City of Stillwater
Federal Emergency Management Agency
Cooperating Technical Community
Mapping Activity Statement

Agreement #001- Hydrologic and Hydraulic Analyses and Floodplain Mapping

In accordance with the Cooperating Technical Community (CTC) Memorandum of Agreement dated 4/17/200 between the City of Stillwater and the Federal Emergency Management Agency (FEMA), Agreement # 001 is as follows:

1. **Objective and Scope:** The objective of this Mapping Activity is to develop detailed hydrologic and hydraulic analyses, and floodplain and floodway mapping in the City of Stillwater. Hydrologic analyses will be completed for approximately 25 square miles of drainage area and hydraulic analysis and floodplain mapping for approximately 5 linear miles of flooding, including the following flooding sources: Stillwater Creek, East Boomer Creek, West Boomer Creek, Duck Creek, Cow Creek Stream B and others in the corporate limits of Stillwater.

   GIS-based hydrologic and hydraulic modeling and mapping techniques will be applied to develop digital GIS data sets in support of the automation or semi-automation of modeling and floodplain mapping.

2. **Period of Performance:** The period of performance will be in accordance with Agreement Article II.

3. **Funding/Cost-Sharing:**

FEMA:	**$**
City of Stillwater	**$_____**
Total	**$**

4. **Standards:** The following standards and documents are relevant to this Mapping Activity:
   - Detailed hydrologic and hydraulic analyses and floodplain mapping will follow the standards set forth in FEMA 37, *Guidelines and Specifications for Study Contractors* (January 1995) and Title 44 of the Code of Federal Regulations (CFR), Part 65. FEMA 37 is available at FEMA's web site at http://www.fema.gov/mit/tsd/EN_reg.htm.
   - Computer models used for hydrologic and/or hydraulic analyses will meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage* (http://www.fema.gov/mit/tsd/EN_modl.htm).
   - Topographic mapping used to delineate floodplain and floodway boundaries will be of adequate scale and topographic definition to provide reasonable accuracy. Planimetric features will be compatible with the base map (with respect to horizontal accuracy) to be

used by FEMA for Digital FIRM production. Topographic mapping taken from aerial photogrammetry or surveys will comply with the requirements of Appendix 4 of FEMA 37. The selection of the topographic mapping source to be used will be coordinated with the FEMA Project Officer prior to analysis and mapping.

- Any levee or dike systems to be shown on the community's FIRM as providing protection from the 1% annual chance flood will comply with the requirements of 44 CFR 65.10. Chapter 7 of FEMA 37 provides guidelines for evaluating levee systems.
- Flood elevations and floodplain and floodway boundaries will reasonably tie in to non-revised information in accordance with 44 CFR 65.6(a)(6).
- The floodway will be established in accordance with 44 CFR 65.7, as well as any applicable state requirements.
- Digital mapping will comply with the requirements of Chapter 9 and Appendix 7 of FEMA 37.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping will be documented and provided to ensure they are consistent with the standards outlined above. Digital data sets (such as elevation, basin, or land use data) will be documented and provided to FEMA for approval prior to performing the analysis to ensure they meet minimum requirements. If non-commercial (i.e., custom developed) software is used for the analysis, then full user documentation, technical algorithm documentation, and the software will be provided to FEMA for review prior to performing the scope of work.
- Digital Elevation Models (DEMs) and field survey data will meet vertical accuracy requirements contained in Appendix 4 of FEMA 37.

5. **Products:** The City of Stillwater will make available items outlined in Chapter 11 of FEMA 37 in the Technical Support Data Notebook (TSDN) format. These include:

- Digital 1% and 0.2 % annual chance floodplain and floodway boundaries:
- Digital profiles of the 10%, 2%, 1%, and 0.2% annual chance water surface elevations representing existing conditions;
- Flood Insurance Study (FIS) report;
- Floodway data tables;
- Digital copies of all hydrologic and hydraulic modeling (input and output files); and
- All back-up data used in the analyses or mapping.

For GIS-based modeling and mapping. The City of Stillwater's contractor Dewberry and Davis, LLC, will deliver all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DFIRM database structure to the City of Stillwater.

6. **Schedule and Milestones:**

Milestone 1 (Scoping Phase): Upon completion, products for the first milestone will be provided to the FEMA Project Officer. These include:

- Annotated copies of effective FIRMs depicting limits of proposed study.
- Documentation of the proposed source of topographic data. including: scale: contour interval; source/methodology; date of survey/data collection; vertical and horizontal datums; and comparison of planimetric features with the Digital FIRM base map planned for use by FEMA.
- A written summary of the initial data research; proposed analysis methodologies: and a work plan.
- Documentation of digital data sets to be used (such as elevation, basin. and land use data). Full user documentation; technical description of methodologies and algorithms: and a copy of the source codes and custom-developed software applications for GIS-based modeling will also be provided.
- Copies of topographic maps depicting proposed cross section locations.
- Deliverables for Milestone 1 will be submitted to the project officer no later than 6 months after the project start date.

Milestone 2 (Hydrology Phase): Upon completion, products for the second milestone will be provided to the FEMA Project Officer. This includes draft hydrologic analyses in accordance with the TSDN format.

Milestone 3 (Hydraulics Phase): Upon completion, products for the third milestone will be provided to the FEMA Project Officer. These include the hydraulic models and sample floodplain mapping in accordance with TSDN format.

Milestone 4 (Final Products): Upon completion, final products will be provided to the FEMA Project Officer. These include:

- The completed TSDN and accompanying data containing the information outlined in Section 5 of this Mapping Activity Statement.
- A QA/QC report documenting the results of the independent review of all computational and data processing procedures

Final products will be made available in accordance with the Period of Performance described in Section 2 of this Mapping Activity Statement. Upon completion of each milestone listed above a coordination conference call including the City of Stillwater, the City of Stillwater's subcontractor, FEMA, and the MCC shall be held. This call shall be initialized and setup by the City of Stillwater. Performance Reports documenting the milestone progress described in this section shall be submitted in accordance with Article VI of the Agreement Articles.

7. **Certification:** The following certifications apply to this Mapping Activity (as appropriate):
   - Hydrologic and/or hydraulic analyses and data will be certified by a registered professional engineer or licensed land surveyor in accordance with 44 CFR 65.6(f).
   - Topographic information will be certified by a registered professional engineer or licensed land surveyor in accordance with 44 CFR 65.5(c).
   - If fill is to be considered in the mapping to raise land areas above the 1% annual chance flood elevation, certification of the fill will be provided in accordance with 44 CFR

65.5(a)(6) by the community's NFIP permit official, a registered professional engineer, or a licensed land surveyor.

- Any levee systems to be accredited as discussed in Section 4 of this Mapping Activity Statement will be certified in accordance with 44 CFR 65.10(e).

8. **Technical Assistance and Resources:** The City of Stillwater may obtain copies of LOMCs, archived engineering back-up data, and data collected as part of the Five-Year Mapping Needs Assessment from FEMA's Mapping Coordination Contractor (MCC) as part of the initial data research. Copies of FEMA's rule-based engineering software packages such as CHECK-2 to evaluate HEC-2 models and FISPLOT, an automated flood profile plotting software package, may also be obtained through the MCC/TEC. The MCC may be contacted at 1-877-FEMA-MAP (336-2627). General technical and programmatic information can be downloaded from FEMA's Flood Hazard Mapping web site (www.fema.gov/mit/tsd). Specific technical and programmatic support may be provided through FEMA's MCC; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this Mapping Activity Statement.

   The City of Stillwater may also consult with the FEMA Project Officer to request support in the areas of: recommended data sources, recommended digital data accuracy standards, assessing vertical data accuracy, data collection methods or sub-contractors, GIS-based engineering and modeling training.

9. **Subcontractors:** Dewberry and Davis, LLC will be a contractor of the City of Stillwater. Procurement of subcontractors using Federal funds provided as part of this Mapping Activity will comply with the requirements of 44 CFR 13.36.

10. **Quality Assurance/Quality Control (QA/QC) Procedures:** The QA/QC procedures outlined in Chapter 10 of the *Guidelines and Specifications for Study Contractors* should be followed during the development of the hydrologic and hydraulic analyses and floodplain mapping. Analyses and mapping should be independently reviewed for compliance with the standards defined in Section 4 of this Mapping Activity Statement. This independent review will be conducted by a firm determined by the City of Stillwater.

    For GIS-based, automated modeling, QA/QC activities should ensure automated calculations are reasonable and in compliance with standard flood modeling and mapping approaches. Dewberry and Davis, LLC, will document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed.

11. **Reporting:** Reporting requirements will be in accordance with Agreement Articles V & VI.

12. **Points of Contact:** The FEMA Project Officer is Mr. James Orwat and the CTC's Project Manager is Mr. Tom Carter, or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities.

Each party has caused this Mapping Activity Statement to be executed by its duly authorized representatives.

Tom Carter CTC Partner's authorized representative	7/28/00 date
Frank Pagano FEMA authorized representative	8/16/00 date