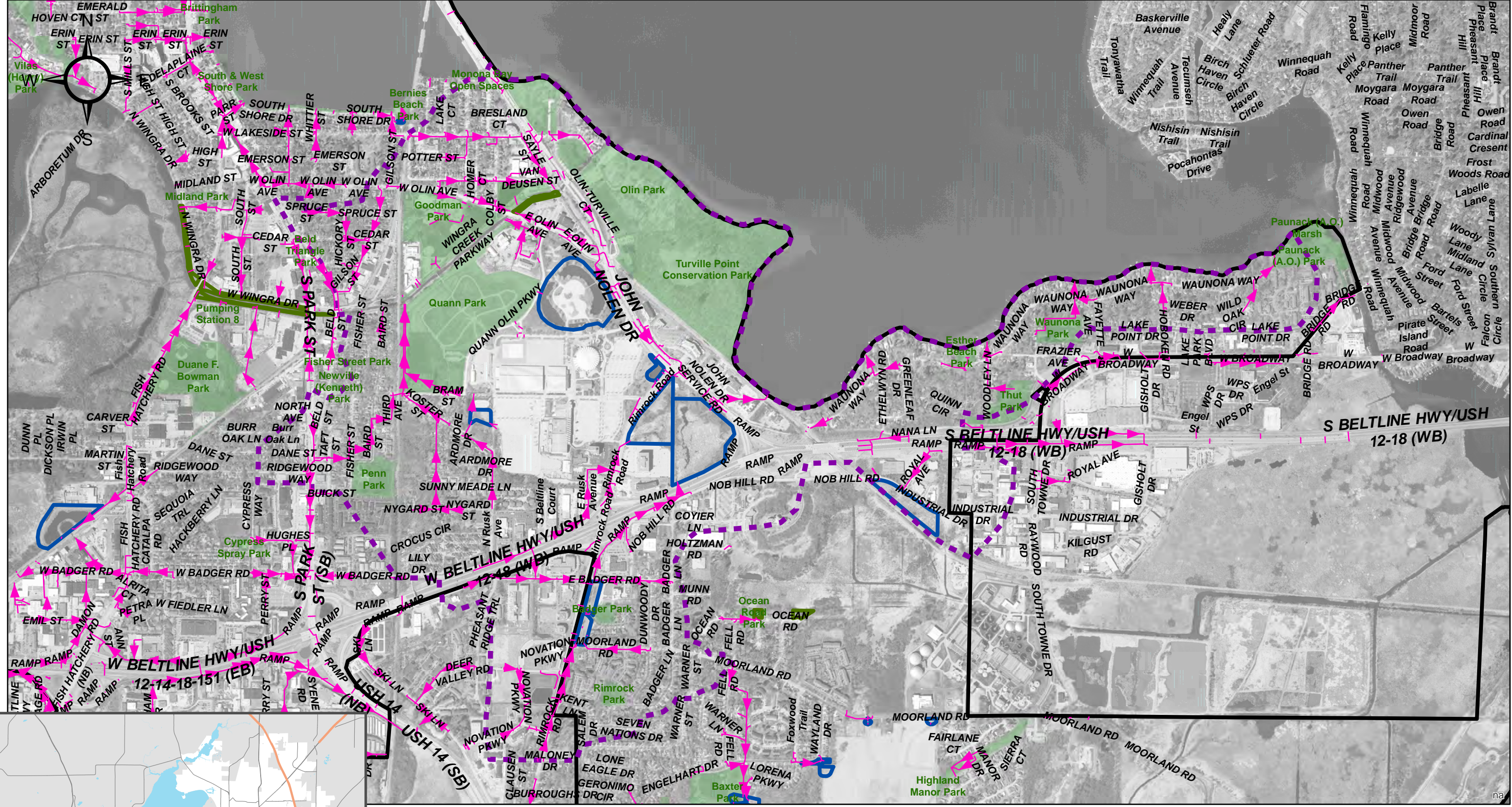
The John Nolen Drive Watershed is approximately 1,350 acres located on Madison's south side (see Figure 1a). The watershed has a mixture of development and is composed of several land uses including residential, commercial, park/open space, wetlands, and highway.

Key Locations identified by light blue stars (See Figure 1c):

1. Two existing 24"x38" HERCP under John Nolen Drive are undersized and in very poor condition. Invert elevations will likely need to be surveyed. Storage in the marsh area just upstream of these pipes (John Nolen Drive Retention Ponds – East and West Friede Ponds) will need to be accounted for accurately in modeling.
2. The Alliant Energy Center and Coliseum property, owned by Dane County, contains multiple subbasins. A stormwater memo for the site, including a map of subbasins, are provided as an attachment to the RFP.
3. Capacity is limited for both pipes (54" RCP and 48"x76" HERCP) that flow out to Wingra Creek. This is due in part to the submerged pipe outfall and tailwater elevation on Wingra Creek.
4. The City has received a couple reports of flooding at this intersection and at the railroad bridge. However, based on existing pipe size (30" RCP) and the contributing drainage area, it's likely that flooding here has been underreported.
5. The area between Bram Street and Koster Street is very low lying and has experienced recurring flooding and it was especially pronounced in 2018.
6. The existing 24" RCP was installed by the Town of Madison in 2004. The inlets contributing to this pipe are not optimally located and there are likely not enough existing inlets to fill the pipe to capacity. Existing conditions modeling should represent this in some way (account for inlet capacity, restrict flow in pipe, etc.). Recommended solutions in this area may include adding and/or relocating inlets along with pipe improvements.
7. The parcels bounded by Sundstrom Street on the east and the railroad tracks on the west are anticipated to develop in the future. Proposed conditions modeling should account for low density residential development in this area. Recommended solutions in this area may include Stormwater treatment for future development.

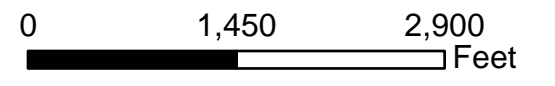
Other information

1. Wingra Creek is not expected to be modeled for this watershed study. The watershed outfalls are where the storm sewer and open channels discharge to Wingra Creek and Lake Monona.
2. Locations within the watershed have had monitoring equipment installed to collect rainfall, stage, and in some instances, flow data. The monitoring equipment locations are shown by green stars on Exhibit 1b. The data from the monitoring equipment will be available for download to the selected consultant.
3. There are currently no scheduled TIP projects in this watershed.
4. Areas outside the current municipal boundary drain into the City in the vicinity of Novation Parkway at Rimrock Road. Storm sewer located in the City of Fitchburg should be included in the model to the degree necessary to accurately model the function of City of Madison stormwater infrastructure.

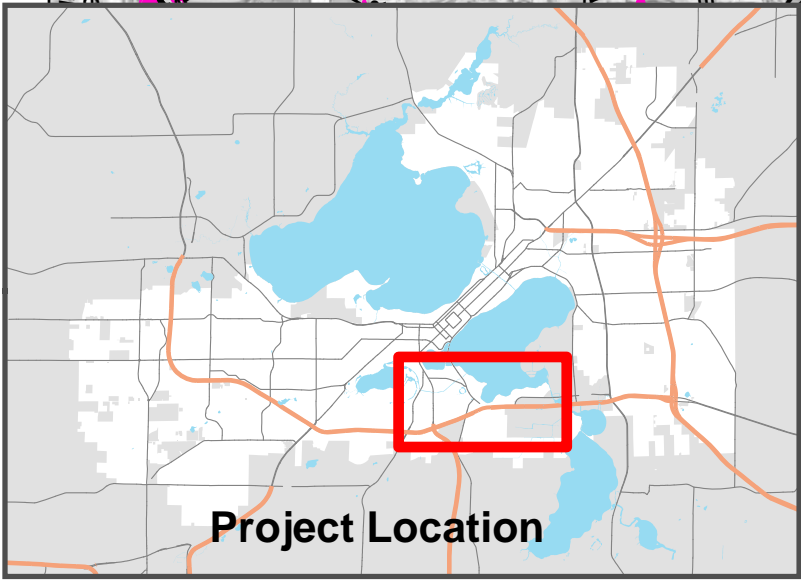
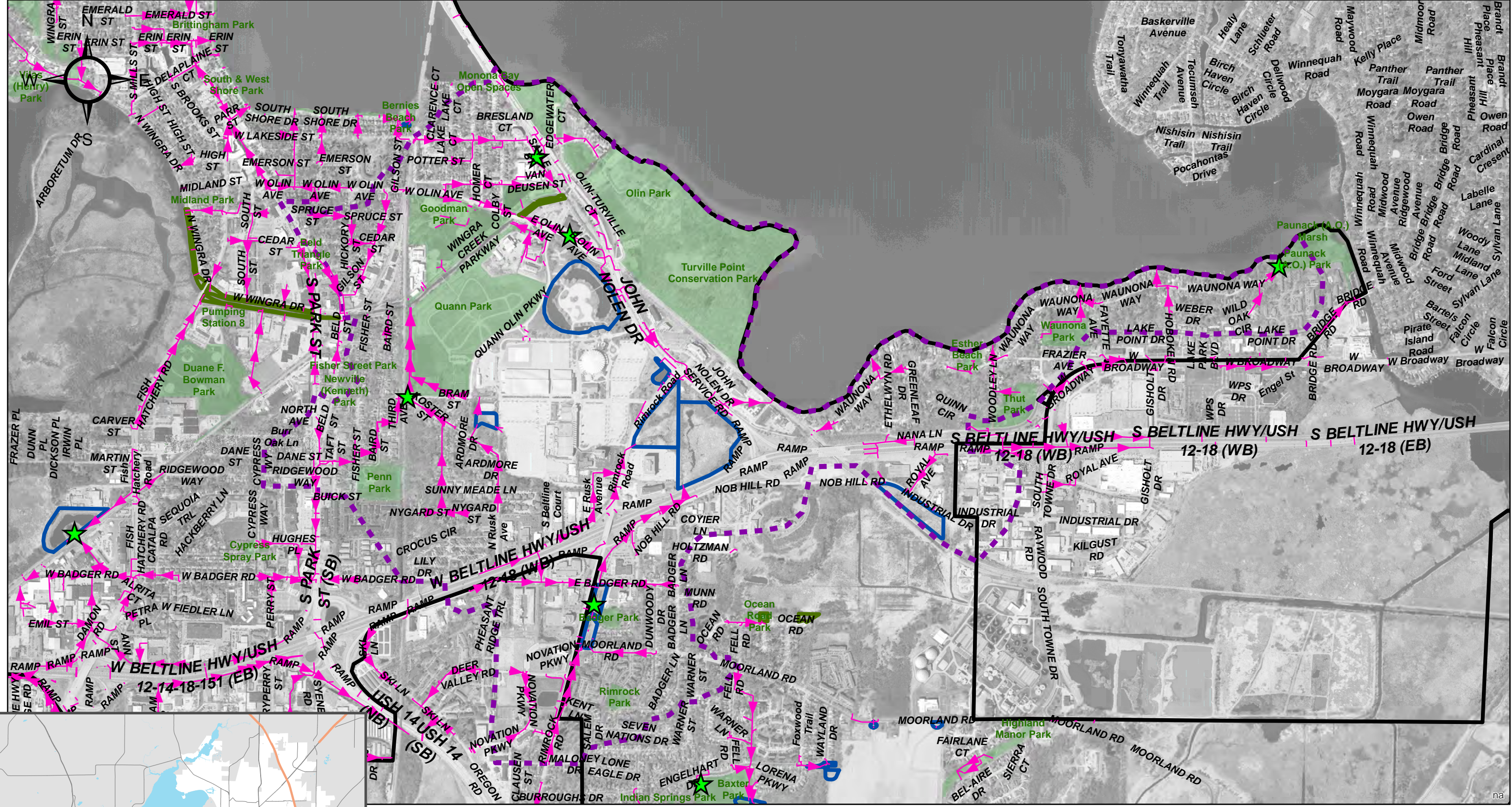


- Greenway
- Pond
- Storm Pipe
- Watershed Study Boundaries
- Parks
- Municipal Limits

Exhibit 1a Watershed Area John Nolen Drive Watershed Study

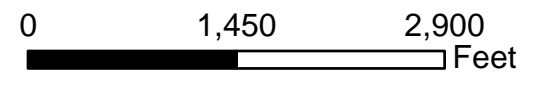


Date: 10/31/2022

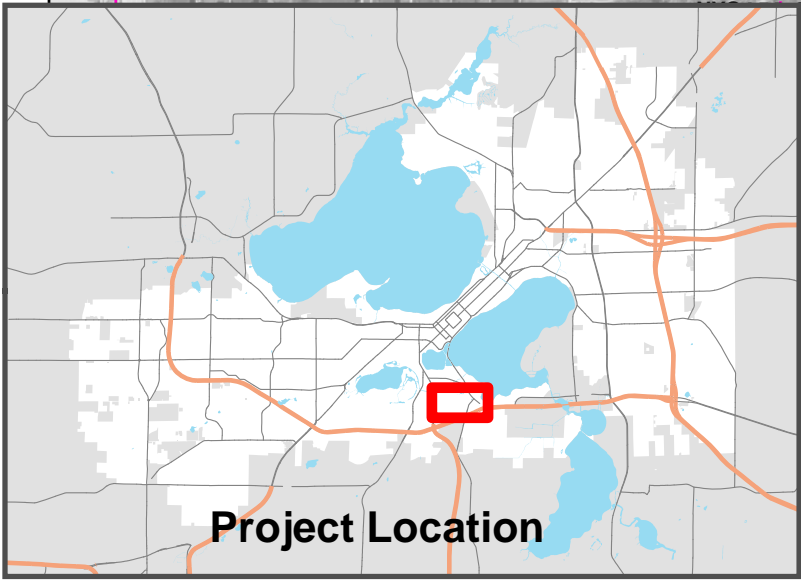
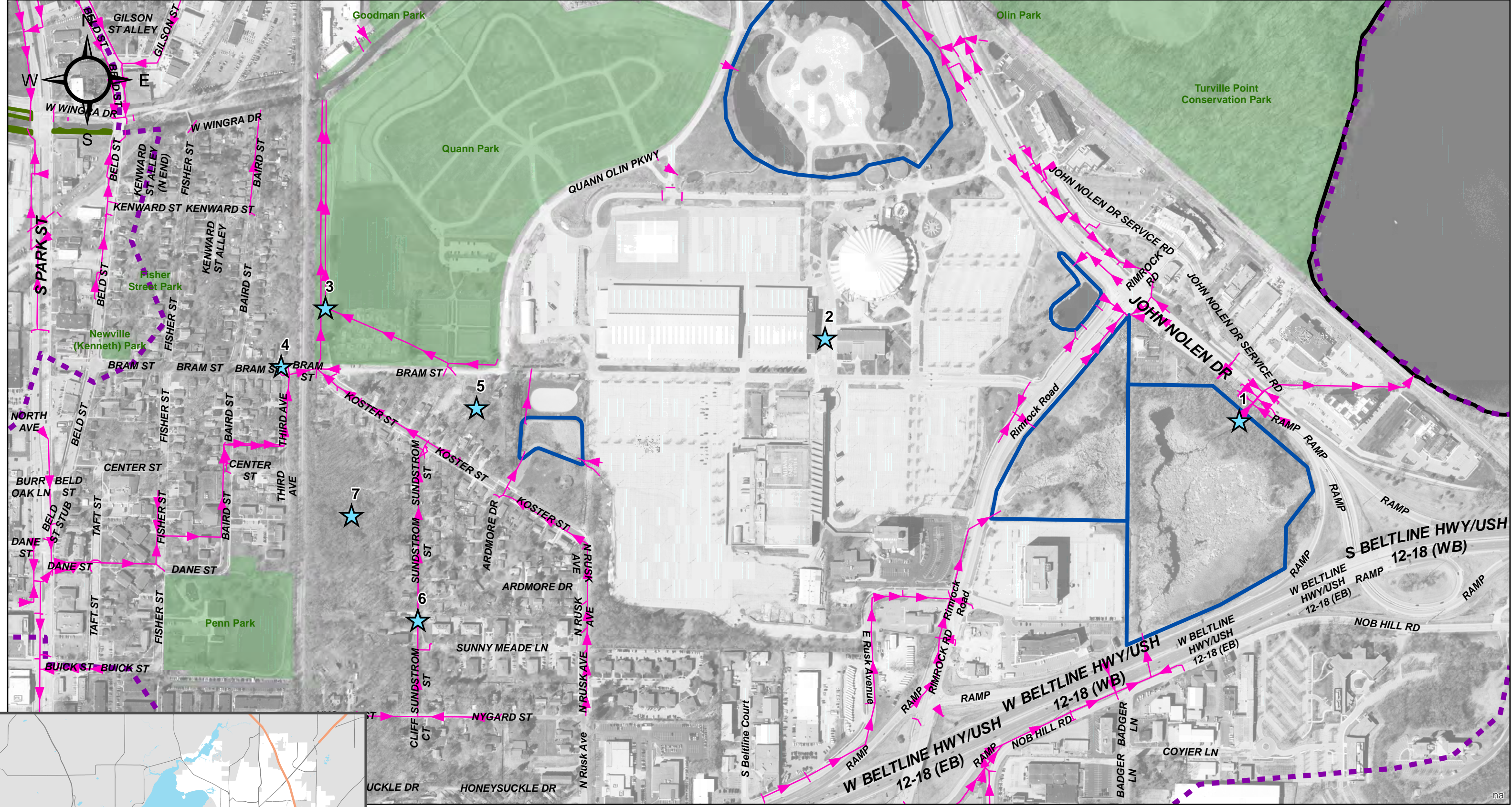


- Greenway
- Pond
- Storm Pipe
- Watershed Study Boundaries
- Parks
- Monitoring Locations
- Municipal Limits

Exhibit 1b Monitoring Locations John Nolen Drive Watershed Study

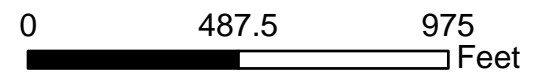


Date: 10/31/2022



- Greenway
- Pond
- Municipal Limits
- Storm Pipe
- Watershed Study Boundaries
- Parks

Exhibit 1c Locations of Interest John Nolen Drive Watershed Study



Date: 10/31/2022



EXHIBIT 2 – WARNER PARK WATERSHED SPECIFIC INFORMATION

The Warner Park Watershed is approximately 6,000 acres located on Madison's northeast side (see Figure 2a). The watershed has a mixture of development and is composed of several land uses including residential, commercial, agricultural, open space, and wetlands.

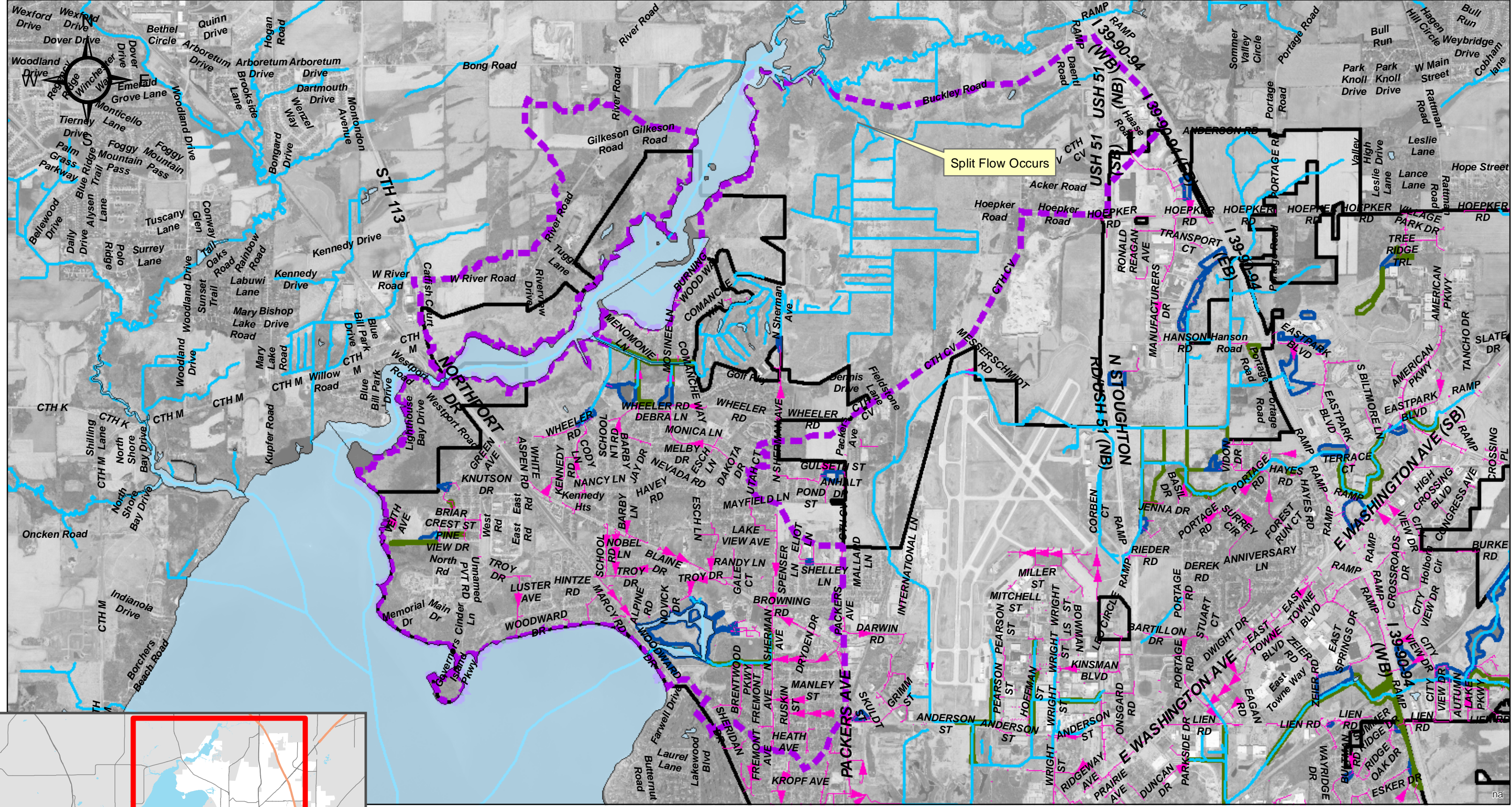
Key Locations identified by light blue stars (See Figure 2c):

1. Pond constructed by Parks in 2012, storm sewers entering ponds may not be large enough to meet all watershed study targets. Drawings included with RFP.
2. Pond constructed by Parks in 2012, storm sewers entering ponds may not be large enough to meet all watershed study targets. Drawings included with RFP.
3. Chronic flooding at low point.
4. Chronic flooding at low point.
5. Constructed by Engineering in 2017. Drawings included with RFP.
6. Culvert likely does not meet watershed study targets. Constructed by Town of Westport when Golf Course was constructed.
7. Town of Westport built channel in 1970's along with Golf Course.
8. Owned by City of Madison Parks, but not in the city of Madison.
9. Likely location of culvert crossing under road. Consultant to field verify.
10. Golf Course being reconstructed. Dane County permitted grading plan included with RFP. Construction should be complete August 2023.
11. Likely not enough inlets in current sewer system. Does box culvert fill or are more inlets needed?
12. Inlet/terrace inlets added around 2013 to resolve flooding in area.
13. Chronic flooding. Does not affect structures.
14. Unimproved road, built in the 50/60s. Scheduled for reconstruction in 2026. Stormwater solutions are challenging here. Looking for solution from consultant for this study.
15. Previously a swale that was replaced with pipe in 1963, then houses were built adjacent to it.
16. Chronic flooding along south side of road.
17. Culvert is likely an old CMP, built in 1962. Engineering recently TVd it. The data is included with this RFP.
18. Reconstructed in 2021. Drawings included with this RFP.
19. There are culverts in series at this location. They act as the outfall for Warner Lagoon. The first is an arch under railroad built by the railroad. It discharges to an elliptical pipe under road built in 2012. Drawings for the elliptical pipe are included with this RFP. Limited data is available for the railroad arch.
City of Madison Parks and City of Madison Engineering recently completed a Water Quality Planning Report for Warner Lagoon. That report and the WinSLAMM models created for it are included with the RFP.
20. Floods due to tailwater from channel.
21. Storm sewers added in 2018 to connect sump pumps in the area. Installed to try to reduce groundwater flooding in the area. Drawings included with this RFP.
22. WDNR designated as navigable channel. Standing water in channel when Lake Mendota is high.
23. Back part of shopping center drains into the backyards of houses.
24. Mostly unimproved area. Solution to meet targets is likely challenging.
25. Area used to flood. Improvements were recently made and likely no longer floods.
26. Likely an area of flooding. Railroad may reconstruct crossing soon. Solution needed in area from consultant for this study.

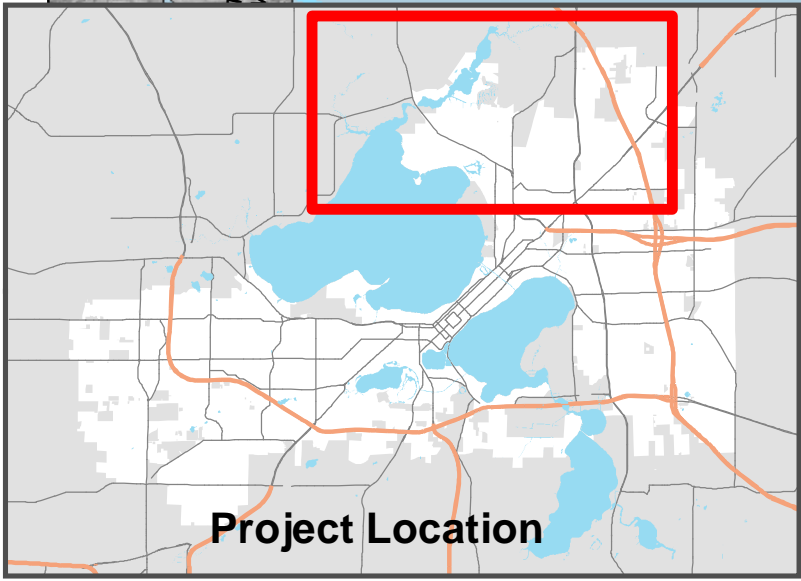
27. Channel is owned by the City of Madison, maintained by Cherokee Marsh Neighborhood Association.
28. Channel is likely poor condition, contaminated, with uneven channel bed. Some areas of the channel bed are higher than the top of the culverts. This causes backwater issues for the golf course. The City does not want a solution for this channel, however, it may need to be included in the model to account for the uneven channel bottom.
29. Resident sent photos and videos of intersection flooding during July 2022 storm. Information included with this RFP.

Other information

1. Agricultural ditches have been constructed in the northeast part of the watershed. According to the current mapping, it appears as if there is split flow near Token Creek. This should be incorporated into the model so the appropriate amount of stormwater reaches the City of Madison stormwater infrastructure.
2. The Yahara River is not expected to be modeled for this watershed study. The watershed outfalls are where the storm sewer and open channels discharge to the Yahara River.
3. Locations within the watershed have had monitoring equipment collected rainfall, stage, and in some instances, flow data. The locations of the monitoring equipment are shown by green stars on Exhibit 2b. The data from the monitoring equipment will be available for download to the selected consultant.
4. Areas outside the current municipal boundary drain into the City in certain locations. Much of this area will eventually be incorporated into the City of Madison. The majority this land will remain open space well into the future. Exhibit 2d is included in the RFP showing the areas that will be developed (not remain open space). For areas developing areas within the watershed, but outside the current municipal boundary, the hydrology and conveyance system should be developed in a manner to 1) assist with stormwater-needs mapping (2D inundation mapping) for the neighborhood development plans and 2) understand where existing infrastructure could be undersized.
5. Two locations in this project area have scheduled TIP projects. The City would like more detailed information for these areas to help facilitate design.



Split Flow Occurs









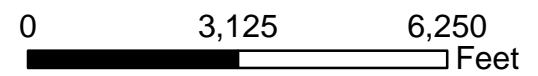
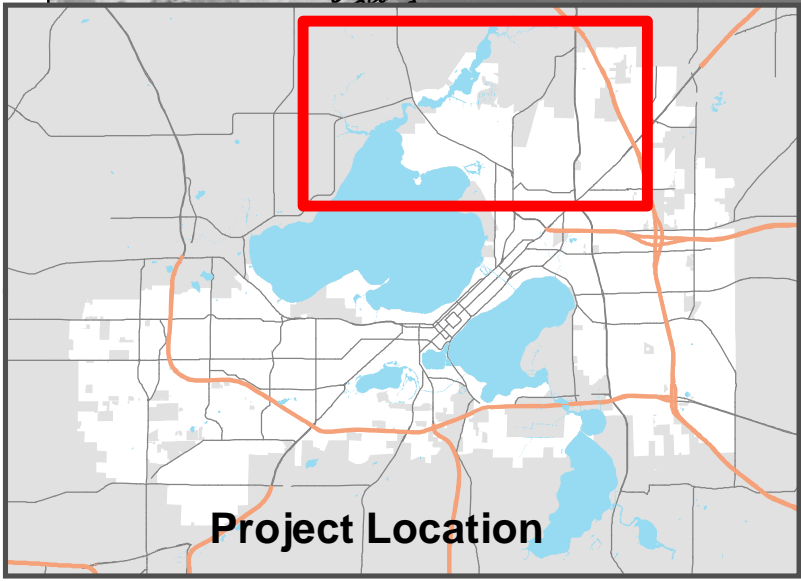
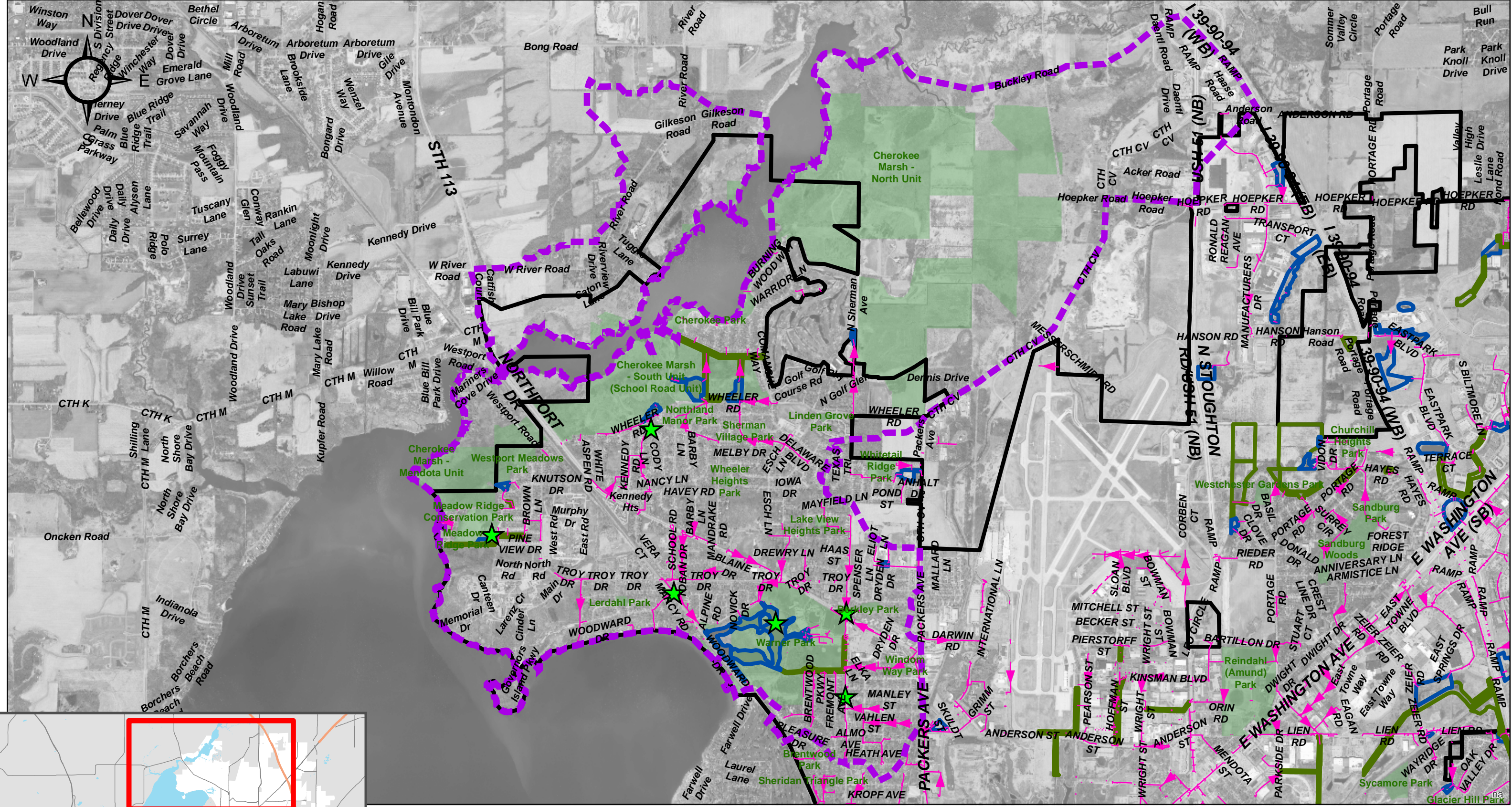
-  Greenway
-  Pond
-  Storm Pipe
-  Municipal Limits
-  Wisconsin Open Water
-  Dane County Hydroline

Exhibit 2a Watershed Area Warner Park Watershed Study



Date: 10/24/2022












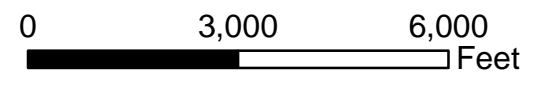
-  Greenway
-  Pond
-  Storm Pipe
-  Municipal Limits
-  Parks
-  Monitoring Locations
-  Watershed Boundary

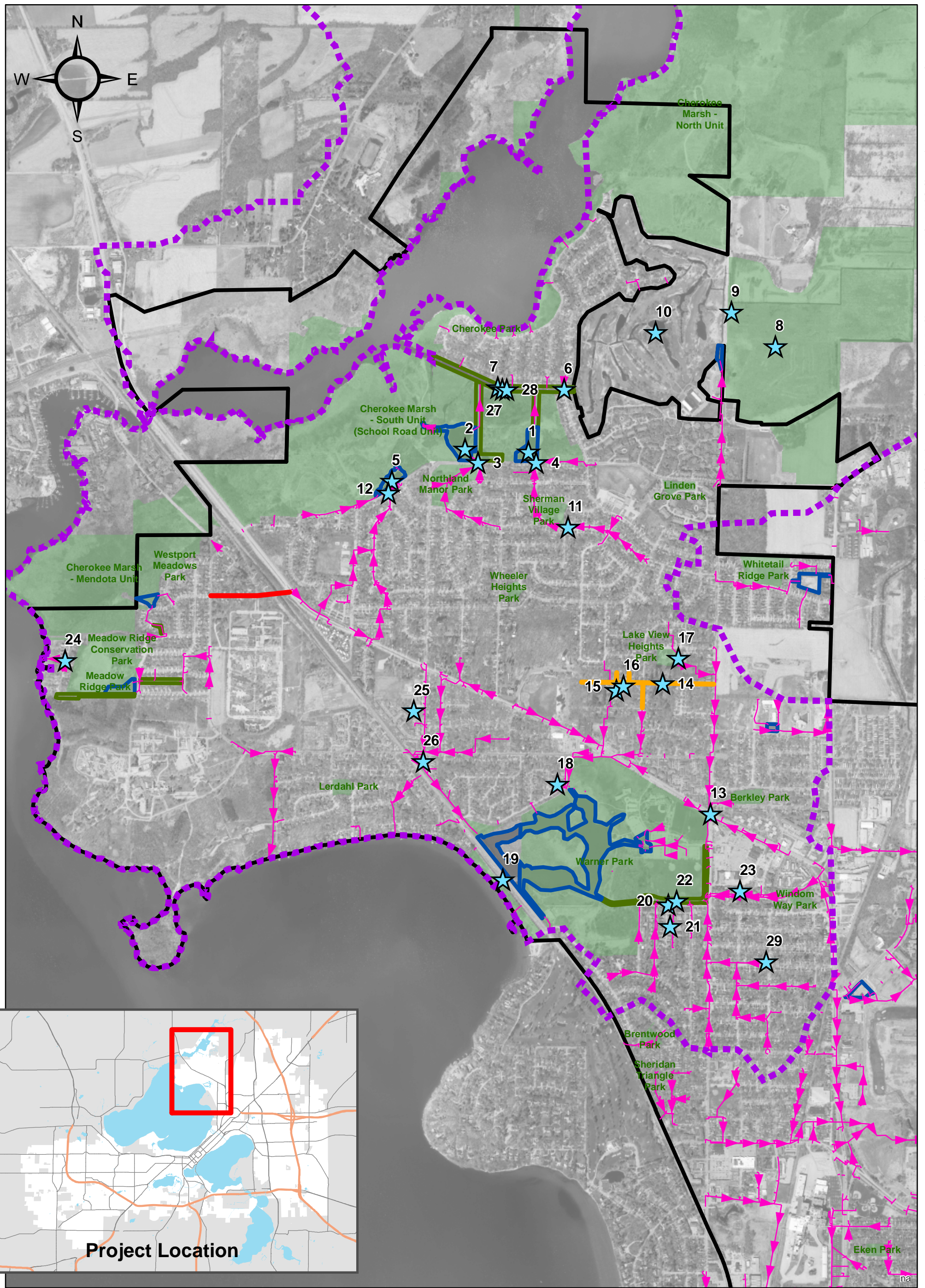
Exhibit 2b Monitoring Locations Warner Park Watershed Study



Date: 10/24/2022



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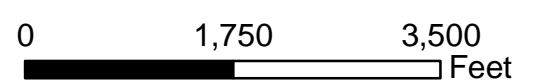
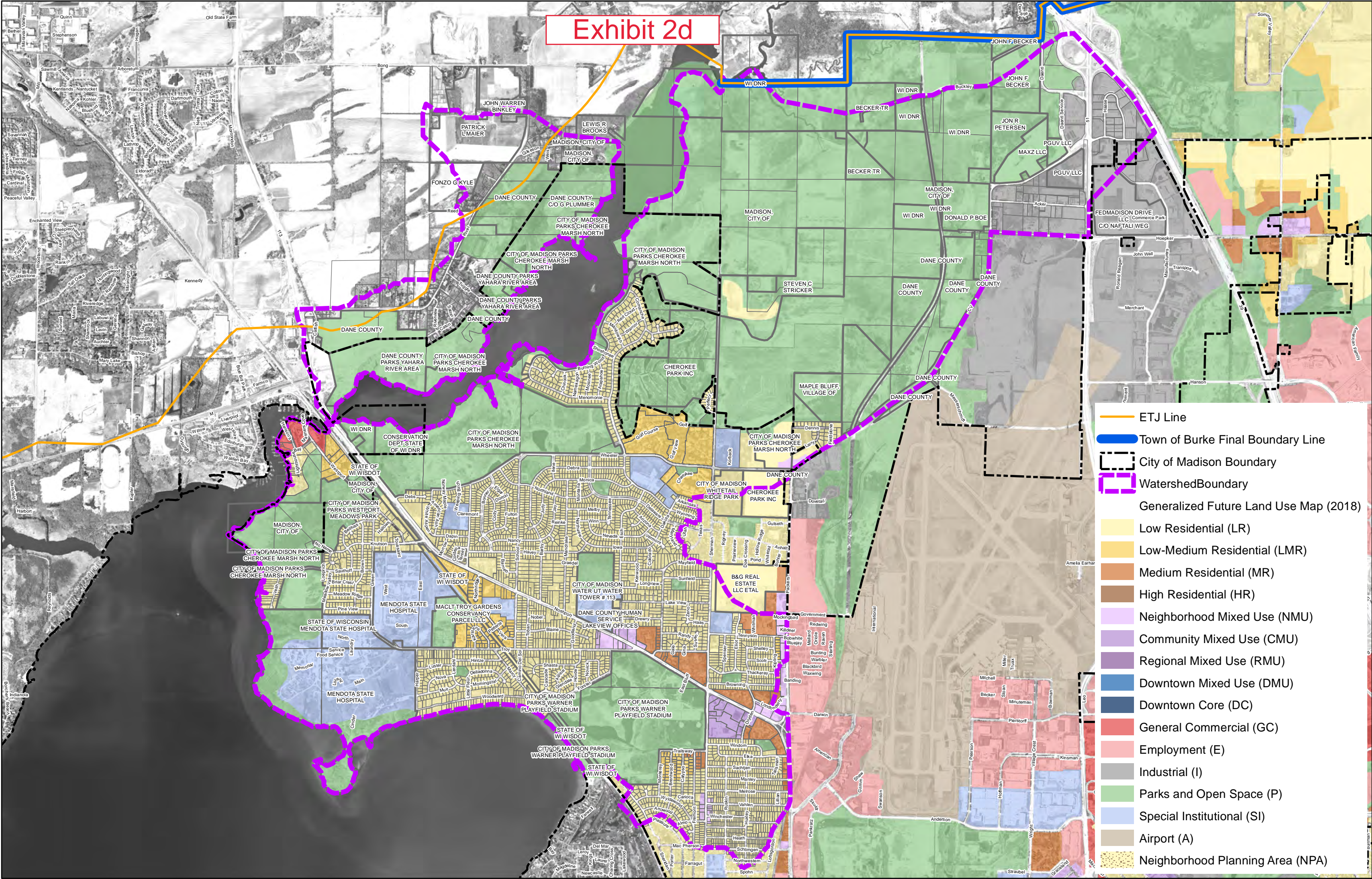
-  Greenway
-  Pond
-  Storm Pipe
-  Municipal Limits
-  Parks
-  Locations of Interest
- TIP**
-  2023
-  2026
-  Watershed Boundary

Exhibit 2c Locations of Interest Warner Park Watershed Study



Date: 10/24/2022

Exhibit 2d
























-  ETJ Line
-  Town of Burke Final Boundary Line
-  City of Madison Boundary
-  Watershed Boundary
-  Generalized Future Land Use Map (2018)
-  Low Residential (LR)
-  Low-Medium Residential (LMR)
-  Medium Residential (MR)
-  High Residential (HR)
-  Neighborhood Mixed Use (NMU)
-  Community Mixed Use (CMU)
-  Regional Mixed Use (RMU)
-  Downtown Mixed Use (DMU)
-  Downtown Core (DC)
-  General Commercial (GC)
-  Employment (E)
-  Industrial (I)
-  Parks and Open Space (P)
-  Special Institutional (SI)
-  Airport (A)
-  Neighborhood Planning Area (NPA)

Exhibit 3: Data Provided by City

City of Madison GIS and Related Data for Watershed Modeling

The following data are provided to the consultants for use in responding to the RFPs and developing watershed models under contract with the City. The consultant shall not use these data for any other purpose or share this data with anyone else.

The available data is not a complete dataset. The City is in process of updating and consolidating data. This document describes what is currently available. Updated data will be supplied to the consultant as it becomes available during the studies.

Data are stored in two locations.

1. Some can be downloaded from the City's Open Data (<https://cityofmadison.maps.arcgis.com/home/index.html>) portal via links shown with each dataset.
2. Others are only available via visiting the City's File Sharing site.
Link: <https://sftp.cityofmadison.com:443/ui/#/syncplify/share?N=wCe5m8quHXtczRbY4y3F8Q>

Where applicable, data for other municipalities within the watersheds will need to be obtained from that municipality.

City Ownership and Mapping Data

- **OfficialMap.gdb** (*FTP/Watershed Studies Folder in OfficialMap.gdb*) is hosted as a rest service here: https://maps.cityofmadison.com/arcgis/rest/services/Public/OPEN_DATA_ENGR2/MapServer
- **TaxParcels Feature Class** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*) is hosted as a rest service here: https://maps.cityofmadison.com/arcgis/rest/services/Public/Property_Lookup/MapServer
- **City Owned_Draft.lyr** (*FTP/Watershed Studies Folder*)
 - Source File TaxParcels, definition query on property owned by various City of Madison agencies
- **Park_Land_polygons Feature Class** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
- **Draft_MOU Feature Class** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Draft Memorandum of Understanding regarding public property that has multiple functionality as a combination of either right of way, park use or stormwater use.

Pond and Greenway Data

- **Pond_Contours Feature Class** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Stage/storage information for all City ponds included in the TMDL permit. New ponds are based on as-built information, while older ponds are based on construction plans, pond survey information, or rules of thumb.
- **Pond_Greenway Feature Class** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Ponds and greenways polygons in layer as Type This includes official pond name, year built, node number, etc. The node number is how the City tracks pond data, therefore specific data is stored in folders titled per pond node. Parcel_owner of MAD-C generally identifies that this pond is under the jurisdiction of the City of Madison Engineering Division or Parks Division. Maintenance responsibilities and deed restrictions are generally noted, but require further investigation.
- **Pond As-Built Information**
 - A list of pond data is organized per watershed and classified by pond node. There may be data, including construction drawings or as-built information for each pond. The data can be retrieved from the City upon request.

Watershed/Outfall Data

- **Subcatchments** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Subcatchments is the City's most up-to-date subcatchment basin information. This information can be dissolved to treatment basins, HH model watershed boundaries, and watershed boundaries. . These recently were merged to drain to the first treatment device.
 - The City anticipates the Consultant will reference subcatchments and will delineate new subcatchments matching existing updated subcatchments from previous watershed studies for the model.
- **ProjectBoundary** (*FTP/Watershed Studies Folder in FloodStudies_2021.gdb*)
 - Boundaries for the watershed studies. Will need to be refined during watershed study as part of subcatchment delineation.
- Historic watershed studies/watershed information
 - Historic watershed study information, primarily water quality focused, organized per watershed

Storm Pipe and Structure Data

- **Storm_Pipes** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb and downloadable as a shapefile on [City of Madison Open Data website](#)*)
 - Storm pipes are mapped by the City of Madison's mapping division. The invert data is based on as-built information. Due to an updated process in 2005, the City has the most confidence in data from 2005 forward.
 - The City Surveyors started using GPS (Global Positioning System- Survey Grade) to set Control for the 2005 construction Season. This system provided uniform elevations all over the City of Madison. Prior to 2005 Hydrants were used as benchmark elevations for projects; hydrant elevations came from a variety of sources and were inconsistent over the City.
 - The City is modifying its data per the schema that is downloadable from the Open Data portal. Based on available data, consultants may need to infer elevations or request survey for important locations within the modeled conveyance system.
- **Storm Sewer Structures** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb and downloadable as a shapefile on [City of Madison Open Data website](#)*)
 - Storm structures are mapped by the City of Madison's mapping division. The invert data is based on as-built information. Due to an updated process in 2005, the City has the most confidence in data from 2005 forward.
 - The City Surveyors started using GPS (Global Positioning System- Survey Grade) to set Control for the 2005 construction Season. This system provided uniform elevations all over the City of Madison. Prior to 2005 Hydrants were used as benchmark elevations for projects; hydrant elevations came from a variety of sources and were inconsistent over the City.
- **Storm_Pipes_Private** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Data was mapped where private storm connects into the public storm sewer. This data is from parking lot construction plans from private development and does not always reflect what was built
- **Storm_Struct_Private** (*FTP/Watershed Studies Folder in FloodStudies_2023.gdb*)
 - Data was mapped from parking lot construction plans from private development and does not always reflect what was built

Impervious Data (*FTP/ Watershed Studies Folder in FloodStudies_2023.gdb*)

- This data was created in 2022 and represents the land cover and connectedness of impervious surfaces in the city based on 2020 aerial imagery

Aerial Photograph, DEM, Contours, LiDAR

- **2018 imagery** is hosted as an image server here:
https://gisimg.cityofmadison.com/arcgis/rest/services/ImageServices/2018_CITY_COLOR/ImageServer
- **2020 imagery** is hosted as an image server by Dane County here:
<https://dcimapapps.countyofdane.com/arcgisimg/rest/services>

Flooding Data (FTP/Watershed Studies Folder in Flood_Data.gdb)

Feature Class Name	Description
FEMA_Reported_Aug20_Public	Public flood damage locations reported to FEMA. Codes: <ul style="list-style-type: none"> ○ A-Debris Removal ○ B- Emergency Protective Measures ○ C-Roads and Bridges ○ D-Water Control Facilities ○ E-Buildings and Equipment ○ F-Utilities ○ G-Parks, Recreation, Other
FEMA_CityDamage_Aug20	Public infrastructure damaged in the flood with repair reimbursements submitted to FEMA. Some overlap with FEMA public reported points.
OtherCollected_FloodPts_Aug20	Locations of issues received (emails/calls) by City Engineering staff as a result of the August 20, 2018 flood event (some overlap with FEMA reported points).
Flood_Report_Pts_MMDDYYYY	Locations of issues received via the City's online flood reporting form; date attached to feature class is the date that the data was pulled from the flood report form.
Historic_FloodPts	Intersections, points, and areas that have been noted over the years as having some flood/drainage related issue; includes 911 calls from June 16, 2018 event; attribute data is variable
Operations_FloodPts	Locations generated from City of Madison Operations work orders and calls received requiring flood/drainage related maintenance issues over the years.
Priority_Inlets	City Engineering Operations priority inlets for maintenance.
BI_FloodPts_Aug20_Private	2-1-1 and Building Inspection collected private damage information from Aug 20 th storm damage. BI used this data to create preliminary damage estimates based on FEMA's flood damage calculator.
Street_Flooding	Layer generated manually by looking at historic data points to determine streets that have had flooding issues, plus institutional knowledge.
Business_FloodPts_Aug20	Businesses that had direct impact on their properties from the August 20, 2018 flooding

MODELING GUIDANCE

Version 2022_05_17 (DRAFT)

Round 4, 5, and 6 Watershed Studies

The City recognizes that an important aspect of modeling is professional judgement; and it will be up to the Consultant to appropriately define parameters, variables, and methodology. However, it is in the City's best interest to have relative uniformity amongst City models. This guidance document was developed to provide uniformity. Where inputs and assumptions differ from those outlined in this document, the Consultant will be expected to justify and document the differences and reasons for the differences.

The purpose of the watershed modeling is to construct planning-level models of the watershed to identify locations with significant conveyance system deficiencies. The identified solutions will be conceptual solutions, not design-level solutions.

City of Madison Flooding Level of Service Goals

1. 10-year design storm event:
 - a. No surcharging onto the street for up to the 10-year design storm; water shall be contained within the pipes and structures.
 - i. When using rain-on-grid hydrology, the goal is met if there is less than 0.25' of curb depth using the FHA method.
 - b. There are locations within the City where low points exist that pond water; these low points are excluded from this goal and will be addressed as streets are redesigned.
 - c. For locations limited by known inlet capacity, allow no more than 0.5 feet of water above storm sewer inlet rim.
2. 25-year design storm event:
 - a. Street to remain passable for emergency vehicles during 25-year design storm.
 - i. This is defined as no more than 0.5 feet of water on the centerline of the street for a length of 100-feet using the depth raster.
 - ii. To define the centerline of street, the County's centerline data (Dane County SDE – GISdw.DCL.RoadCenterline) should be used.
 - b. Note that the Watershed Study modeling approach will not explicitly account for cross flow conditions where more gutter flow on one side of the street can overtop the crown.
3. 100-year design storm event:
 - a. No home or business will be flooded during the 100-year design storm.
 - i. This is defined as no more than 0.5 feet of water at the 5-foot buffer around a structure.
 - b. Enclosed depressions to be served to the 100-year design storm (which can include safe overland flow within street, easements, greenways or other public lands).
 - i. For purposes of the watershed studies, enclosed depressions are defined as depressions in public right-of-way where stormwater needs to reach private property to overflow from the depression.
 - ii. Solutions will also be developed for enclosed depressions where the stormwater collected is solely from private property. In these cases, the solutions may be implemented thru public-private cooperation or solely by the private property owners.
 - c. Greenway crossings at streets to be served to the 100-year design storm.
4. 500-year design storm event:
 - a. Safely convey stormwater; i.e. limited impact on private property.
 - b. Limited impact is defined as no more than 0.5 feet of water at the 5-foot buffer around a structure.
5. Provide flooding solutions that do not negatively impact downstream properties.

Due to the inherent variability and complexity of stormwater conveyance systems, it is understood it may not be practical to meet the above level of service goals in all areas of the City.

Guidance for Solutions

1. For the purpose of the watershed studies “deficiencies” in the system shall be defined as existing infrastructure, drainage capacity, or system limitations that fail to meet the goals stated in 1-5 above.
2. Watershed deficiencies will be reviewed, and solutions will be provided up to, the 100-yr design storm.
3. In areas where flooding occurs in events exceeding the 100-year storm, those areas will not be prioritized for engineering solutions, but will be identified in existing conditions model for 500-year event storms.
4. Proposed solutions will be identified for only the publicly owned drainage system.
5. Drainage issues that are private (water from the public infrastructure such as streets, greenways, ponds and/or easements is not the cause of the drainage issue) will not require modeling solutions but should be noted, where possible, in the existing conditions analysis so staff may work with property owners if necessary. (See Also Hydraulics section of Modeling Guidance for discussion on private system existing conditions modeling.)

Emergency Vehicle Allowable Flood Depths (email from Fleet on 5/12/2020)

1. SUVs – up to 6-inches
2. Large Trucks – up to 3-feet
3. Ambulances, vans, and pick-up trucks – between 6-inches and 3-feet

MODELING PARAMETERS:

Initial model parameters are the following items:

1. Include storm sewers and culvert segments for the trunk line drainage system and major conveyance to that system. Additional conveyance components may be included if felt necessary by the modeler to understand the conveyance system drainage.
2. Inlet capacity will not be included in the model. It is assumed that sufficient inlets are present accommodate stormwater. In areas where there is known chronic flooding that has been reported to Engineering, additional detail may be requested.
3. Incorporate significant existing storm water management facilities (public and private) into the model.
4. Subdivide provided outfall basins into smaller watersheds as needed in order to properly execute the model.
5. Coordinate System and Vertical Datum
 - a. Horizontal Coordinate System: NAD 1983 HARN WISCRS Dane County Feet (WKID 103412).
 - b. Vertical Datum: NAVD88 (pre 2007 adjustment) ft (City of Madison Datum + 845.6)
 - c. Various data sources have different horizontal and vertical datums, check datum for each data source prior to use.
 - d. When setting up PC-SWMM Models, the default coordinate system that looks like it matches the City's preferred coordinate system is not the same. PC-SWMM's default coordinate system is State Plane and the exact coordinate system the City uses is not in PC-SWMM's database. To create a PC-SWMM model with the same coordinate system:
 - i. Open up a new, blank model.
 - ii. Add one of the City's shapefiles with the preferred coordinate system.
 - iii. Then, in PC-SWMM, select that coordinate system as the default.
6. Monitoring Data Time Zone: Different sources of monitoring data use different time zones. Also, some adjust for daylight savings time whereas others do not. When using the monitoring data, check both the time zone and if the data is adjusted for daylight savings time.
7. Monitoring Data Review: Familiarize yourself with the location of the monitoring gage at each site. Also, visit the monitoring site following a rain event to review the site conditions for things that would

impact the measurements. For example, is there debris clogging anything?

8. Naming convention

- a. Names are limited to 20 characters where possible. Both PC-SWMM and XP-SWMM can take lengthy names but both indicate shorter is better for avoiding truncating names.
- b. Subcatchments:
 - i. Begin with Subcatchments naming convention provided by the City in the Outfall Basin feature class.
 1. Add a three-digit designator to the end of the name, beginning with 000
 2. As subcatchments are subdivided, increase the added designator by 1.
 3. Example: ME04-A-0014-H (*Provided by City*) → ME04-A-0014-H-MAD-C-000 (*For the original basin*) → ME04-A-0014-H-001 (*For first subdivision*)
 - ii. Final outfall basin feature class file, including supporting files used to compute runoff timing and volume parameters shall be part of the deliverables provided to the City of Madison.
 - iii. Note first downstream stormwater control practice as attribute in subcatchment feature class.
- c. Structures and Junctions:
 - i. Node (Junction/Storage/Outfall) names for existing structures shall retain the asset identification provided by the City.
 - ii. Proposed Structure names are to be determined by the Consultant but shall be given a "logical" name that reflects general location, function, or other.
 - iii. For junctions that need to be added that are storm sewer tees as constructed, use the downstream manhole / structure with "_01" added in increasing order moving from downstream to upstream. For example, the first junction added for a tee upstream of MI3350-001 would be MI3350-001_01
- d. Pipes:
 - i. Conduit names for existing pipes shall retain the asset identification provided by the City, except that:
 1. The first two letters (i.e AE, IN, etc) can be removed
 2. Leads with an asset ID that takes up all 20 characters can be shortened to the corresponding assigned ID. For example, IN3350-032_AS3350-007_3350-001 can be changed to 3350-032_3350-001_001
 - ii. Proposed Pipe names are to be determined by the Consultant but shall be named in a manner similar to the City pipe naming convention, which includes the upstream and downstream structure names.
- e. Channel/Street Flow Segments:
 - i. Conduit names for drainage-ways shall be named in a manner that identifies the greenway segment it represents by Greenway Node Number and the distance from the upstream end. Example: GR7541-062_125 would represent a channel segment that begins 125 feet into the North Door Creek Greenway – Sprecher Road Section.
 - ii. Conduit names for streets shall be named with "Rd_"[US_Node_Name]_[DS_Node_Name] and remove the first two letters in the node name similar to how pipes are named.
- f. Natural Channels:
 - i. Natural channel transects shall be named with the same ID as the conduit name.
 - ii. Street models as natural channels shall be named in a manner that is easily identifiable for the street or street type it represents.
 - iii. A shapefile shall be created documenting where natural channel transects are cut.
- g. Other SWMM Features (Weirs, orifices, etc)
 - i. Other SWMM features shall have readily identifiable names corresponding to the type of feature they are trying to model. For example, an orifice for a detention pond should have an ID that is "<Detention Pond ID>_ORIF_01", keeping within a 20 character limit.
- h. Ponds
 - i. Use the pond name identifier from GT-Viewer combined with a common name.

For example, the ponds at Odana Hills Golf Course would be "PD3461-001_OdanaHills"

- ii. Use abbreviation of name if unofficial full name creates a model name longer than 20 characters.
- i. Non-City owned infrastructure
 - i. Consultant may choose name if consistent naming convention is not created by entity that owns infrastructure
 - ii. If Consultant chooses name, all infrastructure owned by another entity shall start with the same few characters. For example, DOT infrastructure could all start with "DOT-" or Fitchburg owned infrastructure could start with "Fit-"

9. Data Notation

The GIS data describing the conveyance system is not complete. In some instances the modeler will be able to make assumptions based on available data. In other locations, the data will require survey. The City is tracking the accuracy of the data with the ultimate goal of having a complete record.

When the modeling is creating the GIS data describing the structures and pipes, they shall create a new attribute in their GIS data and categorize the data as the following:

a. Structures:

- Source_IE
- Source_Rim

b. Pipes:

- Source_ToIE
- Source_FromIE

c. Private:

- Notes

d. Source –enter Number and text in bold in attribute

0. **Converted:** legacy EI's taken from the structure, all EI's received the structures outgoing EI by default when converted in 2020. *This does not mean this data is ***better*** than the survey data, if it looks suspect, you should investigate and try to clarify the source (especially for pre-2005 data, or structures/pipes within ponds/gwys)*

1. **Survey:** Survey data (current)

2. **AsBuilt >2004:** As-Builts (2005-present) since City used GPS-Survey Grade to set control improving consistency citywide

3. **AsBuilt pre-2005:** As-Builts (pre-2005)

4. **ConstPlan:** Construction plans

5. **GTV:** GTV in-line text, no plans to support

6. **Interpolate:** interpolated (saddled structure had inverts on either side and interpolated—should eventually be surveyed)

7. **Inferred:** best guess, (can't get survey now or is pulled from LiDAR, but should eventually be surveyed)

8. **No data:** Needs survey (searched and unable to find—should eventually be surveyed, but a higher priority)

e. When creating a model, Engineers will verify/update:

i. Structures:

- Source_IE
- Source_Rim
- Project_No

ii. Pipes:

- Source_ToIE
- Source_FromIE
- Project_No

iii. Private:

- Notes
 - PLP_address
 - GTV

- Survey (survey will need to confirm all fields)

10. Rainfall

a. MSE4 24-hour Distribution and NOAA Atlas 14 Depths

Recurrence Interval (years)	Rainfall Depth (inches)
1	2.49
2	2.84
5	3.45
10	4.09
25	5.02
50	5.74
100	6.66
200	7.53
500	8.94

- b. Long-Duration Storm – Two 24-hour, 100-year MSE4 storm events with the time between peak rainfalls shorted from 24 hours to 12 hours.

11. Hydrology (SWMM Method with Horton Infiltration) (References: A, B, C, J, L)

- Parameters listed are default parameters and may need to be adjusted based on calibration data.
- a. Subcatchment Detail for Street Drainage
 - i. Contributing area to the existing storm sewer system that is to be modeled (Determined on a watershed by watershed basis)
- b. SWMM Routing Parameters (if calibration is not available to adjust parameters)
 - i. Percent Impervious:
 - 1. In areas where impervious areas are delineated:
 - a. Use impervious/Pervious areas from City provided feature class.
 - 2. In areas where Impervious areas are not delineated:
 - a. Use City provided WinSLAMM land use file and the “HowTo_CalculateCN” Document.
 - b. Areas not delineated in City Provided WinSLAMM land use file shall defer to Dane County Land Use Map.
 - c. Match WinSLAMM land uses with Dane County Land Use.
 - 3. Note: The City had a set of surface cover data built off the 2018 ortho image. The deliverables from Task 4 are the easiest to utilize in models. The impervious type is defined in a domain and to use it you may need to [“Export a table to include domain descriptions and coded values”](#)
 - ii. DCIA
 - 1. In areas where impervious areas are delineated:
 - a. Use impervious/Pervious areas from City provided feature class.
 - 2. In areas where Impervious areas are not delineated:
 - a. Reference WinSLAMM Standard Land Use DCIA Spreadsheet
 - iii. Width – Estimated based on subcatchment shape. Estimation methodology shall be documented.
A single width shall be calculated for the entire subcatchment and used for all three sub-areas.
It is expected Width is one of the first calibration parameters for peak flow.
 - iv. Slope – Computed manually or estimated based on LiDAR. Computation or estimation methodology shall be documented.
 - v. In XP-SWMM, each subcatchment is to be split into area of (1) DCIA, (2) non-DCIA, and (3) pervious area. Within the model, the non-DCIA shall be routed to the pervious area.

- vi. In PC-SWMM, indicate the percent being routed to pervious in the subcatchment attribute.
- c. Horton Infiltration
 - i. For typical urban pervious area (Based on range of values for different soil types, moisture conditions, and vegetation conditions found in Reference A):

HSG Group ^a	Max Infil. Rate (in/hr)	Min Infil. Rate (in/hr)	Decay Rate (1/hr)	Dry Days ^b	Maximum Infiltration Volume (in)
A	4.0	1.0	4.0	3.1	
B	2.0	0.5	4.0	4.4	
C	1.0	0.2	4.0	7.0	
D	0.5	0.1	4.0	9.9	
Water	0	0	0	0	

^aFor HSG listed as A/D, B/D, C/D, the default approach will be to assume the HSG associated with the lower infiltration rate (HSG D).

^bUse equation 4-12, pg 99, SWMM Reference Manual Volume 1 – Hydrology (Revised), January 2016

- ii. Impervious Manning's n – 0.016
- iii. Pervious Manning's n – 0.20
- iv. Depression Storage for Impervious – 0.05 inches
- v. Depression Storage for Pervious – 0.15 inches
- vi. Zero Depression Storage – 25 percent
- vii. Factors for adjusting (L)
 - 1. Forest – Multiply max and min infiltration rates by 2.
 - 2. Farmland (row crops) – Multiply max and min infiltration rates by 1.2.
 - 3. Farmland (close crops) - Multiply max and min infiltration rates by 1.8.
 - 4. Other land uses – discuss with City staff
- viii. Area-weight the Horton Infiltration parameters for each subcatchment based on the area of each soil type within a subcatchment. Remove impervious area from area-weighting.
- ix. It is understood the NRCS/SCS updates the soil mapping at various times. The project teams will identify a date the soils data will be downloaded and that will be the data used for the duration of the project.
- d. Evaporation: Turn off evaporation from calibration and design storm event runs.

12. Hydrology (SCS CN Hydrology – ONLY USE WHERE DESIGNATED BY CITY) (References B, K)

- a. Runoff Curve number, Percent Impervious, Directly Connected impervious Area
 - i. In areas where impervious areas are delineated:
 - 1. Use impervious/Pervious areas from City provided shapefile.
 - 2. Impervious areas shall use a runoff curve number of 98.
 - 3. Urban pervious areas that are mowed and maintained can assume the area is Open Space in good condition listed in Table 4-9 of Reference B.
 - 4. All other pervious land uses shall match descriptions listed in Table 4-9 of Reference B.
 - 5. Create a composite subbasin runoff curve number that incorporates both impervious and pervious areas.
 - ii. In areas where Impervious areas are not delineated:
 - 1. Use City provided WinSLAMM land use file and the “HowTo_CalculateCN” Document.
 - 2. Areas not delineated in City Provided WinSLAMM land use file shall defer to Dane County Land Use Map.
 - 3. Match WinSLAMM land uses with Dane County Land Use and repeat item “i.” of this section.
 - 4. Impervious areas shall use a runoff curve number of 98.
 - 5. Urban pervious areas that are mowed and maintained can assume Open Space in good condition listed in Table 4-9 of Reference B.

6. All other pervious land uses shall match descriptions listed in Table 4-9 of Reference B.
7. Create a composite subbasin runoff curve number that incorporates both impervious and pervious areas.

b. Routing Parameters

- i. Width - In PC-SWMM only, Estimated based on subbasin shape. Estimation methodology shall be documented. It is expected that width is one of the first calibration parameters to be adjust for peak flow.
- ii. Slope - In PC-SWMM only, computed manually or estimated based on LiDAR. Computation or estimation methodology shall be documented.
- iii. Time of Concentration - In XP-SWMM only, calculate each watershed time of concentration based on equations listed in SCS Urban Hydrology for Small Watershed, 2nd Ed., (TR-55), June 1986 (Reference K). The max flow length for sheet flow is 75 feet in urban areas and 150 feet in agricultural/natural areas.
- iv. In XP-SWMM and PC-SWMM, the percent impervious shall be zero and the composite runoff curve number shall incorporate impervious and pervious areas.

13. 1D Hydraulics (References: A, B, D, E, F, G)

- Dynamic mode with constant / variable timestep sufficient to model system accurately.
 - Conduit lengthening shall not be used unless prior approval from City on reason.
 - Parameters are default parameters and may need to be adjusted based on calibration data.
 - This list is not intended to be exhaustive.
- a. System to be Modeled
 - i. Public
 1. Standard: Trunk line and major conveyance components to trunk line.
 2. Process for Exceptions: Provide justification for conveyance components not included.
 3. Use engineering judgement for inclusion of additional detail beyond this standard.
 - ii. Private
 1. Standard: Not included
 2. Process for requiring inclusion of private pipes:
 - a. Stormwater management detention facilities providing significant detention
 - b. When necessary to understand the functioning of the public system. For example, the West Towne Mall parking lot drainage system.
 - iii. Greenways and major surface drainages
 - iv. Significant stormwater detention facilities (public and private).
 1. Private systems may be simplified if serving a single site.
 2. Provide justification for detention facilities not included.
 - b. Loss Coefficients (see drawing at end of document)
 - i. Entry
 1. Culverts – Select Inlet Type based on the Help File or HEC-RAS Hydraulic Reference Manual
 2. Storm Sewer (internal at MHs) = 0.05
 3. Storm Drainage Structures (MH) at 45 degree bend = 0.25
 4. Storm Drainage Structures (MH) at 90 degree bend = 0.5
 5. For culverts and entrances to storm sewer from an open channel or pond, both the energy loss coefficient and the inlet control (culvert code) shall be used.
 - ii. Exit
 1. Culverts –
 - a. Exit closed conduit to open channel = 0.5
 - b. Exit closed conduit to lake or pond = 1.0
 2. Storm Sewer (internal at MHs) = 0.05

3. Storm Drainage Structures (MH) at 45 degree bend = 0.25
4. Storm Drainage Structures (MH) at 90 degree bend = 0.5
- c. Coefficient of Discharge
 - i. Weirs
 1. Sharp Crested – 3.0
 2. Roadway embankment – 2.6
 3. Flatter overflow – Use engineering judgment
 - ii. Orifices
 1. 0.6
- d. Manning's n
 - i. Pipes
 1. Concrete Pipe: 0.013
 2. Other n values shall be chosen within generally acceptable ranges.
 - ii. Channels
 1. Use Chow's Open Channel Hydraulics, Reference E
 - iii. Bank Flow, including developed urban areas
 1. Use Chow's Open Channel Hydraulics, Reference E
- e. Transect Placement and Modifiers
 - i. Splitting long open channels
 1. Changes in cross section
 2. Significant changes in slope and roughness
 3. Overflow points
 - ii. Segment Lengths
 - iii. Channel Geometry
 - iv. Provide shapefile where natural channel transects are selected along with XS Identifier
- f. Tailwater Conditions:
 - i. Lake Mendota: one foot over Summer Maximum – 851.10
 - ii. Lake Monona: TBD
 - iii. Lake Wingra (100-year WSE): 848.0
 - iv. Yahara River between Lakes Mendota and Monona: TBD
- g. Inlet Clogging Factors
 - i. Continuous Slopes
 1. Street slope < 1% - 25% Clogging
 2. Street slope >= 1% - No Clogging
 - ii. Sags – 50% Clogging

14. 2D Data (References: A, G, H, I)

- a. Surface Roughness – The average Manning's n may vary by land cover / land use. Referencing TR-55, the following roughness can be used for sheet flow conditions. Choose based on professional judgement and document in the report.
 - i. Impervious areas - 0.1
 - ii. Turf grass areas - 0.24
 - iii. Wooded – 0.4
 - iv. Prairie – 0.15
 - v. Other – reference TR-55
- b. Channel Roughness - Where the 2D surface experiences channel flow, rather than sheet flow, utilize the Manning's n values for open channels
- c. Impervious Area/Inactive Areas - The City had a set of surface cover data built off the 2018 ortho image. The deliverables from Task 4 are the easiest to utilize in models. The impervious type is defined in a domain and to use it you may need to ["Export a table to include domain descriptions and coded values"](#)
 - i. Average the roughness within the ROW based impervious and pervious area.
- d. Blocked Obstructions – enter roofs as Inactive Areas in XP-SWMM and Obstructions in PC-SWMM
 - i. Non-residential – use City impervious area data for roofs

- ii. Residential – use Dane County roof layer
- e. Grid cell/mesh size: Use size that balances model run time and sufficient 2D overland flow detail.
- f. Grid/mesh orientation: Where possible, align grid/mesh with major channel flow direction. If not practical, then use orientation that minimizes run time.

15. Rain-on-Grid Analysis (Do not use without discussion with City)

a. Hydrology

For a full study area Rain-on-Grid model, no nodes or pipes should be active within the Runoff Mode.

- i. Rainfall - All runoff is generated using Rainfall / Flow Area layers. Individual layers shall be created for each rainfall event, with only the applicable one active during each scenario. Rainfall distributions stated above in Section 9 shall be used.
- ii. Landuse – Layers for the following land uses must be created: Buildings, Impervious, Turf Grass, Wooded, Prairie, Water and any other applicable layers. Land use layers for Turf Grass, Wooded, Prairie, and any other pervious land coverage, shall be additionally divided up into Hydrologic Soil Groups A, B, C, and D. These layers should cover the entire study area. Under the Land use data tab, inputs for Manning’s Roughness, Rainfall Abstraction, and Infiltration must be completed.

1. Manning’s Roughness:

- a. Buildings – Variable roughness must be used. A Depth-Roughness relationship as follows is appropriate:

Depth (ft)	Roughness
0.00	0.01
0.30	0.01
0.31	0.1
10.0	0.3

- b. Impervious – A constant roughness of 0.016
- c. Turf Grass, Prairie, Wooded, and other Pervious – Variable roughness must be used to account for sheet flow at low flow depths. The consultant shall use roughness coefficients stated above in Sections 10.c and 12.a to develop these roughness curves.
- d. Water – A constant roughness of 0.01.

2. Rainfall Abstraction:

- a. Buildings and Impervious – Initial Abstraction of 0.04 inches (XP-SWMM Default). Continuing loss should remain 0.0.
- b. Pervious - This shall remain unchecked, as Initial and Continuing losses will be accounted for via the Horton Infiltration parameters.

3. Infiltration:

- a. Buildings and Impervious – This shall remain unchecked
- b. Pervious – Horton Infiltration as described above in Section 10.c shall be created for each pervious land use layer.

b. 2D Model Settings

- i. Grid extent shall cover the entire study area.
- ii. Default area type shall be set to Active Area. There should not be any inactive areas within the model.
- iii. Default land use should be set to one of the pervious layers (suggested to use layer with largest total area). However, this should not have any impact on the modeling if there is full coverage of land use layers.
- iv. Head boundaries shall be set anywhere where surface flow is able to leave the study area.

- c. 1D Model Network
 - i. The 1D storm sewer network shall be extensive enough to include enough inlets throughout the watershed so that surface water can adequately pass from the 2D surface into the 1D model. Multiple inlets at the same location may be combined to a single node. Inlets either side of the street shall remain separate nodes.
 - ii. Each inlet node must have Link Spill Crest to 2D checked. Each culvert inlet/outlet must have Link Invert to 2D checked. If calibration shows not enough flow is entering each inlet node, Spill Crest elevations may be lowered below the 2D cell elevation (0.5 ft is an acceptable initial lowering value)
- d. 1D/2D Interface Lines at Intersections
 - i. In steeper watersheds, the water on the grid may not enter the pipe due to the limitations of the xp2d grid module. Pipes should be reviewed after a simulation for this occurrence. Where this occurs, add 1D/2D interface lines to connect the flow at appropriate intersections to the 1D node.

16. Suggested Proposed Solutions Organization

- a. The Proposed Solutions simulations should be set up in the following way (unless discussed with City staff first). The purpose is to have a model with just the proposed storm sewer improvements, just the regional improvements, and then both.
 - i. Add the proposed storm sewer to the Existing Conditions Model as a Scenario.
 - ii. Once complete, save the model file with a new name. Add the regional solutions in the Base Scenario, keeping the proposed storm sewer as a scenario.

17. Non-Modeling Data

- a. When utilizing XP-SWMM, provide attributed describing the source of data in the representative GIS feature classes
- b. When utilizing PC-SWMM, also add attributes to the entities describing their data sources.

18. Solutions

- a. Analysis – what are the underlying causes of flooding in:
 - i. Areas reported in the “Flood Download” from City staff
 - ii. Other flooded areas in the modeling not identified in the “Flood Download”
 - 1. If more than 10 total areas, work with City staff to prioritize locations to evaluate
 - iii. City to identify suggested solutions and provide to Consultant for consideration
 - iv. Consultant to identify solutions independently and take lead on overall solutions for watershed
- b. Prioritize Solutions
 - i. Property Damage
 - ii. Major arterials where emergency vehicles cannot get through
 - iii. More criteria - TBD
- c. Displaying solutions/Order of solutions
 - i. Show each solution independently and then combined
 - ii. Order
 - 1. Property/pipe owned by Stormwater Utility
 - 2. Pipe size needed to solve remainder of issues
 - 3. Other public properties
 - a. Janet will provide areas where there are non-starters in Parks
 - 4. Private properties
 - iii. Show structures removed from the 100-yr event
 - 1. Intersect the flood raster with the building outlines
 - 2. Buffer buildings by 5-feet to account for inaccuracies of building footprint layer
 - 3. Any building outline that intersects the buildings is considered “flooded” if depth of intersection is 6 inches or greater.
- d. In SWU-owned land all proposed grading must have the following conditions for

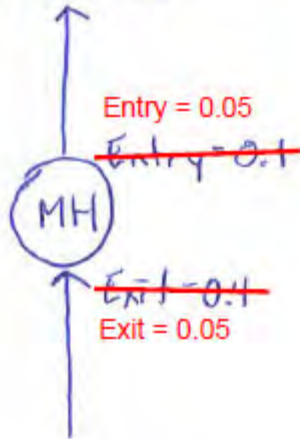
maintenance access:

- i. be offset from the property line on 1 side by 15 feet (parallel to channel flow, from Pond access to pond outlet)
 1. Shall be extended to reach all priority inlets or sanitary access structures within greenway
 - ii. All proposed berms must be 10 feet wide @ top of berm
 - iii. Slopes no steeper than 4:1
 - e. Overlay TIP map with inundation mapping to understand where immediate future project opportunities are
 - f. Freeboard – City does not have a minimum freeboard requirement
 - g. Properties adjacent to greenway and new greenway crossings – Current ordinance states property low building opening must be 4' above invert of downstream greenway street structure crossing. Therefore, may need to make structures wider, instead of deeper, to not flood upstream properties
19. Water that overflows Watershed Study Boundaries
- a. There may be locations along a watershed study boundary where water overflows that boundary and enters an adjacent watershed. When this occurs
 - i. 2D outflow boundaries should be drawn in the locations to allow the water to leave the model as it would normally.
 - ii. A 2D flow recording line should be added in this location, just upstream of the 2D outflow boundary.
 - iii. The model should be run for all design storm events.
 1. If flow is found to be significant, hydrographs should be exported from the model and provided to the City Project Manager so they can be inserted into the adjacent watershed study model.
 2. If flow is not found to be significant, the flow can be ignored.
 - iv. The watershed report should include a section showing the locations of the overflow. Text and tables in the report should briefly describe the magnitude of the overflow and the duration.

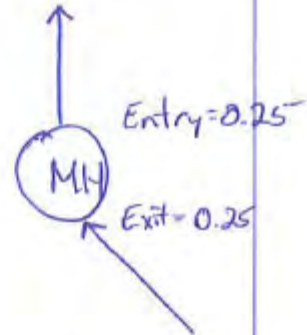
REFERENCES

- A. Model Help Files and User Forums
- B. Storm Water Management Model version 5.1 User's Manual. (Available at: <https://www.epa.gov/water-research/storm-water-management-model-swmm-version-51-users-manual>)
- C. SWMM reference manual volume I – hydrology (Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NYRA.txt>)
- D. SWMM reference manual volume volume II – hydraulics (Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100S9AS.PDF?Dockey=P100S9AS.PDF>)
- E. Chow, Open Channel Hydraulics, 1959
- F. HEC-RAS Hydraulic Reference Manual. (Available at: <https://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS%205.0%20Reference%20Manual.pdf>)
- G. ASCE Two-Dimensional Modeling Using HEC-RAS, Lecture 8 – Troubleshooting and Reviewing, Page 31; 2017.
- H. Australian Rainfall & Runoff Revision Projects, Project 15: Two Dimensional Modeling in Urban and Rural Floodplains, November 2012.
- I. FLO-2D Reference Manual, FLO-2D Software, 2012.
- J. ASCE Manual of Engineering Practice No 28.
- K. SCS Urban Hydrology for Small Watershed, 2nd Ed., (TR-55), June 1986
- L. Found during calibration in the Pheasant Branch Watershed. Area underlain with Prairie du Chien geology. Areas with other geology will need to select appropriate multipliers.

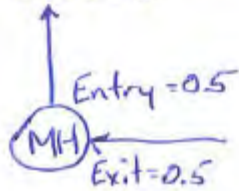
Straight-Through
Manhole



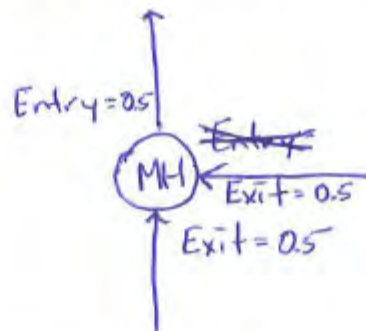
45° Bend
Manhole



90° Bend
Manhole



TEE Manhole



TEE (No Manhole)

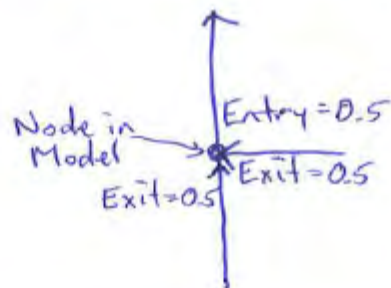
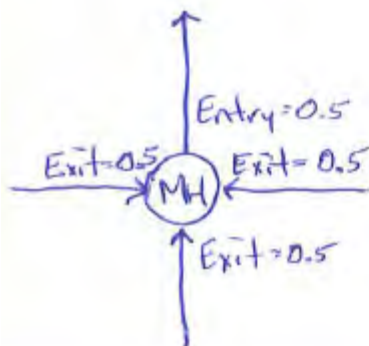


Exhibit 5

General Notes

- On Front Cover: Note “The City makes no representation about the accuracy of these records and shall not be liable for any damages” (disclaimer may be modified by City)
- Where deviated from Model Guidance, include assumptions in items Model Development text
- Expand discussion specific to assumptions
- Use “resident” as opposed to “citizen” and “property owner” for commercial areas
- Volume control infrastructure – note “being analyzed separately” with no further information
- Water Quality components – only for purposes of data entry into WinSLAMM if solution gets some water quality benefit
- Prioritization Matrix – only note that it is being done by City to develop implementation order
- Hyperlink table of contents to sections in report

Report Content

1. Executive Summary (2 page maximum for Mayor’s office)
 - a. Quantify where we didn’t reach flood goals
 - i. U% of U sewers surcharge during 10-yr event
 - ii. W% of W inlets are under capacity
 - iii. X% and X greenway crossings of Y total greenway crossings
 - iv. Y% of Y arterial streets
 - v. Z% of Z structures flood
 - vi. Other applicable data
 - b. AE2S maps (see example)
 - i. Briefly explain how model is used to see if flood goals are met
 - c. Summary of proposed solutions and costs
 - d. Quantify where flood goals are after all solutions are implemented
 - i. U% of U sewers surcharge during 10-yr event
 - ii. W% of W inlets are under capacity
 - iii. X% and X greenway crossings of Y total greenway crossings
 - iv. Y% of Y arterial streets
 - v. Z% of Z structures flood
 - vi. Other applicable data
2. Introduction
 - a. Project Background and Purpose
 - b. Scope of Study
 - c. Historic Flooding in Watershed
 - i. Flood Reports
 - ii. Areas reported by City staff
 - d. Summary of Past Studies (if applicable)
 - i. Report Name, Date, Author, Location (if known)
3. Water Resources Inventory
 - a. Study Setting
 - b. Watershed
 - c. Topography



- d. Drainage Systems
 - i. Natural System
 - ii. Constructed System
- e. Runoff Conditions
 - i. Land Use
 - ii. Impervious Area
 - iii. Soil Types
 - iv. Wetlands
- 4. Guidance and Data Sources
 - a. Reference Model Guidance Document
 - b. List Data Sources
- 5. Model Development
 - a. Modeling Software
 - b. Rainfall Files
 - i. Design Rain Events
 - ii. Measured Rain Events
 - 1. Explain monitoring background and more clearly explain why/how events were chosen. (BC for example)
 - c. Hydrologic Model Development
 - i. **PCSWMM Models**
 - 1. The City of Madison has identified issues with PCSSWMM's 1983_HARN_WISCRS_Dane_County_Feet projection. Prior to beginning work, the consultant shall work with the City of Madison to determine the best projection for the model and corresponding GIS data
 - ii. SWMM Runoff Description (brief and why being used)
 - iii. Subwatershed Input Data (Summary, details in Appendix)
 - 1. Area
 - 2. Impervious Area (Directly Connected and Disconnected)
 - 3. Width
 - 4. Slope
 - 5. Soils
 - 6. Infiltration Parameters
 - 7. Antecedent Runoff Conditions
 - 8. Depressional Storage
 - 9. Internally Drained Areas
 - 10. Runoff routing – to surface node, directly to storm sewer, etc
 - d. 1D Hydraulic Model Development
 - i. Hydraulic conveyance system analysis
 - 1. Open Channel
 - 2. Closed Conduit – Storm sewers and culverts
 - ii. Inlet capacity analysis
 - 1. Clearly explain process, assumptions, and how associated figure was developed.
 - 2. Where inlet capacity not done (Round 2 plus studies), state that and why – limitations of software in 2D plus effort to do



accurately cause analysis to be unreasonable. And, that during calibration/verification process, individual areas where flooding occurs, but modeling is not showing, were revised to show inlet restrictions in those individual areas. Note: a proposed solution of additional inlets should then be added to the Proposed Conditions solutions in these areas.

- iii. Detention pond analysis
- iv. Open Water/Backwater Effects
- e. 2D Hydraulic Model Development
 - i. Description of areas modeled in 2D (if entire watershed is not modeled in 2D)
 - ii. Topographic Data
 - iii. 2D Grid
 - iv. 2D Land Use and Roughness Values
 - v. Inactive Areas
 - vi. 1D/2D Interface
 - vii. 2D Boundary Conditions
- f. Special Conditions (example – Spring Harbor discharge to McKenna/Greentree; Other municipalities that are part of the watershed, etc)
- g. Existing Conditions Non-Calibrated Model Results
- 6. Model Calibration
 - a. Baseflow Conditions
 - b. Recorded Rainfall and Flow Data
 - c. Selected Runoff Events
 - i. Graphs at monitoring locations showing pre-calibrated and post-calibrated hydrographs (stage, flow, etc) for each calibration event
 - ii. Add approximate recurrence interval for each of events in table as % chance, and describe approach you used to determine it
 - d. Calibration Results
 - i. Repeat metrics from scope & if you didn't meet them explain why. Note where you did meet them. We want this to be very thorough.
- 7. Results Evaluation
 - a. Go into detail of where we are meeting flood goals and where we aren't and how the stats from the executive summary were created
 - i. process & assumptions in creating maps and statistics
 - b. Add technical description of process used to determine which structures were flooded/which roads did not meet goals
 - i. include details on computer models and LiDAR data – accuracy, calculations/process used, etc
 - ii. Note – not absolute – only valuable as a comparison from model to model
 - c. Add all limitations (including over-predicting)
 - i. Discuss recommendations to address limitations in designed solutions (where model is over/under predicting—where flow goes super critical)
 - d. Review areas reported by City staff in watershed and say whether or not model shows this & if it doesn't, provide an explanation.
 - e. Reference existing conditions mapping



8. Public Engagement
 - a. Public Information Meetings
 - b. Focus Groups
9. Recommended Solutions Development
 - a. Overall process used:
 - i. Consultant and City Data Review
 1. Description of land use types/ownership types where solutions cannot be implemented - railroads, utility corridors, cemeteries, historic places, etc that would preclude potential solutions from being implemented
 - ii. Consultant and City Brainstorming
 - iii. Consultant Modeling/calculations
 - iv. Meetings with City Engineering staff to discuss ideas/modeling/calculations
 - v. Convergence of solution to share with City Agencies
 - vi. City Agency meetings (refer to appendix with notes)
 - vii. Finalization of solutions following meetings with City Agencies
 - viii. Mention of Peer Review #3
 - ix. Draft reports going to all City Agencies to add their solution specific comments (Consultants will get comments to incorporate into Final Report)
 - b. Brief description of all solutions reviewed
 - i. Solutions reviewed but not ultimately included and reasons why
 - ii. Solutions reviewed and selected, including iterations done
10. Recommended Alternative
 - a. Include following paragraph at the beginning of this section somewhere that fits with the flow of the text:

” It should be noted that the improvements documented in this report are not meant to be full design-level efforts; they are conceptual solutions that help the City’s Engineering Division understand the magnitude of solution needed in a given area to meet the targets. As projects are looked at further, and if they move to the point they are contemplated for programming, then projects will then go into a more detailed design phase. This project phase collects detailed data needed for design and looks at refined design, permitting, and environmental issues associated with the particular project.”
 - b. Detailed description of solutions including figures, tables, text
 - c. Include information detailed in **Proposed Solutions** Document at the end of this Document
 - d. How proposed alternative reducing flooding for
 - i. Flood Reporting Locations
 - ii. Areas reported by City staff
 - iii. Focus Groups
 - e. Water quality information (all data listed below to be provided for EACH RECOMMENDED SOLUTION)
 - i. Will solution have a WQ impact (Y/N)?
 1. All further information to be provided only if answer to above is “Y”
 - ii. Solution name
 - iii. Solution type (wet pond, infiltration, etc)



- iv. Solution description (new SCM, retrofit, replacement of existing SCM, etc)
 - v. Contributing drainage area (to be provided as a polygon shapefile/GIS feature class)
 - vi. For wet/dry pond solution
 - 1. Stage-storage relationship (from bottom elevation to top containment elevation) (provided in ft AMSL)
 - 2. Permanent pool elevation (ft AMSL)
 - 3. Outlet description for ALL outlets
 - a. Outlet type (culvert, orifice, pump, weir)
 - b. Outlet size/dimensions
 - c. Outlet elevation (ft AMSL)
 - vii. For infiltration solution
 - 1. All information required for wet/dry ponds
 - 2. Infiltration information
 - a. Native soil infiltration rate
 - b. Proposed fill description (type, infiltration rate)
 - viii. For other solution type that consultant determines may have WQ impact
 - 1. Discuss with City PM to determine appropriate information to provide
11. Areas targets cannot be met
- a. Describe theoretical scenario used to determine additional capacity/volume needed and why that doesn't "fit"
 - i. Oversized pipes to free outfall
 - ii. 6 inches of water against a structure
 - iii. No figures, discussion only (do not want residents to confuse theoretical analysis for something that can be built)
 - b. Add note in final report document the goals were strived for but in some areas are only reachable thru property acquisition
12. Climate Resilience Analysis
- a. 0.2% Chance analysis
 - b. Infrastructure modifications
13. Cost estimate
- a. City provided unit costs, consultants adjusted based on project specifics and information from City
14. Recommended Implementation Order
- a. Technical
 - i. Regional solutions that have to go in for localized solutions to meet criteria – so if projects are related, note relationships
 - ii. Practices that would be nice to be constructed before others
 - iii. Which solutions work together to reduce flooding
 - iv. Other special notes for long-term project implementation purposes so Engineering doesn't forget
 - b. Citywide Priority – City will provide text
 - i. RESJI process/Prioritization Matrix
 - ii. Opportunities from other Agency Projects
 - iii. Each solution will have an individual public information process



15. Next Steps

- a. Internal – sharing with City design staff
- b. Internal – sharing with Council and City agencies
- c. External – sharing with stakeholders such as friends’ groups, developers, etc

Limitations of Study

Appendices

Appendix A: Modeling Guidance Document

Appendix B: Hydrology Input Parameters per Subbasin

Appendix C: Hydraulic Input Parameters (Links, Nodes)

Appendix D: Flooding depth and duration for up to 25 locations for each design storm

Appendix E: Inlet Capacity Analysis Documentation

Appendix F: Focus Group Summary (Not Resident-Specific) – Summary in words (see AE2S example)

A. PIM2 focus group feedback

Appendix G: Peer Review #1 Summary

Appendix H: Additional Calibration Information

Appendix I: Peer Review #2 Summary

Appendix J: Peer Review #3 Summary

Appendix K: Table of 25 locations and how solutions reduce flooding at those locations

List of Figures (Maximum Size 11x17)

1. Watershed and Subcatchments
2. Land Use (original land use mapping)
3. Impervious Area (connected and disconnected)
4. 2D Land Use (if different than that in Figure 2)
5. Surface Roughness Values
6. Model Network (can be put in Appendices)
7. Flooding Report Locations (can be moved to Figure 1)
8. Historic Flooding Locations (from City flood download)
9. Focus Group Locations-include maps with comments (see BC example)
10. Map of Locations for Analysis (25 locations)
11. Inundation Mapping
12. Inlet Capacity
13. Pipe Capacity for 10 year Map
14. Summary of flood goals maps (see AE2S example)
15. Watershed map showing areas where solutions cannot be implemented (cemeteries, historic landmarks, non-city lands that we can’t acquire, etc)
16. Locations of Solutions
17. Conceptual Layouts of each Solution
 - a. Grading – existing and proposed contours
 - b. Pipes/culverts – design flow, size at that design flow, head at design flow, inverts
 - c. Greenways – inverts, maximum design elevation for 100-yr, elevation at which structure flooding will occur



- d. Storage areas - footprint , volume required (peak storage), maximum design elevation for 100-yr (peak elevation), elevation at which structure flooding will occur, normal water elevation, outlet structure configuration
 - e. Potential land acquisition/easement areas
 - f. Major utility corridors – MMSD, ATC, MGE Transmission, Gas mains
 - g. Areas that preclude us from implementing solutions (cemeteries, historical land marks, railroad corridors, non-city lands that cannot be acquired, etc)
18. Inundation Mapping as a result of solutions

List of Tables

List of Abbreviations

On External Hard Drive:

- Photos taken during Focus Groups, Resident specific information (name, address, anecdotal flooding, etc)
- Model Input and Output Files
- GIS Files including parcels where structures are impacted
- xptin and terrain file used to create xptin
- ANSI E-size Inundation Maps (only on USB)

Proposed Solutions

Information to Document in Report regarding Solution, Permitability, and Constructability

V2020_02_25

Each proposed solution should have the following information documented in the Final Report

Proposed Solution Description

- Narrative describing the characteristics of the solution (footprint/alignment/cross section, inlet, outlet, relevant peak water surface elevations/flows, pump station, etc). This information should be the basic physical information someone would use to start designing the solution.
- Flood mitigation goals targeted with proposed solution
- Flood improvement from proposed solution (reduction in targeted peak water surface elevation, number of structures removed, number of miles of streets where storm sewer is not surcharged, etc)

Current land ownership for all aspects of project – Use layer provided by City

- Project site
- Relevant connections to/from project site
- Land ownership types
 - o City of Madison
 - Park
 - Street right-of-way
 - Stormwater Utility
 - o County
 - o Federal



- Madison Metropolitan School District
- Madison Metropolitan Sewerage District
- Private
- Railroad
- Other

Known utility conflicts

- Other storm sewer
- Sanitary sewer
- Water main
- Large gas mains/high-pressure gas mains
- High power electric distribution lines
- Other

Other known concerns

- Archeology Concerns (data to be provided by City)
- Cemeteries
- Conservation parks
- Considered a Bridge – needs a special DOT number if it's a bridge
- Distance to nearest well - if in wellhead protection zone
- FEMA flood zones
- High bedrock
- High groundwater
- Landmark Concerns and Historic properties
- Landfills
- Plans (City will get comments from Planning following drafting of report)
- Tree impacts
- Wellhead protection zone from Madison Water Utility
- Within 400' of well
- Wetland indicators
- Wetland delineations (if available)
- Other

Anticipated permits

- City of Madison Erosion Control
- Artificial Wetland Permit
- Wisconsin DNR Construction Site Disturbance (WRAPP)
- Wisconsin DNR/USACE Permit for Wetland Disturbance
- Wisconsin DNR/USACE Permit for Dredging a Navigable Waterway
- Wisconsin DNR/USACE Permit for Stream Realignment
- Wisconsin DNR/USACE Permit for Streambank Stabilization
- Wisconsin DNR Permit for Culvert
- Other



GIS Deliverables

All data shall be submitted in a format readable by ArcGIS 10.7.1.

Consultants shall submit final GIS data in geodatabase format for soils, subcatchments, flow paths, proposed solutions. Consultants may submit rasters as individual .tif files. Map packages are acceptable, as supplements original geodatabases and raster files.

All GIS data include metadata. This shall include a summary explaining the general purpose of the data. Credits indicating what company, department, persons who created data, use limitations or disclaimers.

Spatial Reference

XPSWMM Models

Digital data proved to the City of Madison shall be in North American Datum

1983_HARN_WISCRS_Dane_County_Feet

WKID: 8193 Authority: EPSG

Projection: Lambert_Conformal_Conic

False_Easting: 811000.0

False_Northing: 480943.886

Central_Meridian: 89.42222222222223

Standard_Parallel_1: 43.0695160375

Scale_Factor: 1.0000384786

Latitude_Of_Origin: 43.0695160375

Linear Unit: Foot_US (0.3048006096012192)

Geographic Coordinate System: GCS_North_American_1983_HARN

Angular Unit: Degree (0.0174532925199433)

Prime Meridian: Greenwich (0.0)

Datum: D_North_American_1983_HARN

Spheroid: GRS_1980

Semimajor Axis: 6378137.0

Semiminor Axis: 6356752.314140356

Inverse Flattening: 298.257222101

PCSWMM Models

The City of Madison has identified issues with PCSSWMM's 1983_HARN_WISCRS_Dane_County_Feet projection. Prior to beginning work, the consultant shall work with the City of Madison to determine the best projection for the model and corresponding GIS data deliverables.

Topology

All data developed and submitted to the City of Madison shall be in a compatible version of ERSI's file geodatabase. All data submitted must be topologically correct. Minimum topology rules are:

- Features will not be duplicated.



- Coincident boundaries will be corrected within a feature dataset (features that share boundaries with features in other feature classes in the dataset)
- Linear features will not overlap
- Linear features will maintain correct arc directionality for any data set with flow directions (draw from upstream to downstream)
- Polygons must be closed
- Polygons will have no overshoots or dangles
- Polygons will not overlap
- Polygons sharing edges will not have gaps
- Pipe and structure data will be snapped to point and line feature

Required Data

Inundation Rasters

The consultant shall submit individual rasters for both the existing conditions and the proposed conditions for the 1, 2, 5, 10, 25, 50, 100, 100 back to back, 200 and 500 year inundation rasters. Each raster shall be submitted in GeoTiff format with proper coordinate system.

For models developed with a single grid size, raster data shall be provided at the same cell size as the model grid. For models developed with variable cell sizes, the consultant shall coordinate with the city to determine the raster cell size format. All rasters shall be submitted excluding zero or null values.

For rasters that are developed with rain on grid watershed modeling, the consultant shall submit both the original raster and the “cleaned raster” that meets the following criteria:

- Removes inundation areas where small rain event and large rain events are large enough to produce the same amount of inundation depth (+/- .02'), but keeps inundation kept for any area greater than .5'
- Removes any inundation depths that are negative.

Raster shall be submitted in a geodatabase.

Water Surface Elevation Rasters

The consultant shall submit individual water surface elevation rasters for both the existing conditions and the proposed conditions for the 100 and 500 year event flood. Each raster shall be submitted in GeoTiff format in proper coordinate system.

For models developed with a single grid cell size, raster data shall be provided at the same cell size as the model grid. For models developed with variable cell sizes, the consultant shall coordinate with the city to determine the raster cell size format.

For rasters that are developed with rain on grid watershed modeling, the consultant shall submit both the original raster and the “cleaned raster” that meets the following criteria:

- Removes all water surface elevations outside of the “cleaned” raster.



Flow Paths

The consultant shall provide a flow path feature class using the City of Madison template. Automated raster flow paths may be allowed as approved by the City.

Internal file location: M:\Maps\Storm\Watershed Studies\Consultant Templates\Flow Paths.gdb

Soils

The consultant shall provide a feature class ... how does this differ from what's in Dane County SDE? Do we want this in a specific format?

Storm Sewer

The City will provide existing stormwater sewer data that includes pipe sizes, types, inverts, rim elevations, etc. During the modeling process, the consultant is required to evaluate this data. Any changes in this data based on the consultants review shall be submitted to the city and flagged with a new field identifying the changed data with notes on the changes.

Subcatchments

The consultant shall provide a subcatchment feature class using the City of Madison template.

Internal file location: M:\Maps\Storm\Watershed Studies\Consultant

Templates\Subcatchments.gdb Subcatchments that internally drain should be labelled "Internally Drain" under the watershed field. Verify if PM definition of Internally Drained prior to categorizing.

Subcatchments geometry shall not include slivers or overlaps. Feature classes that have gaps in subcatchment delineations or overlaps shall be rejected.

Watershed Solutions Geodatabase

The consultant shall provide completed feature classes using the City of Madison template for each of the following:

- Proposed_Notes
- Proposed_Inlets_NoPipe
 - Map only additional inlets required to fill existing pipe capacity. Additional inlets required as part of new pipe construction are implied in the Proposed_Pipes Feature Class.
- Proposed_Pipes
 - Inlets required as part of new pipe construction to fill proposed pipe are implied and not identified in this data or any other separate dataset.
- Proposed_Contours (based on regional solutions)
- Proposed_Regional Solutions

Watershed Analysis Geodatabase

The consultant shall provide the completed feature classes using the City of Madison template for each of the following:

- Existing Street Flooding
 - This must be submitted as a polyline feature class.



- As defined as flooding greater than .5' for greater than 100' along the street centerline during the 25 year storm event.
- Existing Structure Flooding
 - This must be submitted as a polygon feature class.
 - As defined as flooding greater than .5' within 5' of the building during the 100 year storm event. Structures that are flooded should be identified including their 5' buffer.
- Proposed Street Flooding
 - This must be submitted as a polyline feature class.
 - As defined as flooding above .5' for greater than 100' along the street centerline during the 100 year storm event.
- Proposed Structure Flooding
 - This must be submitted as a polygon feature class.
 - As defined as flooding greater than .5' within 5' of the building during the 25 year storm event. Structures that are flooded should be identified including their 5' buffer.

GIS Python Scripts or Model Builders

The Consultant shall submit all python scrips/model builders used to develop these analysis. Scripts and/or model builders must be delivered in ArcGIS 10.7.1 and Python 2.7.

