Wisconsin Department of Natural Resources
Cooperating Technical Partner
Mapping Activity Statement

Agreement WDNR-2003-1b - Hydrologic and Hydraulic Analyses and Floodplain Mapping

In accordance with the Cooperating Technical Partner (CTP) Memorandum of Agreement dated September 14, 2001, between the Wisconsin Department of Natural Resources (WDNR) and the Federal Emergency Management Agency (FEMA), Mapping Activity Statement WDNR-2003-1b is as follows:

1. **Statement Objective and Scope:** The objective of this Mapping Activity is to develop detailed hydrologic and hydraulic analyses and floodplain and floodway mapping in Ozaukee County and incorporated areas. Hydrologic analyses will include 150 mi^2 of drainage area. The hydraulic analyses includes 32.7 linear miles of river in Ozaukee County, including the following flooding sources: Mole Creek 2.2 miles, Un-named primary tributary to Mole Creek 4.9 miles, Un-named secondary tributary to Mole Creek 1.1 miles, Ulao Swamp 2.0 miles, Ulao Creek 7.0 miles, Sauk Creek 14.4 miles, Unnamed tributary to Mole Creek 0.5 mi, Un-named tributary to un-named primary tributary to Mole Creek 0.6 miles.

   Objective 1.1 - The hydrologic methods used for this analysis will be HMS Peak flood discharges will be calculated for the 10, 2, 1 and 0.5 percent annual chance storm events. These flood discharges will be the basis for subsequent hydraulic analyses of the above-mentioned flooding sources(s). The study area is approximately 30% of the Ozaukee County total land area.

   This effort takes advantage of better county wide topographic data (2-ft) developed by Ozaukee County. Existing hydraulic studies will be evaluated and if meeting FEMA standards will be incorporated into this redelineation effort.

   The hydraulic methods used for this analysis will include HEC-RAS. The hydraulic analysis will be used to establish flood elevations and regulatory floodways for the subject flooding source(s). The WDNR will conduct a Quality Control review of all data sets produced.

   Objective 1.2: The hydraulic methods used for this analysis will include HEC-RAS. New hydraulic modeling shall include compilation of flood profiles and floodways based on National Flood Insurance Program Guidelines and Wisconsin state statutes. Digital Topography available through Wisconsin DNR, will be used to create cross sectional data in overbank areas, and new survey data will be used to supplement or replace existing data at bridge or culvert geometry where available. Similarly, channel bathymetry will be obtained based on a mix of existing cross section data and new survey data. The hydraulic analysis will be used to establish flood elevations and regulatory floodways for the subject flooding source(s).

Wisconsin DNR will delineate floodplain boundaries for the 1% and 0.2% recurrence intervals and the regulatory floodway on a digital work map based on existing topography or new topographic data. WIDNR will incorporate the results of all effective Letters of Map Change as appropriate. Refinement of the remaining approximate flood hazard areas will be conducted to ensure consistency with Ozaukee County's 2-foot contour equivalent topographic data. The WDNR will conduct a quality control review to ensure delineations fit well with the current Ozaukee County 2-ft contour data.

2. **Period of Performance:** The period of performance of this MAS will be 10-1-03 to 3-30-05 in accordance with Cooperative Agreement Article II.

3. **Funding/Local Effort:** I :

Table 1 LOCAL CONTRIBUTIONS

Task	Source of Revenue	Amount
1. Countywide Preparation of Digital Topographic Maps, Orthophography, and other base mapping		
2. Floodplain redelineation for 55 miles of Streams with Existing Detailed Floodplain Studies		
3. Hydrologic and Hydraulic Analyses and Digital Mapping		
Subtotals by Entity		
	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 *Guidelines and Specifications for Flood Hazard Mapping Partners*, February 2002, which can be found at www.fema.gov/mit/tsd/dl_cgs.htm
   - Computer models used for hydrologic and/or hydraulic analyses are limited to those included on FEMA's list of accepted numerical models for NFIP usage as found at http://www.fema.gov/mit/tsd/en_modl.htm.
   - Topographic mapping used to delineate floodplains and floodways 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) selected by FEMA for Digital FIRM production. Topographic mapping taken from aerial photogrammetry or surveys will comply with the requirements of Appendix A of *Guidelines and Specifications for Flood Hazard Mapping Partners*, February 2002. Appendix A can be found at www.fema.gov/mit/tsd/dl_cgs.htm.

- The floodway will be established in accordance with *Guidelines and Specifications for Flood Hazard Mapping Partners*, February 2002, and any applicable state and/or community requirements.
- Map revision data incorporated on a per-project basis for fill placement, channel modifications, levees or bridge/culvert placement will comply with Subpart 65 of Title 44 CFR.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping will be documented and provided to FEMA to ensure that 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 that 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.

5. **Products:** All supporting documentation for the activities in this Mapping Activity Statement shall be submitted in accordance with Appendix M, Section M.2.1 of the *Guidelines and Specifications for Flood Hazard Mapping Partners*, February 2002. These include:
   - Digital copies of hydrologic and hydraulic modeling (input and output) files.
   - "Summary of Discharges" table(s) presenting discharge data for each flooding source.
   - Appropriate SC application/certification form for hydrology.
   - Table with range of Manning's "n" values.
   - 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 Table(s) for each subject-flooding source. The Floodway Data Table(s) must be compatible with the DFIRM database.
   - All back-up data used in the analyses or mapping, including work maps.
   - DFIRM mapping files, in one of the GIS file and database formats specified in FEMA's DFIRM Specifications.
   - Metadata files describing the DFIRM data, including the required information shown in the examples shown in FEMA's DFIRM Specifications.
   - Complete set of plots of the DFIRM panels showing all detailed flood hazard information at a suitable scale.
   - A QA/QC report that includes a description and the results of all automated or manual QA/QC steps taken during the preparation of the DFIRM.

- For GIS-based modeling and mapping, WDNR will deliver all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the Digital Flood Insurance Rate Map (DFIRM) database structure.

6. **Schedule and Milestones:**

Milestone 1., Scoping Phase (10-1-03 to 12-31-03): Products for the first milestone to be provided to the FEMA Project Officer include:

- Annotated copies of effective FIRMs depicting limits of proposed study.
- Documentation of the proposed source of topographic data, scale, contour interval, source/methodology, date of survey/data collection, vertical and horizontal datum's, and comparison of planimetric features with the DFIRM base map selected by FEMA for DFIRM production.
- 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.

Milestone 2, Hydrology Phase (11-1-03 to 2-1-04): Products for the second milestone to be provided to the FEMA Project Officer include draft hydrologic analyses in accordance with the TSDN format.

Milestone 3, Hydraulics Phase (2-1-04 to 9-1-04): Products for the third milestone to be provided to the FEMA Project Officer include the hydraulic models and sample floodplain mapping in accordance with TSDN format.

Milestone 4, Final Products: (10-1-04 to 3-30-04): Final products to be provided to the FEMA Project Officer 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.

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 to or 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:** FEMA will provide copies of effective FIS hydraulic models, FEMA-issued Letters of Map Change (LOMCs), and archived engineering back-up data from FEMA's Mapping Coordination Contractor (MCC) or other contractors as assigned by FEMA for archive maintenance.

   Specific technical and programmatic support from FEMA force contracts should be coordinated with the FEMA Project Officer. This may included a request for support in selection of data sources, selection of digital data accuracy standards, assessment of vertical data accuracy, selection of data collection methods, selection of sub-contractors, and GIS-based engineering and modeling training

9. **Contractors:** 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:** WDNR will undertake internal QC reviews to ensure that the products described under Section 5 of this Mapping Activity Statement conform to the standards outlined under Section 4 of this Mapping Activity Statement. Additionally, an independent review for compliance with these standards will be undertaken by WDNR.

    For GIS-based, automated modeling and mapping techniques, QA/QC activities should ensure automated calculations are reasonable and in compliance with standard flood modeling and mapping approaches. WDNR will document internal QA/QC procedures to ensure all calculations and data processing were reviewed. Software tools used to perform modeling routines that emulate a model on FEMA's accepted model list based on rewritten source codes must be submitted to FEMA for review and approval in accordance with the conditions outlined in Subparagraph 65.6(a)(6) (i), (ii), and (iii) of the NFIP regulations.

11. **Reporting:** Reporting requirements will be in accordance with Cooperative Agreement Articles V & VI. WDNR shall work with the FEMA Project Officer to establish an acceptable protocol for entry of project information into the Monitoring of Contracted Studies (MICS) database at the beginning of each project. WDNR will update MICS quarterly. If this report proves to be sufficient, the Assistance Officer may waive the written quarterly reports thereafter (reference 44 CFR Part 13.40, *Monitoring and Reporting Program Performance*). However, this shall not affect the financial reporting requirements (reference 44 CFR Part 13.41, *Financial Reporting*). The PO shall ensure that key WDNR staff have been provided access and passwords to MICS. The PO will also provide project-naming conventions for MICS. Once access is provided, MICS (including a tutorial) may be found at: https://mics.fema.gov.

12. **Points of Contact:** The CTP Project Manager is Alan Lulloff or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities. The FEMA contacts are: Ken Hinterlong, Project Officer, and Lee Traeger, Technical Monitor.

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

for

Bruce Baker, Acting Director
Bureau of Watershed Management
Wisconsin Department of Natural Resources

9/29/03
Date

for

Terry Fell, Chief
Hazard Identification and Risk Assessment Branch
Federal Emergency Management Agency, Region V

September 29, 2003
Date