AMENDMENT NO. 1
TO THE CONTRACT FOR PURCHASE OF SERVICES
(DESIGN PROFESSIONALS)
CONTRACT 8852

WILLOW CREEK WATERSHED STUDY

RECITALS

This amendment is for additional work beyond the scope of the existing agreement and consists of conducting the Phase 1 green infrastructure analysis to corroborate the work done in-house for the Pheasant Branch Watershed Study.

1. On July 8, 2020, the City of Madison, hereinafter called the "City", and MSA Professional Services, hereinafter called the "Consultant" entered into a contract for a flood and stormwater modeling of the Willow Creek Watershed, Legislative File No. 60251.

2. Article 9 and Article 10, of the contract, provided for amendment of the contract for additional services.

3. The City has authority to execute an amendment to this contract as provided by Council Legislative File No. 60251.

NOW THEREFORE, The City and the Consultant hereby agree to amend the contract as follows:

A. PROJECT DESCRIPTION

Amend project Scope of Work per the attached file, entitled "Willow Creek Watershed Study – Amendment No. 1, Contract 8852".

B. COMPENSATION

Amend Paragraph 24 of purchase of services contract to increase the contract by $19,156.00 for a new contract amount of $213,771.00.

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

CONTRACTOR:

MSA Professional Services
(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:

By: _____
David P. Schmiedicke, Finance Director

Date: _____

By: _____
Maribeth Witzel-Behl, City Clerk

Date: _____

Approved as to Form:

By: _____
Eric T. Veum, Risk Manager

Date: _____

By: _____
Michael Haas, City Attorney

Date: _____

Task 6.1 – Volume Control Alternatives Analysis (Distributed Green Infrastructure)

Step 1 – Create the models

MSA will conduct GIS and modeling activities necessary to determine the effect on peak flows for the 1-year, 10-year, and 100-year, 24-hour events under conditions where there is an effective reduction in Directly Connected Impervious Area (DCIA) of 10% and 25%,

Activity #1 – Delineate subwatershed boundaries.

MSA will use a Bare-Earth DEM with the existing storm sewer network 'burnt-in' to account for underground drainage to delineate watersheds of approximately 5 to 7 acres across the entire Willow Creek watershed. Resulting watersheds will receive limited manual review and adjustment to account for obvious drainage features not represented in the DEM.

Activity #2 – Estimate subwatershed DCIA

Using standard XP-SWMM modeling approach, MSA will estimate fraction of DCIA within each subwatershed using actual digitized impervious area, standard land use coverage, and impervious connectivity provided in the City of Madison watershed modeling guidance.

Activity #3 – Calculate XP-SWMM 1D Node Data

Using GIS tools, MSA will identify the location of the single outlet point from each of the subwatersheds delineated under task 1. Each outlet point will be assigned a coordinate correct X, Y locations for placement within the XP-SWMM model, as well as a Z elevation value for integration with the 2D surface within the XP-SWMM model.

MSA will estimate the necessary storage volume, expressed as depth and surface area) for each subwatershed expressed as a function of the area of DCIA to be disconnected in each scenario (10% or 25%)

Activity #4 – Enter 1D Node data into model

MSA will import nodes defined in Activity #3 into the Existing Conditions Calibrated XP-SWMM model. This will be accomplished in two distinct methods:

Watersheds upstream from the existing storm sewer network. For locations where the downstream end of any subwatershed delineated as part of activity #1 occurs upstream from the existing storm sewer system, an additional 1D node representing the DGI system will be added to the system to represent DGI. This node will be linked to the 2D surface.

DGI nodes will be assigned invert, ground surface, and storage volume data as necessary to:

- Define necessary system storage sufficient to disconnect the equivalent of 10% and 25% of the estimated DCIA in the upstream drainage area, and
- Integrate with the 2D surface
    - Node inverts will be depressed below the 2D surface to provide storage below existing grades
    - Node ground elevations will be linked to the 2D surface to allow overflow to the surface when DGI storage is filled.

Note – 1D DGI nodes added during this step will be physically separated from 1D storm sewer system nodes from a hydraulic modeling perspective, but will still need to be connected within

the hydraulics layer via inactive links to ensure proper model integration of all hydraulic elements.

Watersheds located within areas served by the existing storm sewer system. For locations where the downstream end of any subwatershed delineated falls geographically downstream of an element of the existing storm sewer system, where the storm sewer system would capture runoff from the 2D surface before it all collected at the subwatershed outlet, MSA will add storage at an existing node within the 1D storm sewer system network to represent DGI. This node will be linked only to the 1D network.

DGI nodes added during this step will be assigned storage below the invert of the lowest pipe connecting to the node with storage volume data as necessary to:

- Define necessary system storage sufficient to disconnect the equivalent of 10% and 25% of the estimated DCIA in the upstream drainage area, and
- Node inverts will be depressed below the elevation of the lowest link connecting to the node such that required DGI storage is provided just below the elevation of the existing lowest link elevation.

Activity #5 – Solve Model, Review Output, Revise Model Input, Re-Solve

MSA will solve the initial 10% disconnected DGI model and will review the results for performance. MSA will adjust model nodes (anticipated to be mostly associated with node locations to ensure green infrastructure is properly filling with runoff) to help ensure reasonable model results are being achieved. MSA will revises both the 10% and 25% DCIA disconnection models in an identical manner. The model will then be solved for the 1-yr, 10-yr, and 100-yr events.

Note that this activity includes one iteration of model revisions prior to solving for final simulation results.

Activity #6 – Tabulate Model Results

MSA will tabulate the results of the final model solutions completed in activity #5 for the 25-locations identified in MSA's original Willow Creek Watershed Study scope of work item #4.

Deliverables:

- Excel table noting the flooding depth (ft) and peak flow (cfs) for the 25 locations as described above for the 1-yr, 10-yr, and 100-yr rainfall events (single event simulations).

Step 2 – Meet with the City to go over the results.

Following completion of Step 1, MSA will meet with the City to review the results of the Volume Control Alternatives Analysis (Distributed Green Infrastructure). For purposes of estimating labor effort, it is assume that the meeting will be conducted virtually via video conference and will last no more than two (2) hours. MSA will have three (3) project staff in attendance.

Deliverables:

- Draft minutes of meeting in MS Word format

Step 3 – Finalize analysis based on meeting with City

MSA will revise the DGI analysis based on feedback obtained from the City. Note that it is anticipated that MSA will have many correspondences with the City regarding fine details of the technical approach to modeling during Step 1 in this process and it is assumed that there will be little need for anything other than minor revisions to the modeling approach subsequent to the meeting conducted as step 2 of the scope of work item.

Deliverables:

- Color figures showing the maximum extent of flooding during each storm event under conditions when DGI is implemented. The figures will be developed using the standard color pallete for flood inundation depths
- Table noting the flooding depth (ft) and peak flow (cfs), under conditions when DGI is implemented, for the 25 locations identified during Task 4 of current Willow Creek Contract Scope of Work.
- Electronic copy of model input files in XP-SWMM compatible format
- GIS files generated for model development.
- Documentation of DGI model approach and findings.

MSA Professional Services October 26, 2020		**Project Manager**	**Water Resources Engineer**	**Sr. GIS Professional**	**Administrative Assistant**	**Total Hours**	**Reimbursable Expenses**	**Total Cost**
Resource		Thompson	Hancox	Converse	Deuchars			
Hourly Rate		$189.00	$126.00	$137.00	$79.00			
Task 6.1 - Distributed Green Infrastructure Evaluation								
Step 1 - Create Models	***6.11***							
Delineate 5-acre subwatersheds			2	20		22		$2,992.00
Estimate DCIA/UCIA/Pervious Areas				8		8		$1,096.00
Prepare Green Infrastructure 1D Node Data			2	4		6		$800.00
Enter 1D Node Data into Model			8			8		$1,008.00
Solve Model, Review Output, Revise Model			32			32		$4,032.00
25 Site Analysis (Site selection exercise in original scope of work)		1	4	2		7		$967.00
Step 2 - Meet with City	***6.12***							
Meet with City (& prepare meeting minutes)		3	3	3		9		$1,356.00
Step 3 - Finalize Analysis	***6.13***							
Create Maps (1-, 10-, 100-yr)		1		24		25		$3,477.00
25 Site Analysis			2			2		$252.00
Prepare Documentation and Data Transfer		4	8	8	4	24		$3,176.00
		9	***61***	***69***	***4***	***143***	***$ -***	***$19,156.00***