

QUALITY CONTROL REVIEWS FOR SUBMITTAL OF THE LOWER WISCONSIN RIVER WATERSHED FLOOD HAZARD STUDIES

WISCONSIN DNR

FIELD SURVEYS

A. Completeness of deliverable package – The deliverables should contain the following items in accordance with the WDNR Survey Specifications document, which is available for download from WDNR’s website at <http://dnr.wi.gov/org/water/wm/dsfm/Flood/RiskMap.html>:

- One set of copies of the original field notes and computations as specified under Section II.E of the WDNR Survey Specifications document;
- One diagram of the level circuit or of the GPS base stations and intermediate bench marks, specified under Section II.E1 of the WDNR Survey Specifications document. If digital, the diagram should be provided in ArcView shape file format or as an ArcInfo coverage;
- One set of bench mark dossier sheets specified under Section II.E2 of the WDNR Survey Specifications document;
- One set of copies of the plan and profile sketches as specified in Section II.E3a of the WDNR Survey Specifications document;
- One set of copies of the field notes and computations as specified in Section II.E3b of the WDNR Survey Specifications document;
- One set of photographs as specified in Section II.E3c of the WDNR Survey Specifications document;
- One set of digital files containing all survey points collected for all structures and intermediate channel sections as specified in Section II.E.4 of the WDNR Survey Specifications document;
- Certification that all work was done under the direct supervision of a Registered Land Surveyor or Professional Engineer in Wisconsin;
- Metadata that follows the FEMA NFIP Metadata Profile for Survey Datasets;
- All deliverables must be submitted according to FEMA’s guidelines for Data Capture Standards in Appendix M [2011] which is available from the WDNR website <http://dnr.wi.gov/org/water/wm/dsfm/flood/RiskMap.html>.

B. Specific review

- Spot check survey points to see if they match the topo

HYDRAULICS

A. Completeness of deliverable package – The deliverables should contain the following items:

- Digital profiles of the 10-, 4-, 2-, 1- and 0.2-percent-annual-chance water-surface elevations representing existing conditions using the FEMA RASPLOT program or similar software;
- Digital versions of the Floodway Data Table for each flooding source that is compatible with the DFIRM database;
- Digital versions of all hydraulic modeling (input and output) files;
- Digital versions of table with range of Manning's "n" values;
- Explanations for unresolved messages from the CHECK-2 or CHECK-RAS program, as appropriate;
- Digital versions of all backup data used in the analyses;
- Digital versions of draft text for inclusion in the FIS report;
- Metadata that follows the FEMA NFIP Metadata Profile for Hydraulics Datasets;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the Hydraulic models;
- For GIS-based modeling, deliverables include all input and output data, intermediate data processing products, GIS data layers, and final products in the format of the preliminary DFIRM database structure;
- All deliverables must be submitted according to FEMA's guidelines for Data Capture Standards in Appendix M [2011] which is available from the WDNR website <http://dnr.wi.gov/org/water/wm/dsfm/flood/RiskMap.html>.

B. Specific review

- Make sure cross sections and structures in model reflect the survey points.
- Run CHECK-RAS and evaluate all errors reported.
- Make sure flows in the steady flow editor match amount and location of the provided hydrology.
- Make sure the downstream boundary condition is correct.
- Make sure there are two plans, one with five profiles and the other with two 100-year profiles acting as a floodway run. Verify that the floodway run has all method 4 encroachments with zero rise and that the output does not have any surcharge from the encroachments.
- Check to make sure the floodway run data matches the 100-year profile of the five profile run.
- Make sure cross section stations in the model match the mapped distance.
- Check for LOMR's that need to be 'incorporated' into the mapping/FIS.

FLOODPLAIN MAPPING (DETAILED AND APPROXIMATE) – we will receive only lines for the detailed SFHA in each county. This will include both the newly studied streams and the approximate studies merged into one file (for the final submittal).

A. General Review

1. **File Completeness** – submittal for both types of studies should include mapping shapefiles formatted according to GIS Submittal Format, available at <http://dnr.wi.gov/org/water/wm/dsfm/Flood/RiskMap.html>):

- **Spatial Data:**

- s_fld_haz_ar.shp
- s_fld_haz_ln.shp
- s_xs.shp
- l_xs_elev.dbf
- s_bfe.shp (where applicable)
- s_wtr_ln.shp
- s_stn_start.dbf

- **Documentation:**

- Detailed Studies:
 - Digital work maps showing the 1- and 0.2-percent-annual-chance floodplain boundary delineations, regulatory floodway boundary delineations, cross sections, BFEs, flood insurance risk zone labels, and all applicable base map features; and
 - Metadata that follows the FEMA NFIP Metadata Profile for Floodplain Mapping and Redelineation Datasets; and
 - A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the digital floodplain mapping data; and
 - Digital versions of Section 3.2 from the FIS report (Hydraulic Analysis), Floodway data tables in either Excel or Word and RASLOT created profiles in both .mdb and .dxf format for each stream studied;
 - Any backup or supplemental information used in the mapping required for the independent QA/QC review;
 - Raster grids produced in HEC-GeoRAS during floodplain delineation: water surface elevation, flood depth and percent annual chance for each of the 10-, 4-, 2-, 1- and 0.2-percent-annual-chance flood frequencies.
- Approximate Studies:
 - Peak Flow values at 'flow change' locations throughout each watershed, based on 2003 Regression Equations from USGS.
<http://wi.water.usgs.gov/publications/flood/index.html>

- Digital work maps showing the 1-percent-annual-chance floodplain boundary delineations, cross section locations, and all applicable base map features;
- Metadata that follows the FEMA NFIP Metadata Profile for Floodplain Mapping Datasets;
- Digital versions of all hydraulic modeling (input and output) files;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the flood hazard data;
- Any backup or supplemental information used in the mapping.

B. GIS Data Review

1. **Topology** – the following rules should be run and result in zero errors:

Spatial Layer	Topology Rule	Parameter	Minimum Cluster Tolerance (ft)
<input type="checkbox"/> S_BFE	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_BFE	Must Not Overlap		0.25
<input type="checkbox"/> S_BFE	Must Not Have Pseudo nodes		0.25
<input type="checkbox"/> S_BFE	Must Be Single Part		0.25
<input type="checkbox"/> S_BFE	Must Not Overlap With Lettered Cross Sections	S_XS	0.25
<input type="checkbox"/> S_FLD_HAZ_AR	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_FLD_HAZ_AR	Must Not Overlap		0.25
<input type="checkbox"/> S_FLD_HAZ_AR	Must Not Have Gaps		0.25
<input type="checkbox"/> S_FLD_HAZ_AR	Boundary Must Be Covered By	S_FLD_HAZ_LN	0.25
<input type="checkbox"/> S_FLD_HAZ_AR	Boundary Must Be Covered By Feature Class Of	S_FLD_HAZ_LN	0.25
<input type="checkbox"/> S_FLD_HAZ_LN	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_FLD_HAZ_LN	Must Not Intersect		0.25
<input type="checkbox"/> S_FLD_HAZ_LN	Must Not Have Dangles		0.25
<input type="checkbox"/> S_FLD_HAZ_LN	Must Be Covered By Boundary Of	S_FLD_HAZ_AR	0.25
<input type="checkbox"/> S_FLD_HAZ_LN	Must Be Single Part		0.25

Spatial Layer	Topology Rule	Parameter	Minimum Cluster Tolerance (ft)
<input type="checkbox"/> S_WTR_AR	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_WTR_LN	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_WTR_LN	Must Not Overlap		0.25
<input type="checkbox"/> S_WTR_LN	Must Be Single Part		0.25
<input type="checkbox"/> S_XS	Must Be Larger Than Cluster Tolerance		0.25
<input type="checkbox"/> S_XS	Must Not Overlap		0.25
<input type="checkbox"/> S_XS	Must Not Have Pseudo nodes		0.25
<input type="checkbox"/> S_XS	Must Be Single Part		0.25

2. **BFE check** – check that all detailed study areas have either BFE lines or a static BFE value in the s_fld_haz_ar layer. If there is not at least one mapped cross section in S_XS for every 1-foot vertical rise in the 1-percent-annual-chance flood elevation, intervening BFE lines must be placed at whole-foot intervals. Other examples include; a riverine AE zone without a flood profile in the FIS report, areas studied with two-dimensional modeling, certain ponding areas, and backwater areas off to the side of streams with flood profiles.
3. **BFEs snapped** – BFE lines must be snapped to the 1% line or Floodway if the 1% and Floodway are coincident.
4. **BFE to Cross Section elevation comparison** – check that the elevations included with the cross sections and BFEs seem orderly and reasonable. This check could be done by displaying the cross section and BFEs lines with labels for the elevation field and visually checking the values on screen.
5. **Sliver Check** – For the s_fld_haz_In layer, the 0.2% line should not be less than 25 ft. from the 1% lines at any point and should be truncated at the point where the difference is 25ft. Eliminate 0.2% Annual Chance Flood Hazard Area:
 - Entirely within 25 feet of the 1% Special Flood Hazard Line;
 - An average of less than 25 ft on the narrow dimension of the polygon;
 - Less than 25 ft from the 1% line for 0.2% polygons that are NOT contained by a 1% polygon.

6. **Projection defined** – there should be a defined projection associated with all the GIS files. All spatial layers should be submitted in State Plane South NAD 83 HARN.
7. **Attribute check** – All shapefiles should be attributed according to Appendix L [2011]. The following fields must be populated and the GIS staff shall check that the values are complete and reasonable:

S_FLD_HAZ_AR.shp

- FLD_AR_ID
- STUDY_TYP
- FLD_ZONE

Specifics/How To:

- Symbolize the different zones to make sure they make sense when compared to the special flood hazard lines

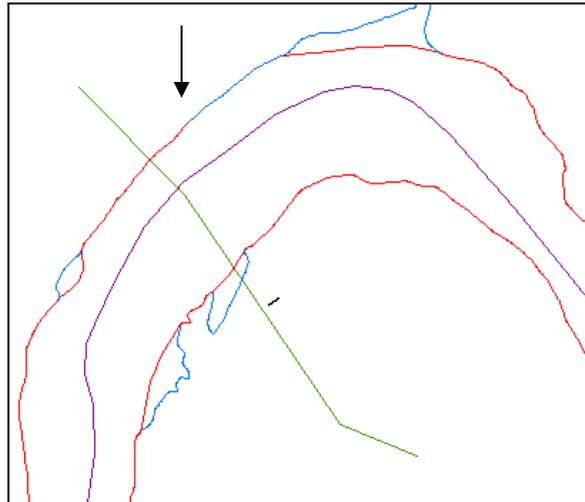
- ZONE_SUBTY
- SFHA_TF
- STATIC_BFE
- DEPTH
- LEN_UNIT

S_FLD_HAZ_LN.shp

- FLD_LN_ID
- LN_TYP

Specifics/How To:

- Double check that the zone break values are correct.
- Symbolize all lines to make sure that they all make sense (i.e. a floodway line accidentally being attributed as a 1% line; see below)



S_XS.shp

- XS_LN_ID
- WTR_NM
- STREAM_STN
- START_ID
- XS_LTR
- XS_LN_TYP
- WSEL_REG
- STRMBED_EL
- LEN_UNIT
- MODEL_ID

L_XS ELEV.dbf

- XS_ELEV_ID
- XS_LN_ID
- FW_WIDTH
- NE_WIDTH_L
- NE_WIDTH_R
- WSEL_FLDWY
- XS_AREA
- VELOCITY
- EVENT_TYP
- WSEL
- WSEL_WOFWY
- WSEL_FLDWY
- WSEL_INCRS

S_BFE.shp

- BFE_LN_ID
- ELEV
- LEN_UNIT

S_WTR_LN.shp

- WTR_LN_ID
- WATER_TYP
- WTR_NM

S_STN_START.dbf

- START_ID
- START_DESC
- LOC_ACC

8. **Modification of Raw (pre-smoothing) Floodplain Boundary** – Prior to creating flood hazard areas, smooth the flood hazard lines using the ArcGIS SMOOTH LINE tool with the PAEK algorithm method and a smoothing tolerance of 20 meters.
9. **Removal of Extraneous Floodplain “Islands”** – Within the 1% Flood Hazard Areas, remove all 0.2% or unshaded Zone X polygons that are 2000 ft² or smaller in area.

- 10. FBS Audit** – Mapping quality standards **must** be consistent with Procedure Memorandum No. 38, dated October 17, 2007. To run this check, review the intersection of the cross sections with the 1% delineation and check that the terrain at that point matches the elevation listed in the cross section attributes according to the standards set forth in PM 38.

C. Engineering Review

1. Make sure model output matches the FDT and XS shapefile;
2. Make sure mapped topwidths match the model;
3. Cross section compared to FDT topwidths and elevations;
4. Compare BFE placement to profiles: are BFEs plotted at significant profile inflection points?
5. No negative slopes should be shown on the profile or FDT;
6. Documentation of incorporated LOMR's;
7. The FIS text, including all updated data tables and Flood Profiles, prepared in the format as documented in FEMA Procedure Memorandum 66, *Flood Insurance Study Report Alignment to Digital Vision*.