Guidelines and Standards for Flood Risk Analysis and Mapping

Appendix M: Data Capture Standards

FINAL

August 2011

FEMA

Table of Revisions for Appendix M: Data Capture Standards

The original Data Capture Standards were published in May 2005 in two volumes as Appendix N, Data Capture Standards and Data Capture Guidelines. In March 2009, the two volumes of Appendix N were combined, expanded and merged with Appendix M, Guidance for Preparing and Maintaining Technical and Administrative Support Data to provide data submittal standards for the entire flood hazard mapping process in digital format.

The following Summary of Changes details revisions of Appendix M subsequent to the previous provisional publication of this Appendix in March 2009. These changes represent new or updated guidance for Flood Hazard Mapping Partners.

Date	Affected Section(s)	Summary of Change
August 2011	All	Deleted Domain Table section (now separate document); removed NFIP Metadata section; renumbered section numbers and cross references to reflect sections removed, renamed, or added
August 2011	All	Replaced term “DFIRM” with “FIRM”
August 2011	All	Replaced term “scoping” with “discovery”
August 2011	All	Corrected reference to Flood Elevation Determination Docket (FEDD)
August 2011	All	Deleted reference to study types “detailed”, “approximate” and “detailed approximate” and replaced with description relating study levels to flood risk
August 2011	All	Added “Esri” when referencing shapefiles
August 2011	All	Replaced term “specifications” with ”standards”
August 2011	M.1.1	Added text describing relationship of Appendix M to Appendix L
August 2011	M.1.2	Added section describing new Section M.2 that replaced scoping
August 2011	M.1.3	Cross-referenced certification of base map data with standards in Sections M.1.15 and M.3.2.3
August 2011	M.1.4	Cross-referenced certification of terrain data with standards in Sections M.1.15 and M.4.2.3
August 2011	M.1.5	Cross-referenced certification of field survey data with standards in Sections M.1.15 and M.5.2.3
August 2011	M.1.6	Cross-referenced certification of hydrology data with standards in Sections M.1.15 and M.6.2.3
August 2011	M.1.7	Cross-referenced certification of hydraulic data with standards in Sections M.1.15 and M.7.2.3
August 2011	M.1.8	Cross-referenced certification of alluvial fan data with standards in Sections M.1.15 and M.8.2.3
August 2011	M.1.9	Cross-referenced certification of coastal data with standards in Sections M.1.15 and M.9.2.12
August 2011	M.1.10	Cross-referenced certification of floodplain mapping data with standards in Sections M.1.15 and M.10.2.6
August 2011	M.1.11	Cross-referenced certification of post preliminary data with standards in Sections M.1.15 and M.11.2.2
August 2011	M.1.12	Added section describing new Risk Assessment section
August 2011	M.2	Replaced Scoping placeholder text with Discovery section

Date	Affected Section(s)	Summary of Change
August 2011	M.3.1	Added requirement to update CNMS database
August 2011	M.3.2	Clarified use of tiling with vector data not suggested
August 2011	M.3.2.1	Deleted reference to DCS User Guide
August 2011	M.3.2.1	Updated required data with corresponding Appendix L feature name in a table
August 2011	Table M.3-1	Converted bulleted text to new Table 3.-1 Required Base Map Files Description
August 2011	M.3.2.7	Updated location of MIP data artifact upload guidance
August 2011	M.4.1	Added requirement to update CNMS database
August 2011	M.4.2.1	Deleted reference to DCS User Guide
August 2011	M.4.2.1	Updated data submittal requirements per Procedure Memorandum 61
August 2011	M.4.2.4	Expanded descriptions for some file formats
August 2011	M.4.2.5	Added requirements that metadata comply with *USGS LiDAR Guidelines* and FEMA Elevation Metadata Profile and include Pre- and Post-flight Aerial Survey and Calibration Report
August 2011	M.4.2.7	Updated location of MIP data artifact upload guidance
August 2011	M.4.2.8	Added Terrain folder and files to directory structure
August 2011	M.5.1	Added requirement to update CNMS database
August 2011	M.5.2.1	Deleted reference to DCS User Guide
August 2011	M.5.2.7	Updated location of MIP data artifact upload guidance
August 2011	Figure M-7	Cropped photograph to remove date stamp
August 2011	Figure M-10	Cropped photograph to remove date stamp
August 2011	M.6.1	Added requirement to update CNMS database
August 2011	M.6.2.1	Section revised based on risk level rather than study type
August 2011	M.6.2.1	Deleted reference to DCS User Guide
August 2011	M.6.2.1	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
August 2011	M.6.2.4	Added Geodatabase feature classes in addition to shapefiles
August 2011	M.6.2.4	Added cross reference to Appendix L for projection
March2011	M.6.2.7	Updated location of MIP data artifact upload guidance
August 2011	M.6.2.8	Added standard for HUC-8 cataloging unit as NRCS Watershed Boundary Dataset
August 2011	M.6.2.8	Changed subfolder name under Hydrology Data from “stream name” to “watershed name”
August 2011	M.7.1	Added requirement to update CNMS database
August 2011	M.7.2.1	Section revised based on risk level rather than study type
August 2011	M.7.2.1	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
August 2011	M.7.2.1	Deleted reference to DCS User Guide
August 2011	M.7.2.4	Updated section number for FIS text from 3.2 to 5.2
August 2011	M.7.2.4	Added Geodatabase feature classes in addition to shapefiles
August 2011	M.7.2.4	Added cross reference to Appendix L for projection
August 2011	M.7.2.7	Updated location of MIP data artifact upload guidance

Date	Affected Section(s)	Summary of Change
August 2011	M.7.2.8	Added standard for HUC-8 cataloging unit as NRCS Watershed Boundary Dataset and updated Draft FIS section to 5.2
August 2011	M.8.1	Added requirement to update CNMS database
August 2011	M.8.2.1	Deleted reference to DCS User Guide
August 2011	M.8.2.1	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
August 2011	M.8.2.1	Revised FIS report location for the draft text file
August 2011	M.8.2.4	Updated reference to FIS text section number
August 2011	M.8.2.4	Added Geodatabase feature classes in addition to shapefiles
August 2011	M.8.2.4	Added cross reference to Appendix L for projection
August 2011	M.8.2.7	Updated location of MIP data artifact upload guidance
August 2011	M.8.2.8	Combined subfolders Alluvial_Fan and Hydraulic_Models
August 2011	M.9.1	Added requirement to update CNMS database
August 2011	M.9.2.1	Replaced “text…file” with “database…file”
August 2011	M.9.2.1	Deleted reference to DCS User Guide
August 2011	M.9.2.1	Added personal Geodatabase feature class in addition to shapefiles
August 2011	M.9.2.1	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
March 2001	M.9.2.4	Removed Summary of Coastal Stillwater Elevations section
August 2011	M.9.2.4	Added section for 1-Percent-Annual-Chance Total Stillwater Elevation Map
August 2011	M.9.2.5	Deleted “Surge Station Location Map” section
August 2011	M.9.2.6	Transect Location Map section updated to clarify when Transect Location Maps are required in the FIS
August 2011	M.9.2.7	Deleted Transect Description Table section
August 2011	M.9.2.8	Deleted Transect Data Table section
August 2011	M.9.2.11	Added Geodatabase feature classes in addition to shapefiles
August 2011	M.9.2.11	Deleted MXD as acceptable format for coastal spatial files
August 2011	M.9.2.11	Added cross reference to Appendix L for projection. Updated FIS Section reference
August 2011	M.9.2.14	Updated location of MIP data artifact upload guidance
August 2011	M.9.2.15	Added “Water Body” and “Project Name” to folder names. Deleted folders for offshore and nearshore “Flooding Source”
August 2011	M.10.2.1	Deleted reference to DCS User Guide
August 2011	M.10.2.3.1	Added source citation and floodplain mapping submittal requirements and modified BFE language.
August 2011	M.10.2.3.1	Deleted reference to DCS User Guide
August 2011	M.10.2.3.2	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
August 2011	M.10.2.4.1	Updated geospatial data requirements and deleted “DCS_” from geospatial file names
August 2011	M.10.2.4.1	Deleted reference to DCS User Guide
August 2011	M.10.2.4.2	Updated geospatial data requirements and deleted “DCS_” from geospatial file names

Date	Affected Section(s)	Summary of Change
August 2011	M.10.2.7	Added Geodatabase feature classes in addition to shapefiles
August 2011	M.10.2.7	Added cross reference to Appendix L for projection
August 2011	M.10.2.10	Updated location of MIP data artifact upload guidance
August 2011	Figure M.10-1	Added "Flood Risk Assessment" to compliance form and updated certification text
August 2011	M.10.2.11	Deleted exclusion for topographic data files submitted as part of requirements of Section M.4
August 2011	M.11.1	Added text to include meeting minutes and artifacts for meetings throughout the lifetime of flood study project
August 2011	M.11.1	Added text administrative project data to technical data
August 2011	M.11.2.1	Deleted affidavit for the Notice of proposed flood elevation determination
August 2011	M.11.2.4	Added requirements that PDF files be created using source files and allow copying and pasting
August 2011	M.11.2.7	Added FEDD file submittal requirements.
August 2011	M.11.2.7	Added FIPS code to directory structure
August 2011	M.11.2.7	Added subfolder for Outcome of Community Engagement Meetings and removed affidavit for the Notice of proposed flood elevation determination
August 2011	M.11.2.7	Deleted FEDD from subfolder names for Supplementary_Post_Preliminary_Data
August 2011	M.12	Added section for Flood Risk Assessment Submittal Standards.
August 2011	M.12	"GIS Spatial Requirements" is moved to Appendix L.
August 2011	M.12.1	Deleted
August 2011	M.12.1.1	Moved to Appendix L
August 2011	M.12.1.2	Moved to Appendix L
August 2011	M.12.1.3	Moved to Appendix L
August 2011	M.12.1.4	Moved to Appendix L
August 2011	M.12.1.5	Moved to Appendix L
August 2011	M.12.2.1	Moved to Appendix L
August 2011	M.12.2.1	Moved to Appendix L
August 2011	Table M.12-1 S_Submittal_Info Spatial File	Added fields HUC8, STUDY_TYP, TOPO_SRC, TOPO_SCALE, CONT_INTVL, EFF_DATE, and CONTRACT_NO and moved to Appendix L
August 2011	M.12.3.1	Moved to Appendix L
August 2011	Table M.12-2 S_Subbasins Spatial File	Added fields HUC8, WTR_NM, BASIN_DESC and moved to Appendix L
August 2011	Table M.12-3 S_Nodes Spatial File	Added fields NODE_DESC. Removed fields SUMDSCH_ID, FUTDSCH_ID, SUMELEV_ID and moved to Appendix L.
August 2011	M.12.3.3	Moved to Appendix L
August 2011	Table M.12-3 L_Summary_Discharges Spatial File	Removed fields WTR_NM, DSCH_2PCT, DSCH_10PCT, DSCH_02PCT, WSEL_2PCT, WSEL_10PCT, and WSEL_02PCT and moved to Appendix L

Date	Affected Section(s)	Summary of Change
August 2011	Table M.12-3 L_Summary_Discharges Spatial File	Added fields NODE_ID and EVENT_TYP and moved to Appendix L
August 2011	Table M.12-3 L_Summary_Discharges Spatial File	Changed field names to DISCH, DISCH_UNIT, WSEL, and WSEL_UNIT and moved to Appendix L
August 2011	Table M.12-3 L_Summary_Discharges Spatial File	Changed DISCH_UNIT to A (required if applicable) and moved to Appendix L
August 2011	Table M.12-3 L_Summary_Discharges Spatial File	Clarified descriptions for DISCH, DISCH_UNIT, and WSEL and moved to Appendix L
August 2011	M.12.3.4	Deleted section on Future Conditions of Summary of Discharges Information Table and moved to Appendix L
August 2011	M.12.3.5	Moved to Appendix L
August 2011	Table M.12-3 L_Summary_ Elevations Table	Removed fields WTR_NM, NODE_DESC, WSEL_10PCT, WSEL_2PCT, WSEL_02PCT and moved to Appendix L
August 2011	Table M.12-3 L_Summary_ Elevations Table	Added fields NODE_ID and EVENT_TYP and moved to Appendix L
August 2011	Table M.12-3 L_Summary_ Elevations Table	Changed field names to WSEL and WSEL_UNIT and moved to Appendix L
August 2011	M.12.3.6	Moved to Appendix L
August 2011	Table M.12-4 S_Hydro_Reach Spatial File	Moved to Appendix L
August 2011	M.12.3.7	Revised profile baseline language and moved to Appendix L.
August 2011	Table M.12-4 S_Profile_Basln Spatial File	Added fields INTER_ZONE, R_ST_DESC, R_END_DESC, V_DATUM_OFF, LEN_UNIT, FLD_PROB1, FLD_PROB2, FLD_PROB3, SPEC_CONS1, SPEC_CONS2 and moved to Appendix L.
August 2011	Table M.12-4 S_Profile_Basln Spatial File	Moved to Appendix L
August 2011	M.12.3.8	Clarified cross-section use and added description of cross-section interpolation and moved to Appendix L
August 2011	Table M.12.5 S_XS Spatial File	Changed field name from WSEL_1PCT to WSEL_REG and moved to Appendix L
August 2011	Table M.12.5 S_XS Spatial File	Removed fields XS_ELEV_ID, XS_LV_ID, and XS_FUTR_ID and moved to Appendix L
August 2011	Table M.12.5 S_XS Spatial File	Added fields STREAM_STN, START_ID, XS_LN_TYP, STRMBED_EL, and PROF_XS_TEXT and moved to Appendix L
August 2011	M.12.3.9	Moved to Appendix L
August 2011	Table M.12-5 L_XS_Elev Table	Added fields XS_LN_ID and EVENT_TYP, NE_WIDTH_L, NE_WIDTH_R, LEVEE_TF, LVSCENARIO, WSELREG_LL, WSELREG_RL, FREEBRD_LL, FREEBRD_RL, CALC_NO_BW, and SEQ and moved to Appendix L

Date	Affected Section(s)	Summary of Change
August 2011	Table M.12-5 L_XS_Elev Table	Removed fields WSEL_10PCT, WSEL_1PCT, WSEL_02PCT, WTR_NM, XS_LTR, STREAM_STM, START_ID, STRMBED_EL, and WSEL_REG and moved to Appendix L
August 2011	Table M.12-5 L_XS_Elev Table	Changed field name from WSEL_2PCT to WSEL and moved to Appendix L
August 2011	M. 12.3.10	Deleted section "Cross Sections Future Conditions Table Information"
August 2011	Table M.12-5 L_XS_FutureCond Table	Removed table
August 2011	M.12.3.11	Deleted section "Cross Sections Levee Table Information"
August 2011	Table M.12-5 L_XS_Levee Table	Deleted table.
August 2011	M.12.3.12	Moved to Appendix L
August 2011	Table M.12-5 S_Stn_Start Spatial File	Added field LOC_ACC and moved to Appendix L
August 2011	M.12.3.13	Revised description of use for BFEs and moved to Appendix L
August 2011	Table M.12-6 S_BFE Spatial File	Moved to Appendix L
August 2011	M.12.3.14	Moved to Appendix L
August 2011	Table M.12-7 S_Alluvial Spatial File	Added fields FANAPEX_DA, AREA_UNITS, METH_DESC. Changed VELOCITY field to FAN_VEL_MN and FAN_VEL_MX and moved to Appendix L
August 2011	M.12.3.15	Moved to Appendix L
August 2011	Table M.12-8 S_Fld_Haz_Ar Spatial File	Changed field name from FLOODWAY to ZONE_SUBTY and moved to Appendix L
August 2011	M.12.3.16	Moved to Appendix L
August 2011	Table M.12-8 S_Zone_Ar Spatial File	Moved to Appendix L
August 2011	M.12.3.17	Moved to Appendix L
August 2011	Table M.12-9 S_Gen_Struct Spatial File	Added fields LOC_DESC, STRUC_DESC, and SHOWN_FIRM and moved to Appendix L
August 2011	Table M.12-9 S_Gen_Struct Spatial File	Removed fields DS_STRUCT_STN, CST_STR_ID, STRUCT_STN, START_ID, and LEVEE_STAT and moved to Appendix L
August 2011	Table M.12-9 S_Gen_Struct Spatial File	Moved LEN_UNIT, PAL_DATE, and LVDBASE_ID to Levee Table and moved to Appendix L
August 2011	M.12.4	Moved to Appendix L
August 2011	Table M.12-10 S_Cst_Tsct_Ln Spatial File	Added fields; TBASELN_ID, EVENT_TYP, RUP, WHAFIS_TF, OVERTOP_TF, BW_HGT_TF, and HVFLOW_TF and moved to Appendix L
August 2011	Table M.12-10 S_Cst_Tsct_Ln Spatial File	Changed ELEV_UNIT description to include Runup fields. Renamed field SWEL_1PCT to SWEL and moved to Appendix L
August 2011	Table M.12-11 L_Cst_Model Table	Added fields STUDY_TYP, LIMIT_FROM, LIMIT_TO, STRM_PRM, STRMPRM_DT, TDESTAT_MT, TDESTAT_DT, R_FETCH_MT, R_FETCH_DT, EROS_METH, EROS_DATE, HAZARDEVAL and moved to Appendix L

Date	Affected Section(s)	Summary of Change
August 2011	Table M.12-11 L_Cst_Model Table	Renamed field WAVE_EFF to WAVE_EFF_DT and moved to Appendix L
August 2011	Table M.12-12 S_Cst_Gage Spatial File	Renamed field GAGE_ID to CSTGAGE_ID and moved to Appendix L
August 2011	Table M.12-13 S_Tsct_Basln Spatial File	Added fields CST_MDL_ID, R_ST_DESC, R_END_DESC, and WTR_NM and moved to Appendix L
August 2011	Table M.12-14 S_CBRS_Ar Spatial File	Spatial file is now titles S_CBRS. Added field WTR_NM and moved to Appendix L
August 2011	M.12.4.5	Moved to Appendix L
August 2011	M.12.4.6	Moved to Appendix L
August 2011	Table M.12-14 S_CBRS_Ln Spatial File	Deleted table
August 2011	Table M.12-15 S_PFD_Ln Spatial File	Moved to Appendix L
August 2011	Table M.12-16 S_LIMWA Spatial File	Moved to Appendix L
August 2011	Table M.12-17 L_Cst_Struct Table File	Added fields STRUCT_ID and WTR_NM and moved to Appendix L
August 2011	M.13 Domain Tables	Deleted section. Domain Tables are now a separate document
August 2011	M.14 NFIP Metadata Profiles	Deleted section. NFIP Metadata Profiles is a separate document
August 2011	References	This is now Section M.13. Deleted reference to Draft Scoping Guidelines

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M.1 Overview

M.1.1 Introduction [August 2011]

The purpose of the Data Capture Standards (DCS) in this appendix is to provide a consistent framework for submittal, storage, and retrieval of the technical and administrative data needed for a Flood Risk Project. In addition, this appendix provides data submittal standards for supporting data that are used in performing risk assessment analyses and the creation of flood risk products but are not captured in the Flood Risk Database (Appendix O *Format and Standards for Non-Regulatory Flood Risk Products*). This framework is intended to improve the quality of flood risk project documentation; facilitate effective project handoff between organizations; provide easier retrieval of flood risk project data; and preserve the investment made in the data.

The data standards are provided in subsequent sections. Each section corresponds to major production data capture points in the Mapping Information Platform (MIP) workflow and includes guidance on submitting the following deliverables: discovery, base map, terrain, survey, hydrologic analysis, hydraulic analysis, alluvial fan analysis, coastal analysis, floodplain mapping for redelineation and digital conversion, post-preliminary data, and risk assessment for studies. These sections describe the minimum dataset of deliverables established by the Federal Emergency Management Agency (FEMA). This appendix replaces the previously published *Appendix M: Guidance for Preparing and Maintaining Technical and Administrative Support Data*; *Appendix N: Data Capture Standards*; and *Appendix N: Data Capture Guidelines*.

The requirements outlined in this appendix apply to FEMA-funded studies and restudies conducted by FEMA's mapping partners, including contractors, as well as those studies performed by communities, regional agencies, and State agencies participating in the Cooperating Technical Partners (CTP) program. The standards in this appendix must be used for all data uploads to the MIP. The data obtained from existing studies and used for mapping can be submitted in native format and do not have to comply with these standards.

Appendix M complements Appendix L, N and O of FEMA's *Guidelines and Standards for Flood Hazard Mapping Partners* (Guidelines). Appendix M allows FEMA to store and track engineering and support data throughout the life cycle of a FIS or a flood risk project. Appendix L provides standards for creating and storing regulatory mapped FIRM data. Appendix N *Flood Risk Data Development and Analysis* provides data development protocols, standards, and best practices for a consistent framework in the development of Flood Risk Datasets to be used in the Flood Risk Database, Flood Risk Map, and Flood Risk Report (a.k.a. flood risk products). Appendix O provides standards for the flood risk products.

M.1.2 Discovery [August 2011]

The Discovery section describes the standards (e.g., type, naming, and format) for the discovery data required to be submitted to FEMA for flood risk projects, flood risk assessments, and mitigation planning technical assistance projects. This information includes any Discovery deliverables that are not captured by the Coordinated Needs Management Strategy (CNMS).

M.1.3 Base Map [August 2011]

The Base Map section describes data needed for the FIS. This information includes aerial photographs, community boundaries, transportation, and other data to aid in the flood risk project process. The base map data must be certified per the standards discussed in Sections M.1.15 and M.3.2.3 of this document.

M.1.4 Terrain [August 2011]

The Terrain section describes the information needed to capture the digital topographic data used for the FIS. For coastal studies, bathymetric data used for the analysis of offshore areas and coastal waters are needed for submission. Digital topographic data must be certified for datasets funded by FEMA per the standards discussed in Section M.1.15 and M.4.2.3 of this document.

M.1.5 Field Survey [August 2011]

The Field Survey section describes the data required to digitally represent information collected in the survey phase of the flood risk project. These standards describe how the survey data for features such as dams, culverts, bridges, transects, structures, and channels must be submitted. If funded by FEMA, survey data must be certified per the standards discussed in Sections M.1.15 and M.5.2.3 of this document. If a flood risk project uses previously collected survey data not funded by FEMA, the information does not need to be translated to the deliverable format listed in this appendix.

M.1.6 Hydrology [August 2011]

The Hydrology section describes the data necessary to document the hydrologic procedures for estimating flood discharges for the FIS. The goal of this section is to describe the format and type of hydrologic data expected by FEMA for new and updated studies for rivers, lakes, closed basins, and ponds. Hydrologic data must be certified per the standards discussed in Sections M.1.15 and M.6.2.3 of this document.

M.1.7 Hydraulics [August 2011]

The Hydraulics section describes the format and type of hydraulic data to be provided to FEMA for the FIS. This section also provides standards for FIS report components, including Floodway Data Tables (FDTs), profiles, and FIS narrative text. The hydraulic data must be certified per the standards discussed in Sections M.1.15 and M.7.2.3 of this document.

M.1.8 Alluvial Fan [August 2011]

The Alluvial Fan section describes data submittal requirements for a flood risk project that includes an alluvial fan analysis. This section also includes standards for FIS elements and certification. The type of data deliverables and formats required are described in this section. The alluvial fan data must be certified per the standards discussed in Sections M.1.15 and M.8.2.3 of this document.

M.1.9 Coastal [August 2011]

The Coastal section outlines data and certification submittal requirements for coastal studies. These data must be submitted at the end of the flood risk project process, once the contractual requirements regarding quality control reviews have been completed. The type of data deliverables and formats required are

described in this section. The coastal data must be certified per the standards discussed in Sections M.1.15 and M.9.2.12 of this document.

M.1.10 Floodplain Mapping for Redelineation and Digital Conversion [August 2011]

The Floodplain Mapping for the Redelineation and Digital Conversion section describes types of deliverables and formats for floodplains and associated mapping products that are created by redelineating floodplains using updated topographic data and the conversion of non-revised effective FIRM information to digital format. The floodplain mapping data created by redelineation and digital conversion must be certified per the standards discussed in Sections M.1.15 and M.10.2.6 of this document.

M.1.11 Post-Preliminary Data [August 2011]

This section presents data generated during the post-preliminary phase of the mapping process that must be submitted to FEMA. This information includes data artifacts generated for studies throughout post-preliminary processing, such as the Flood Elevation Determination Docket (FEDD), preliminary and final Summary of Map Actions (SOMAs), and Revalidation letters. This section also includes the submittal of Floodplain Boundary Standard (FBS) self-certification information for all types of flood risk project methods and the results of community engagement meetings. The post preliminary data created must be certified per the standards discussed in Sections M.1.15 and M.11.2.2 of this document.

M.1.12 Risk Assessment [August 2011]

This section presents data that support the Risk Assessment and Flood Risk Products. This section describes the information used in the process of creating Flood Risk Products and could include data not found in other sections of Appendix M that will assist in re-creating the specifics of a risk assessment project. The risk assessment data created must be certified per the standards discussed in Sections M.1.15 and M.12.2.3 of this document.

M.1.13 Data Submittals to the MIP [August 2011]

It is extremely important that a complete set of the most up-to-date engineering and mapping data associated with changes to FEMA maps is captured by the MIP before their effective date. This includes data submitted to the MIP at various workflow steps described in this appendix and any revisions to previously submitted data during the life cycle of the mapping process, before to the flood risk project's effective date. These data form the scientific and technical basis for the flood map and are needed in the future to address challenges or changes to the maps. This requirement replaces the requirement to submit a hardcopy Technical Study Data Notebook (TSDN) at the end of each mapping project as outlined in Appendix M dated April 2003.

In order for a mapping project to advance in the MIP flood risk project workflow, the required data outlined in this appendix must be submitted to the MIP by mapping partners as they complete their scope at each workflow step they are assigned to perform. Data submitted at these workflow steps may change later during the flood risk project process for a variety of reasons, such as appeals received during the appeal period. If these changes require a revised preliminary map, a new project will have to be started

on the MIP. This project will have a new case number, which will follow the required workflow steps, and the revised data will be captured as the flood risk project moves throughout the workflow.

In other cases, where a revised preliminary map is not needed (e.g., updated model re-runs did not affect Base (1-percent-annual-chance) Flood Elevations (BFEs) or revised files are associated with documentation which does not affect maps), mapping partners are required to submit the revised data to the MIP via the "Load Studies Data Artifacts" of the "Data Upload" tab under MIP's "Tools & Links." Choose "TSDN" in the Study Data Type drop-down menu.

If the revised file is intended to replace a file that is already submitted to the MIP (e.g., the previously submitted file is incorrect or superseded by the new data), and the existing file cannot be overwritten because the original workflow task is completed and not available, MIPHelp must be contacted to remove the incorrect file/duplicate entry to avoid confusion in the future.

M.1.14 Certification of Data [August 2011]

Certification of submitted data for FEMA-funded studies is required. Although certification requirements are included in each of the following sections (workflow steps), each mapping partner must complete and submit only one product certification when their work on a project is complete. For example, if topographic data development is awarded to Contractor 1 as the only task, that contractor must upload a completed certification form (provided in Figure M.10-1) at the "Develop Topographic Data" workflow step once all the requirements in that contract are fulfilled. On the other hand, if Contractor 2 is assigned (contracted) to produce the preliminary FIRM, including hydrologic and hydraulic analyses, then Contractor 2 is required to submit one certification form along with the submittal of the preliminary FIRM. As stated in the certification form provided in Figure M.10-1, the contractor is certifying that the work performed was completed in accordance with the contract and all amendments thereto and direction from the Regional Project Officer and/or their representative and with sound and accepted engineering practices.

In addition, each mapping partner must certify (via the certification form provided in Figure M.10-1) that the files uploaded to the MIP represent the complete and final documentation of the work performed on the flood risk project. If any of the data in these files are modified during the mapping process, it is the responsibility of the mapping partner that made the modifications to the files to upload the revised files to the MIP using the upload process described in this section as well as subsequent sections for the specific deliverable.

M.2 Discovery Submittal Standards

M.2.1 Overview [August 2011]

The purpose of this section is to describe the standards (e.g., type, naming, and format) of the Discovery data required to be submitted to FEMA for flood risk projects. All data must be submitted in digital format. A mapping partner with the responsibility for performing Discovery is required to submit the data specified in this section to FEMA.

The Coordinated Needs Management Strategy (CNMS) database must be updated throughout Discovery, as applicable, based on the information and data collected. The mapping partner assigned with the task for "Discovery" per the Statement of Work (SOW) or Mapping Activity Statement (MAS), is required to submit the data in this section as part of the upload process in the Mapping Information Platform (MIP) workflow.

Information regarding the Discovery process is provided in Appendix I of these Guidelines. The mapping partner must follow the requirements outlined in Appendix I to collect as much information as possible regarding the watershed. The requirements and deliverables associated with the Discovery process that are not covered by the CNMS are described in this section.

M.2.2 Requirements [August 2011]

M.2.2.1 Data Files [August 2011]

Discovery deliverables include all the data collected during Discovery (including data collected after the Discovery meeting) and the draft and final Discovery Map. Any data collected during Discovery that are required by the CNMS must use the data model provided in the CNMS Database User's Guide to enter the data and update CNMS. Any Discovery deliverables that are not captured by the CNMS are listed in the following sections and must be submitted as specified in this section. If additional data are collected during Discovery that are not specifically mentioned in this section, those data must also be submitted in the format collected as part of Discovery deliverables as supplementary data. Data submitted to the MIP as part of this section must be consistent with data listed in the Discovery Report (see description under "Discovery Requirements" sub-section below).

If it is determined that a flood risk project is appropriate for the watershed, Discovery deliverables should also include the final scope of work for the flood risk project, and a project charter.

The Discovery deliverables listed below are categorized into two types:

- R – Required; indicates a deliverable item that must be delivered for every Discovery submittal, regardless of the circumstances of the individual watershed;
- A – Required if applicable; indicates a deliverable that is required to be submitted for all Discovery submittals unless the deliverable is not applicable or required to be produced for the flood risk project.

Discovery Requirements

- Project Team – Required: In a written digital format, provide contact information for each member of the flood risk project management team. Each team member's organization, phone number (and facsimile number, if available), email, and role should be identified.
- Community Contact List (Contact_Info) – Required: This table includes contact information for the county and every incorporated community in the flood risk project that has the following positions/roles occupied: Chief Executive Officer (CEO), such as Mayor, City Manager, County Judge, or other; State National Flood Insurance Program (NFIP) Coordinator; local Floodplain Administrator (if community participates in the NFIP); State Hazard Mitigation Officer (SHMO); and data/Geographic Information System (GIS) contact (person to contact to obtain local data for use in the flood risk project).

Table M.2-1. Contact_Info Tabular File

Fields	Description
ORGANIZATION	Community, Agency, or Organization Name
CEO	Is this the CEO (Yes/No)?
FPA	Is this the Floodplain Administrator (Yes/No)?
SHMO	State Hazard Mitigation Officer (Yes/No)?
GIS	Is this the Primary GIS Contact (Yes/No)?
FIRST NAME	Contact first name
LAST NAME	Contact last name
PHONE	Contact Primary Phone Number
ADDRESS	Contact Address
CITY	Contact City
STATE	Contact State Abbreviation
ZIP	Contact Zip Code
E-MAIL	Contact e-mail address
DATE	Date the contact information was confirmed

- Discovery Report – Required, if applicable: This report should form a complete record of the Project Discovery Initiation activities and deliverables completed prior to the Discovery Meeting. For example, a Table of Contents should be provided and a list of all data collected, followed by a write-up of the data analysis that went into preparing for the Discovery meeting.
- Political Area (DCS_S_Pol_Ar) – Required: This spatial file contains the political boundaries that cover the geographic extent of the flood risk project/mapping project. The spatial entity for this layer is a polygon.

Table M.2-2. DCS_S_Pol_Ar Spatial File

Field	Type	Length	R/A	Description
POL_AR_ID	Text	25	R	Primary key for table lookup. Assigned by table creator.
POL_NAME1	Text	50	R	Political Area Name 1. This is the primary name of the area shown, the area with floodplain management jurisdiction. For areas that have more than one name, this would be the primary name, with additional names shown in the field below. This would correspond to the official name of this jurisdiction used by the Federal Emergency Management Agency (FEMA) within the NFIP. For unincorporated areas of a county, this must be the county name (e.g., Montgomery County).
POL_NAME2	Text	50	A	Political Area Name 2. This is the secondary name of the area shown. Populated if there is a common name for an area other than the official jurisdiction name.
POL_NAME3`	Text	50	A	Political Area Name 3. This is the tertiary name of the area shown. Populated if there is a situation where islands, National Parks, National Forests, military bases, or other area boundaries and labels need to be shown on the FIRM underneath the POL_NAME1 and POL_NAME2 labels.
CO_FIPS	Text	3	R	County FIPS Code. This is the three-digit county Federal Information Processing Standard (FIPS) code. This is a standard numbering system that is used by the Federal government. Defined in FIPS Pub 6-4.
ST_FIPS	Text	2	R	State FIPS. This is the two-digit code that corresponds to the State FIPS code. This is a standard numbering system that is used by the Federal government. Defined in FIPS Pub 6-4. These two numbers correspond to the first two digits of the panel number.
COMM_NO	Text	4	R	Community Number. This is the four-digit number assigned by FEMA to each community for tracking purposes under the NFIP. On newer FIRMs the State FIPS and the community number appear below the community name.
CID	Text	6	R	Community Identification Number. This is the six-digit community identification number assigned by FEMA. It is created by combining the State FIPS code with the COMM_NO. If the jurisdiction does not have a community number assigned by FEMA, the CID is created by combining the State FIPS code with the abbreviation contained in the COMM_NO field (FED, ST, or OTHR).
ANI_TF	Text	1	R	Area Not Included. Acceptable values for this field are listed in the D_TrueFalse table.
ANI_FIRM	Text	6	A	Used for Area Not Included polygons where ANI_TF equals “T” and where the data is included in another FIRM Database, usually because it is a multicounty community. Enter the DFIRM_ID of the FIRM

Field	Type	Length	R/A	Description
				Database that contains the SFHA data of the ANI community. For a single-jurisdiction flood risk project, the value is composed of the 2-digit state FIPS code and the 4-digit FEMA CID code (e.g., 480001). For a countywide flood risk project, the value is composed of the 2-digit state FIPS code, the 3-digit county FIPS code, and the letter "C" (e.g., 48107C). Populate with "NP" if the area has never been converted to a FIRM Database from paper FIRM format.
SOURCE_CIT	Text	11	R	Source Citation. Abbreviation used in the metadata file when describing the source information for the feature.

- Transportation (DCS_S_Trnsport_Ln) – Required: This spatial file provides transportation features that cover the geographic extent of the flood risk project/mapping project. The spatial entity for this layer is a line.

Table M.2-3. DCS_S_Trnsport_Ln Spatial File

Fields	Type	Length	R/A	Description
TRANS_ID	Text	25	R	Primary key for table lookup. Assigned by table creator.
MTFCC	Text	25	R	MAF/TIGER feature class code. Defines the primary feature for the edge.
FULLNAME	Text	100	R	Full name of feature. Concatenation of expanded text for prefix, qualifier, prefix direction, prefix type, basemap name, suffix type, suffix direction, and suffix qualifier (as available) with a space between each expanded text field. This is the primary name of the feature. For areas that have more than one name, this would be the primary name with subsequent names shown in fields below. Route numbers and "Intercoastal Waterway" would also be included in this item.
ALTNAME1	Text	100	A	First alternative name of feature. This is the secondary name of the feature.
ALTNAME2	Text	100	A	Second alternative name of feature. This is the tertiary name of the feature.
SOURCE_CIT	Text	11	R	Source Citation. Abbreviation used in the metadata file when describing the source information for the feature.

- USGS HUCs (DCS_S_HUC) – Required: This spatial file contains the Hydrologic Unit Codes (HUCs) for the flood risk project flood risk project area. This will enable the capture of

appropriate drainage basins, including those outside the community boundary. The spatial entity for this layer is a polygon.

Table M.2-4. DCS_S_HUC Spatial File

Field	Type	Length	R/A	Description
HUC_ID	Text	25	R	Primary key for table lookup. Assigned by table creator.
HUC_CODE	Text	14	R	Unique hydrologic unit based on USGS levels of classification in the hydrologic unit system
HUC_NAME	Text	80	R	The primary name of the hydrologic unit
DIGITS	Short Integer	14	R	Number of digits in HUC-Code (8, 10, 12, or 14)
SOURCE_CIT	Text	11	R	Source Citation. Abbreviation used in the metadata file when describing the source information for the feature.

Discovery Meeting Data Requirements

- Discovery Meeting Invitation Letters – Required: In written format, provide the Discovery Meeting invitation letters. These letters should: identify the time and place for the meeting; provide contact information for the Project Manager or Management Staff; and discuss the intended purpose of the meeting.
- Discovery Meeting Agenda – Required: In written format, provide the Discovery Meeting agenda which identifies date, time, location, FEMA participants, topics to be covered, and an estimated time for each. If multiple Discovery meetings are to be held, meeting agendas for each must be included in this file and submitted as one file.
- Discovery Meeting Attendance Record – Required: In written format, provide a Discovery Meeting attendance record containing contact information for all attendees at the Discovery Meeting. If multiple Discovery meetings are to be held, attendance records for each must be included in this file and submitted as one file.
- Discovery Meeting Summary – Required: In written format, provide a Discovery Meeting summary, summarizing pertinent meeting information including key topics and community map update requests. If multiple Discovery meetings are to be held, a meeting summary for each must be included.
- Project Charter – Required, if applicable: If a project charter is signed between communities and FEMA, it must be submitted as part of Discovery. However, the project charter may not always be signed at the end of Discovery. In such cases, a project charter cannot be submitted. If a project charter is signed after Discovery, it must be submitted to the TSDN folder on the MIP.

Post-Discovery Meeting Data Requirements

- Mapping Activity Statement – Required, if applicable: In written format, provide Mapping Activity Statement (MAS) forms for the flood risk project. FEMA has developed MAS forms covering the tasks and standards for flood map projects that are being undertaken under a Cooperating Technical Partner (CTP) program Partnership Agreement.

- Statement of Work – Required, if applicable. In written format, provide SOW forms for the flood risk project. FEMA has developed SOW forms covering the tasks and standards for FEMA-contracted flood risk projects. Once the flooding sources in the SOW are contracted for an engineering update, these flooding sources must be updated in the CNMS database using the CNMS User's Guide.
- Discovery Map (DCS_S_Discovery_Map) – Required: This spatial file contains each stream segment and/or coastline contained within the FIRM database, National Hydrography Dataset (NHD) 100k coverage, or best available streamline data for flood sources included in the scope of work for the flood map project update. This file should provide an inventory of stream mileage for the project area by effective and proposed zone and flood risk project type. This will be shown on the final discovery map. The spatial entity for this layer is a line.

Table M.2-5. DCS_S_Discovery_Map Spatial File

Field	Type	Length	R/A	Description
DISCMAP_ID	Text	25	R	Primary key for table lookup. Assigned by table creator.
COUNTY	Text	100	R	County Name
COMMUNITY	Text	100	R	Community Name
STATE	Text	50	R	State Name. Acceptable values for this field are listed in the D_State_Name table.
CID	Text	6	R	Community Identification Number. This is the six-digit community identification number assigned by FEMA. It is created by combining the State FIPS code with the COMM_NO. If the jurisdiction does not have a community number assigned by FEMA, the CID is created by combining the State FIPS code with the abbreviation contained in the COMM_NO field (FED, ST, or OTHR).
ST_FIPS	Text	2	R	State FIPS. This is the two-digit code that corresponds to the State FIPS code. This is a standard numbering system that is used by the Federal government. Defined in FIPS Pub 6-4, these two numbers correspond to the first two digits of the panel number. Acceptable values for this field are listed in the D_State_FIPS table.
EZONE_TYP	Text	55	R	From effective flood risk project. Acceptable values for this field are listed in the D_Zone table.
EST_TYP	Text	30	R	Effective Study Type. Acceptable values for this field are listed in the D_Study_Typ table.
FLOOD_TYP	Text	50	R	Flooding type. Acceptable values for this field are listed in the D_Flood_Typ table.

Field	Type	Length	R/A	Description
WTR_NM	Text	100	R	Surface Water Feature Name. This is the name of the stream or water body, including lakes and shorelines.
STREAM_LEN	Double	Default	R	Length of stream associated with a flood risk project in feet
FBS_TF	Text	1	R	Are stream segments anticipated to meet Floodplain Boundary Standard (FBS)? Acceptable values for this field are listed in the D_TrueFalse table.
RANKING	Text	6	A	Ranking based on local/regional input. Values to be used for this field are High, Medium or Low.
FST_TYP	Text	30	R	Final Study Type. Acceptable values for this field are listed in the D_Study_Typ table.
SOURCE_CIT	Text	11	R	Source Citation. Abbreviation used in the metadata file when describing the source information for the feature.

- Proposed FIRM Panel Index (DCS_S_Prp_FirmPan) – Required: This spatial file contains the proposed panel scheme for the flood risk project area and the panels to be updated as a result of the Discovery meeting. The spatial entity for this layer is a polygon.

Table M.2-6. DCS_S_Prp_FirmPan Spatial File

Field	Type	Length	R/A	Description
FIRM_ID	Text	25	R	Primary key for table lookup. Assigned by table creator.
ST_FIPS	Text	2	R	State FIPS. Acceptable values for this field are listed in the D_State_FIPS table.
PCOMM	Text	4	R	Community or County Identification Number. This is the 3rd through the 6th digits of the panel number. For community based maps this corresponds to the FEMA Community Identification number. For countywide maps, this is the county (or county equivalent) FIPS code with a “C”.
PANEL	Text	4	R	Panel Number. This is the 7th through the 10th digits in the complete panel number. This is assigned by the scale of the map and the position within the community or county. The panel number scheme is described in detail in Appendix K of these Guidelines.

Field	Type	Length	R/A	Description
SUFFIX	Text	1	R	Map Suffix. This is the final digit in the complete panel number. This is a letter suffix at the end of the panel number. The map suffix is incremented one letter every time the panel gets republished.
FIRM_PAN	Text	11	R	FIRM Panel Number. This is the complete FIRM panel number, which is made up of ST_FIPS, PCOMM, PANEL, and SUFFIX. This is the 11-digit FIRM panel number that is shown in the title block of the map.
PANEL_TYP	Text	30	R	Panel Type. The type of FIRM panel that identifies whether the panel is printed or not printed and whether it is community based or countywide mapping. Acceptable values for this field are listed in the D_Panel_Typ table.
SCALE	Text	5	R	Map Scale. This is the denominator of the FIRM scale as a ratio. For example, 24000 is the denominator for a 1" = 2000' map. Acceptable values for this field are listed in the D_Scale table.
BASE_TYP	Text	20	R	Base map type. The type of base map used for the FIRM panel shall be recorded in this field. Acceptable values for this field are listed in the D_Basemap_Typ table.
UPDATED_TF	Text	1	R	Will this panel be updated as a result of Discovery meeting? Acceptable values for this field are listed in the D_TrueFalse table.
SOURCE_CIT	Text	11	R	Source Citation. Abbreviation used in the metadata file when describing the source information for the feature.

- Geospatial Data Summary – Required: In written format, provide an inventory for all collected data covering the entire flood risk project area.

M.2.2.2 Acceptable File Formats [August 2011]

Discovery data must be submitted in one of the following digital formats listed below.

- SHP – Esri Shapefile or personal/file Geodatabase format (for all spatial files)
  - Political Area (DCS_S_Pol_Ar)
  - Transportation (DCS_S_Trnsport_Ln)
  - USGS HUCs (DCS_S_HUC)
  - Discovery Map (DCS_S_Discovery_Map)
  - Final Study Areas (DCS_S_Fin_Study_Ar)

  - Proposed FIRM Panel Index (DCS_S_Prp_FirmPan)
- MS Word / PDF format for all text documents (PDF files to be created from native format where possible)
  - Project Management Team Contact Information
  - Discovery Meeting Invitation Letters
  - Discovery Meeting Agendas
  - Discovery Meeting Attendance Records
  - Discovery Report
  - Discovery Meeting Summary
  - Project Charter
  - Mapping Activity Statement Form(s)
  - Statement of Work Form(s)
  - Geospatial Data Summary
- XLS or XLSX/ MDB / DBF format for all tabular information files
  - Community Contact Info
  - National Metrics

M.2.2.3 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Discovery Metadata Profiles must be included with the submittal (to be developed). The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation.

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Discovery Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a Web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.2.2.4 Transfer Media [August 2011]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or on one of the following electronic media:

- CD-ROM
- DVD
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner)

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data are mailed to FEMA, all submitted digital media must be labeled with at least the following information:

- Mapping partner's name
- Community name and State for which the FIS was prepared
- Discovery Data
- Date of submission (formatted mm/dd/yyyy)
- Disk [*sequential number*] of [*number of disks*] (if not uploaded through workflow). The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission if the data is not uploaded through workflow on the MIP.

M.2.2.5 Transfer Methodology [August 2011]

- Discovery data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.2.2.6 Directory Structure and Folder Naming Conventions [August 2011]

The Discovery files in Section M.2.2 – Requirements, must be submitted consistent with the following directory structure. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

The *Discovery* folder is located on the root directory for each community submittal on the MIP (e.g., State/County_FIPS/MIP Project_ID). For riverine projects, discovery data must be submitted to the appropriate HUC-8 subfolder. The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service (NRCS). Coastal projects, for which the scope is identified independently from riverine projects, may encompass more than one HUC-8 code and, therefore, they must be submitted to the appropriate subfolder associated with the flooding source (water body) studied (such as the Atlantic Ocean). The Discovery deliverables must be uploaded to the applicable subfolders according the following directory structure:

- \HUC-8\Discovery\General
  - Metadata File
- \HUC-8\Discovery\Project_Discovery_Initiation
  - Project Management Team
  - Community Contact List
  - Discovery Report
  - Political Area (DCS_S_Pol_Ar)
  - Transportation (DCS_S_Trnsport_Ln)
  - HUC (DCS_S_HUC)
- \HUC-8\Discovery\Supplemental_Data
  - All other data collected during Project Discovery Initiation
- \HUC-8\Discovery\Discovery_Meeting
  - Meeting Invitations

  - Meeting Agendas/Meeting Minutes
  - Meeting Attendance Records
  - Meeting Summary
  - Project Charter
- \HUC-8\Discovery\Post_Discovery
  - SOW, or MAS
  - Discovery Map (DCS_S_Discovery_Map)
  - Final Study Areas (DCS_S_Fin_Study_Ar)
  - Proposed FIRM Panel Index (DCS_S_Prp_FirmPan)
  - Geospatial Data Summary

For coastal projects:

- \Water Body Name\ Discovery\Project_Discovery_Initiation
  - Project Management Team
  - Community Contact List
  - Discovery Report
  - Political Area (DCS_S_Pol_Ar)
  - Transportation (DCS_S_Trnsport_Ln)
- \Water Body Name\Discovery\Supplemental_Data
  - All other data collected during Project Discovery Initiation
- \Water Body Name\Discovery\Discovery_Meeting
  - Meeting Invitations
  - Meeting Agenda/Meeting Minutes
  - Meeting Attendance Record
  - Meeting Summary
  - Project Charter
- \Water Body Name\Discovery\Post_Discovery
  - SOW or MAS
  - Discovery Map (DCS_S_Discovery_Map)
  - Final Study Areas (DCS_S_Fin_Study_Ar)
  - Proposed FIRM Panel Index (DCS_S_Prp_FirmPan)
  - Geospatial Data Summary

M.3 Base Map Submittal Standards

M.3.1 Overview [August 2011]

This section describes the format and type of base map data required to be submitted to FEMA for the Flood Insurance Study (FIS). All data must be submitted in digital format. The mapping partner performing "Acquire Base Map" is required to submit the data in this section.

The base map records and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all Project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the new or revised FIS report and FIRM.

M.3.2 Requirements [August 2011]

M.3.2.1 Data Files [August 2011]

The minimum required data for the basic mapping data submission are the source mapping data and the base map files used in the flood risk project. These data can be contained in a single file or in tiled files for non-vector data only. Tiling is not suggested for vector data because file sizes are small enough to be manageable. These submissions must be compliant with the base map file standards in Appendix L. The details on the spatial and look-up tables required in this section are provided in Appendix L which also include DFIRM_ID (study identifier) and VERSION_ID (product identifier) fields. For data submittals required in this section, VERSION_ID must be populated in these tables. However, DFIRM_ID field can be left blank until the creation of the FIRM Database. The following information must be submitted:

Table M.3-1. Required Base Map Files Description

Required Base Map Files Description	Corresponding Appendix L Feature Name
Location of areas updated in this flood risk project along with attributes associated with each data development DCS submittal	S_Submittal_Info
Hydrographic features, including streams, rivers, lakes, and shorelines	S_Wtr_Ln and S_Wtr_Ar (optional)

Required Base Map Files Description	Corresponding Appendix L Feature Name
Current political boundary polygons, including those that define the county, corporate limits, extraterritorial jurisdictional areas, military lands, and Native American lands	S_Pol_Ar
Range, township, and section lines/Public Land Survey System, if applicable	S_PLSS_Ar
Road, railroad, airport/runway centerline data (MAF/TIGER format)	S_Trnsport_Ln
Hydraulic structures (bridges, dams, culverts etc., excluding levees).	S_Gen_Struct
Datum conversion points used to determine the vertical datum conversion, if applicable.	S_Datum_Conv_Pt
Feature names for all of the above features that have names and may be provided as annotation/text features or as attributes	NA
Flood Insurance Rate Map panel layout, either existing or new depending on whether this is a first time countywide product.	S_FIRM_Pan
Source Citation information for use in the FIS Bibliography Table and in the Preliminary and Final FIRM Database metadata files.	L_Source_Cit
For Ortho-based maps, the following additional datasets are required:	
Ortho Imagery	NA
Imagery index if the provided data is tiled or mosaic	S_Base_Index

For either base map type, a narrative describing the scope of work, direction from FEMA, issues, information for the next mapping partner, etc., must be submitted.

M.3.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Acquire Base Map." General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of acquiring the base map. It includes any documentation generated during this task, such as letters, transmittals, memoranda, general status reports and queries, special problem reports (SPRs), technical issues that need to be documented, and direction given by FEMA. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.3.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) base map data development must be certified using the Certification of Compliance Form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the"Acquire Base Map" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A

PDF file of this form, with the original signature, date, and seal affixed to the form, must be submitted digitally in the general directory identified in section M.3.2.8. This form must be signed by a registered or certified professional from the firm contracted to perform the work, or by the responsible official of a government agency. A digital version of this form is available at www.fema.gov.

M.3.2.4 Acceptable File Formats [August 2011]

Base map data must be submitted in a georeferenced, digital format. These data can be contained in a single file or in a tiled set of files. Any tiled data must have an accompanying index spatial file. The following formats are acceptable for files:

- BIL – Band Interleaved by Line (image format linked with satellite derived imagery);
- Esri Personal/file Geodatabase;
- Esri Shapefile;
- GeoTIFF – TIFF variant enriched with GIS-relevant metadata;
- IMG – ERDAS IMAGINE image file format;
- JPEG2000;
- MrSID – Multi-Resolution Seamless Image Database;
- MS Word format for project narrative;
- PDF format for general correspondence and certification;
- PNG and JPEG – georeferenced; and
- TIF – with accompanying world file.

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hardcopy text documents. Created PDF files must allow text to be copied and pasted to another document. In addition, Esri shapefiles and Geodatabase files must be projected and have projection information defined (refer to Appendix L for additional information).

M.3.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP OrthoImagery and/or Base Map Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA, based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the “Guides & Documentation” tab, under “MIP User Care”.

If metadata is available from an agency or organization that provided the orthophotos or other data, it should be included in the metadata submittal. Reference the data providers’ original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.3.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or by mailing the files to FEMA on one or more of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions, with a mailing label for return to the mapping partner).

In special situations, or as technology changes, other media may be acceptable if coordinated with FEMA.

When data are mailed to FEMA, all submitted electronic media must be labeled with at least the following information:

- Mapping partner's name;
- Community name and State for which the FIS was prepared;
- Base Mapping Data;
- Date of submission (formatted mm/dd/yyyy);
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.3.2.7 Transfer Methodology [August 2011]

Base Map Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.3.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files presented in Section M.3.2 – Requirements must be submitted to the MIP or mailed to FEMA within the following directory structure. Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8). The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

- \HUC-8\General
  - Project narrative
  - Certification
  - Metadata file
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes.
- \HUC-8\Base_Map\Spatial_Files

- Road and railroad centerline data
- River, stream, lakes, and shorelines
- Structures (levees)
- Parks and forests
- Feature names
- Political boundaries
- Range, Township and Section lines
- Orthophotos
- Base map index

M.4 Terrain Submittal Standards

M.4.1 Overview [August 2011]

This section describes the format and type of terrain data required to be submitted to FEMA for the Flood Insurance Study (FIS). All data must be submitted in digital format. The mapping partner performing "Develop Topographic Data" is required to submit the data in this section.

The mapping partner should refer to Appendix A of these Guidelines and the USGS *LiDAR Guidelines and Base Specification*, v13 for guidance on terrain data production. This section is not intended to detail the specifications and procedures for coastal hydrographic surveys. The reader is referred to the following additional sources for details on coastal surveys:

- National Oceanic and Atmospheric Administration (NOAA) NOS Hydrographic Survey Specifications and Deliverables (April 2007);
- NOAA Office of Coast Survey Hydrographic Surveys Division Field Procedures Manual (March 2007); and
- U.S. Army Corps of Engineers (USACE) National Coastal Mapping Program Joint LiDAR Bathymetry Technical Center for Expertise.
- Appendix D of the Guidelines and Specifications for Flood Hazard Mapping Partners (February 2007).

The terrain data records and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the new or revised FIS report and FIRM.

M.4.2 Requirements [August 2011]

M.4.2.1 Data Files [August 2011]

The minimum data required for the terrain data submission are the source terrain and the processed terrain data used in the flood risk project. These data can be contained in a single file or in tiled files. When tiled files are submitted, they must be accompanied by a tiling index file. If any processing has been performed, the original and final files must be submitted as well. For instance, if terrain data were blended from three different sources to create the final terrain data, the original of the three sources and the final terrain file that results from the blending process must be submitted. This information is required to be a georeferenced, digital submittal. The following information must be submitted when it is used to perform a flood risk project:

- Light Detection and Ranging(LiDAR) data;

  For projects that acquire new LiDAR data:

  - Metadata (must comply with the requirements in the USGS *LiDAR Guidelines and Base Specification*, v13). In addition, the finished elevation product for hydraulic modeling should be documented by a FGDC-compliant metadata file that complies with the FEMA Elevation Metadata Profile
  - QA/QC reports in compliance with FEMA requirements (must include the vertical accuracy calculations as a Microsoft Excel spreadsheet)
  - Project documentation (must include a Pre-flight Operations Plan and Post-flight Aerial Survey and Calibration Report)
  - Raw point cloud data (must comply with the requirements in the USGS LiDAR Guidelines and Base Specification, v13)
  - Classified point cloud data (must comply with requirements in the USGS LiDAR Guidelines and Base Specification, v13)
  - Optional breaklines, when produced, must be delivered in compliance with FEMA requirements)
  - Optional digital bare earth elevation data product(s) (e.g., DEM, DTM, contours) in file formats specified in the Statement of Work

  For existing LiDAR data not processed as part of the project, the bare earth data must be submitted, and the submittal of the all returns data (if available) is optional.

- Photogrammetric data;
  - Metadata (must comply with the requirements in the USGS *LiDAR Guidelines and Base Specification*, v13).
  - Collection Report detailing mission planning and flight logs, flying heights, camera parameters, forward overlap and sidelap
  - Survey Report detailing the collection of control and reference points used for calibration and QA/QC
  - Aerial triangulation (AT) report detailing compliance with relevant accuracy statistics.
  - Processing Report detailing photogrammetric processed used to manually compile elevation data or to semi-automatically compile elevation data with automated image correlation or other techniques
  - QA/QC reports in compliance with FEMA requirements
  - Geo-referenced extents of each delivered dataset
  - Digital bare earth elevation data product (DEM, DTM, mass points, breaklines, contours) specified in the Statement of Work
  - Optional breaklines, when produced, must be delivered in compliance with FEMA requirements
- Tiling index for data files;
- Contours;
- Bathymetry;
- Digital Elevation Models (DEMs);
- Triangulated Irregular Networks (TINs) and ESRI Terrain datasets;
- Hydro-corrected DEMs;

- USGS topographic data;
- All other relevant terrain data; and
- A project narrative that includes scope of work, project issues and/or modifications, direction from FEMA and other relevant correspondence, information for next mapping partner, references, etc.

A spatial file is required for use whenever terrain data is submitted in a tiled format. A Tile Index spatial file must accompany each different set of tiled data. While all tiled terrain data may reference the same Tile Index, it is possible that each set of tiled data references a unique Tile Index based on different origins and cell sizes (for example, natural DEMs, Hydro corrected DEMs, contours and flow vectors could each be based on a different Tile Index). Tiles must be topologically correct and have only one part, and cannot self-intersect (must be simple). Adjacent tiles should not overlap or have gaps between them.

M.4.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Develop Topographic Data." General correspondence is the written correspondence generated or received by the mapping partner to fulfill the requirements of developing topographic data. It includes any documentation generated during this task, such as letters, transmittals, memoranda, general status reports and queries, SPRs, technical issues that need to be documented, and direction given by FEMA. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of this appendix.

M.4.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) terrain data development must be certified using the Certification of Compliance Form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the "Develop Topographic Data" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF file of this form with the original signature, date, and seal affixed to the form must be submitted digitally in the general directory identified in Section M.4.2.8. This form must be signed by a registered or certified professional from the firm contracted to perform the work, or by the responsible official of a government agency. A digital version of this form is available at www.fema.gov.

M.4.2.4 Acceptable File Formats [August 2011]

Terrain data used to perform the flood risk project must be submitted in a georeferenced, digital format as listed below. These data can be contained in a single file or in a tiled set of files. Any tiled data must have an accompanying index spatial file. Note that the FEMA and USGS LiDAR specifications include some specific file format requirements.

- Contours, Masspoints, and breaklines – Personal/file Geodatabase, DXF, or shapefile (2D or 3D)
- DEMs – Esri grid, GeoTIFF, or ASCII grid
- LiDAR – LAS file, ASCII x, y, z file (comma or space delimited)
- Terrain and/or TIN– Esri ArcGIS
- MS Word – project narrative

- PDF – correspondence and certification

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. Created PDF files must allow text to be copied and pasted to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected.

M.4.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Terrain Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA, based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Terrain Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

Metadata should also comply with the requirements in the USGS *LiDAR Guidelines and Base Specification*, v13. In addition, the finished elevation product for hydraulic modeling should be documented by a FGDC-compliant metadata file that complies with the FEMA Elevation Metadata Profile. Project documentation must also include a pre-flight Operations Plan and a post-flight Aerial Acquisition and Calibration Report per FEMA requirements.

M.4.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or by mailing the files to FEMA on one or more of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions, with a return label for shipment back to the mapping partner).

In special situations, or as technology changes, other media may be acceptable if coordinated with FEMA.

When data are mailed to FEMA, all submitted digital media must be labeled with at least the following information:

- Mapping partner's name;
- Community name and State for which the FIS was prepared;
- Terrain Data;

- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.4.2.7 Transfer Methodology [August 2011]

Terrain artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.4.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files presented in Section M.4.2 – Requirements must be submitted to the MIP or mailed to FEMA within the following directory structure. For FEMA-funded LiDAR acquisition projects, LiDAR data must be submitted in its entirety to the MIP even if the collection footprint extends beyond the current Risk MAP project area. If LiDAR data is obtained for a project from a third party (e.g., existing LiDAR data from a County), only LiDAR data used for that project must be submitted to the MIP. Third party LiDAR data outside the project area must not be submitted. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP. Terrain files are arranged into appropriate directories based on data type. Only directories appropriate to the project are required.

- \General
  - Project narrative
  - Certification
  - Flight plans and logs
  - Mapping partner and independent QA/QC reports
  - Metadata file
- \Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes.
- \Terrain\Source\Raw Point Cloud Data
  - LiDAR data – Raw Point Cloud Data
  - LiDAR Tile Index spatial file (if used)
- \Terrain\Source\Classified Point Cloud Data
  - LiDAR data – Classified Point Cloud Data
  - LiDAR Tile Index spatial file (if used)
- \Terrain\Source\Breaklines
  - 3D breakline spatial files
  - 3D breakline Tile Index spatial file (if used)
  - 2D breakline spatial files
  - 2D breakline Tile Index spatial file (if used)
- \Terrain\Source\Bare Earth DEM
  - Bare earth DEM files

  - Tile Index spatial file (if used)
- \Terrain\Source\Contours
  - Contour spatial files
  - Contour Tile Index spatial file (if used)
  - Bathymetric files
  - Bathymetric Tile Index spatial file (if used)
- \Terrain\Source\TIN
  - Uncorrected TIN files
  - Terrain (Esri ArcGIS format)
  - Tile index spatial file (if used)
  - Mass points (if used)
- \Terrain\Source\HDEM
  - Hydrologically corrected DEM files
  - Terrain (Esri ArcGIS format)
  - Tile Index spatial file (if used)
- \Terrain\Final\Classified Point Cloud Data
  - LiDAR data – Classified Point Cloud Data
  - LiDAR Tile Index spatial file (if used)
- \Terrain\Final\Breaklines
  - 3D breakline spatial files
  - 3D breakline Tile Index spatial file (if used)
  - 2D breakline spatial files
  - 2D breakline Tile Index spatial file (if used)
- \Terrain\Final\Bare Earth DEM
  - Bare earth DEM files
  - Tile Index spatial file (if used)
- \Terrain\Final\Contours
  - Contour spatial files
  - Contour Tile Index spatial file (if used)
  - Bathymetric files
  - Bathymetric Tile Index spatial file (if used)
- \Terrain\Final\TIN
  - Uncorrected TIN files
  - Terrain (Esri ArcGIS format)
  - Tile index spatial file (if used)
  - Mass Points (if used)
- \Terrain\Final\HDEM
  - Hydrologically corrected DEM files
  - Terrain (Esri ArcGIS format)
  - Tile Index spatial file (if used)

- \Terrain\Supplemental Data
  - As-built drawings
  - GIS representation of structures

M.5 Field Survey Submittal Standards

M.5.1 Overview [August 2011]

The purpose of this section is to provide the type and format of survey data that must be submitted to FEMA for the Flood Insurance Study (FIS). All data must be submitted in digital format. The mapping partner contracted to "Perform Field Survey" is required to submit the data in this section.

This section is not intended to specify in-process compilation or procedures, but rather to present the standards and requirements for output and deliverables. The mapping partner should refer to Appendix A of these Guidelines for guidance on the performance of surveying. The formats specified in this section are required for new surveys for FEMA-funded studies. Surveys taken from previous studies, or not associated with the current flood risk project, do not need to be translated to the format specified in this section. This survey data must be uploaded in the native data format.

This section will focus on the data that are obtained during the survey of the following features:

- Cross Sections;
- Transects;
- Temporary Bench Marks;
- High Water Marks; and
- Structures
  - Bridges
  - Channels
  - Culverts
  - Dams
  - Levees
  - Coastal Structures

Survey data must be referenced to a standard coordinate system, employ a standard projection, and specify the horizontal and the vertical datums used. These positional references are established prior to the field data collection and topographic mapping phase of the project. All planimetric and topographic features must be collected and referenced to this coordinate system and projection. A detailed discussion of aerial mapping and surveying standards, which includes horizontal and vertical control for new mapping, is provided in Appendix A of these Guidelines. A discussion of vertical datum selection and conversion is provided in Appendix B of these Guidelines.

The field survey records and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;

- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.5.2 Requirements [August 2011]

M.5.2.1 Data Files [August 2011]

The following deliverables are required for survey submittals:

- Survey Files;
- Digital Photographs;
- Digital Sketches; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

Survey notebooks can be included but are not required. Consistent data collection methods must be followed for FEMA-funded survey data collection in support of the FIS. All survey data must be collected and delivered in the appropriate coordinate system and vertical datum and use standard description codes (survey codes listed in Table M.5.2) and standard naming and file types.

M.5.2.1.1 *Naming Conventions* *[March 2009]*

All structures and cross sections must have a unique alpha three-character ID as a feature name. A feature name (three-character ID) must have the abbreviated stream name followed by the number of the feature on that stream. All numbers must start from the downstream limit and increase upstream. Names must begin with an abbreviation consisting of the first three letters of the stream name. For example, Swift Creek would be **SWI**. In numbering structures and cross sections, it is suggested to use a numbering system that allows for intermediate numbers to be added later in cases where a structure or cross section is skipped or added (e.g., 100, 200, 300, etc.). Some variation is allowable if multiple streams in the same flood risk project area begin with the same three letters. The name and numbers must be separated by an underscore rather than space or dashes. An optional descriptor can be included at the beginning of the names to accommodate statewide programs (e.g., NC10_SWI_500_1).

For unnamed tributaries, a convention is to use the nearest named stream that the unnamed stream flows into as part of the naming convention. For example, the first structure on an unnamed tributary that flows into Swift Creek would be SWI_100_1 numbered sequentially from downstream to upstream. The second structure on this unnamed tributary will be SWI_200_1.

As part of the reconnaissance process, mapping partners must review all the stream names to determine the best way to name the files and streams. Before collecting survey data, basic naming and location for each hydraulic feature to be surveyed should be set and sketched out on work sheets.

M.5.2.1.2 *Survey Data File Naming Convention and Format* *[August 2011]*

Survey data files must also be organized and named based on the stream name (Swift_Creek_ 3_15_2011.txt). Coastal transects and structures survey data files should be named based on the flooding source, and community (Atlantic_Ocean_City_MD_3_15_2011.txt). The date in the file name is the date

the deliverable file was created. Data files must be stored in a comma delimited text file, spreadsheet, or database format and include all hydraulic feature data and bench marks surveyed for that stream. The file must be developed in a tabular format that includes columns for point number, northing, easting, elevation, survey code and the type of structure. Northing and easting column headings must include coordinate system and units. The elevation column heading must include datum and units. The survey code column must list the survey code per the data dictionary. The last column should provide the type of structure such as "Cross Section No. 2", "State Route 22 Bridge", Transect No. 55, etc. An example file is shown in Table M.5-1. All point data associated with structures or features may be listed in one table. As needed, the easting and northing units can be converted into latitude and longitude.

Table M.5-1. Survey Data File Example

(Hydraulic Feature SWI_32400 on Swift Creek)

Structure ID	PT NO.	NORTHING WV SPC S NAD 1983 (SFT)	EASTING WV SPC S NAD 1983 (SFT)	Elev. NAVD 1988 (FT)	Code	Structure Type
SWI_32400	32400	468854.208	1737859.314	607.66	GR	Cross Section No 2
SWI_32400	32401	468865.357	1737850.764	602.14	GR	Cross Section No 2
SWI_32400	32402	468875.480	1737842.719	597.75	GR	Cross Section No 2
SWI_32400	32403	468881.852	1737838.918	593.52	TOBL	Cross Section No 2
SWI_32400	32404	468887.119	1737835.142	591.86	TOSL	Cross Section No 2
SWI_32400	32405	468897.284	1737830.623	581.12	CH	Cross Section No 2
SWI_32400	32406	468900.368	1737828.459	581.48	CHCL	Cross Section No 2
SWI_32400	32407	468905.686	1737824.840	581.16	CH	Cross Section No 2
SWI_32400	32408	468912.298	1737821.658	583.91	TOSR	Cross Section No 2
SWI_32400	32409	468917.314	1737816.902	592.42	TOBR	Cross Section No 2
SWI_32400	32410	468926.152	1737809.303	596.96	GR	Cross Section No 2
SWI_32400	32411	468931.695	1737804.390	598.74	GR	Cross Section No 2
SWI_32400	32412	468942.672	1737796.103	605.24	GR	Cross Section No 2

M.5.2.1.3 *Survey Photographs and Sketches* *[March 2009]*

Every hydraulic feature must have a unique identification name that will also be shared by the photographs with additional suffixes to indicate location. Five digital photographs must be taken for each structure and two digital photographs taken for each cross section. For example, a structure on Swift Creek identified as "SWI-100" would be as follows:

- SWI_100_DSCH.jpg – downstream channel (from the structure looking downstream)
- SWI_100_DSFACE.jpg – downstream face of the structure
- SWI_100_OTXS.jpg – overtopping cross section looking left to right
- SWI_100_USFACE.jpg – upstream face of the structure
- SWI_100_USCH.jpg – upstream channel

A cross section on Swift Creek would be as follows:

- SWI_100_DSCH.jpg – downstream channel (from the structure looking downstream)
- SWI_100_USCH.jpg – upstream channel

The surveyor should keep a photo log for each stream surveyed, so that photograph naming and completeness can be checked. The photo log does not have to be submitted as a deliverable.

Photographs must be limited to one megabyte in size and stored in .jpg (jpeg) format for maximum compression. Photographs are critical and are used to determine the Manning's roughness coefficient and hydraulic model development. Photographs must be taken with the clearest view and reviewed for clarity, especially in low light conditions, before leaving the site. In locations where obstructions may prevent a single picture from being taken to represent the required view, multiple photographs may be taken and stitched together to form the final view.

A survey sketch must be prepared at all hydraulic features, including cross sections (e.g., Figures M.5-2 and M.5-4). The sketch must include notations and measurements representing the structural geometry and the natural ground and show description codes and shot numbers from the field survey so that the sketch can be related to the field survey. Each sketch must include a planimetric and profile view (viewed looking downstream left to right, upstream face of structures) and show the following items: piers/piles, channel banks, channel, direction of flow, rails, deck, footings, abutments, culvert inverts, shape and size of opening, bench mark location, skew to flow, and north arrow.

Sketches must be scanned and named. Scans must be limited to one megabyte (approximately 200 dpi) and stored in PDF or .jpg (jpeg) format. File names must be based on stream and structure/cross-section number (e.g., SWI_100_SKETCH.jpg).

Digital deliverables including points, photographs, and sketches must be organized by stream name.

M.5.2.1.4 *Survey Codes* *[August 2011]*

Table M.5-2 lists the required survey codes and descriptions that must be used for new survey data submissions. Figures M.5-1 through M.5-10 show specific examples for some of the field survey point locations and the corresponding survey codes. Annotation of photographs, such as those provided in Figure M.5-1 and M.5-3, is not required. All annotated photographs provided in this sub-section are for informational purposes only and show the locations of data points with corresponding survey codes for reference.

Table M.5-2. Survey Codes

Code	Description	Field Survey Location
ABT	Abutment	face/foot of abutment of bridge
BOCEDS	Back Of Curb Edge	where slope meets top of culvert or top of headwall above culvert

Code	Description	Field Survey Location
	Down Stream	centerline on downstream end for determining outlet projection
BOCEUS	Back Of Curb Edge Up Stream	where slope meets top of culvert or top of headwall above culvert centerline on upstream end for determining inlet projection
BRCL	Bridge Centerline	centerline of bridge in overtopping section
CH	Channel	stream bottom between TOS shots
CHCL	Channel Centerline	center of the main flow area of the stream
CUL	Culvert Shape	multiple CUL codes can be used to define shapes for culverts, especially irregular shapes
CULCL	Culvert Centerline	centerline of culvert in overtopping section
CULDSCR	Culvert Down Stream Crown	the highest point of the downstream end of a culvert
CULDSINV	Culvert Down Stream Invert	the lowest point of the downstream end of a culvert
CULUSCR	Culvert Up Stream Crown	the highest point of the upstream end of a culvert
CULUSINV	Culvert Up Stream Invert	the lowest point of the upstream end of a culvert
DAMCL	Dam Centerline	the high point of a dam
DH	Dune Heel	landward toe of primary frontal dune
DP	Dune Peak	peak or rear shoulder of primary frontal dune
DT	Dune Toe	seaward toe of primary frontal dune
EOB	End Of Bridge	end of the bridge deck at the road/rail elevation
ERM	Elevation Reference Mark	Permanent elevation monument. An ERM must be set at every structure and at cross sections if they are more than half a mile to the nearest structure.
FBCL	Foot Bridge Centerline	centerline of non-vehicular bridges in overtopping section
GDR	Guardrail	top of guardrail at ends to define limit and height
GDRBOT	Guardrail at Bottom	base of guardrail at ends to define and height
GR	Ground	on ground to show elevation changes, used outside TOB shots, between TOB and TOS, and to indicate islands or bars within the channel. When used in channel cross-section surveys, a GR point must be placed at least 15 feet past the top of bank or until there is no overhead obstruction from foliage. If overhead foliage is too thick for the entire overbank area, full valley cross sections should be a consideration for modeling.
HWMARK	High Water Mark	historical high water marks-mud/stain lines, drift lines, parole evidence, etc.
INVDS	Invert Down Stream	channel invert at downstream end of structure, used to define paved aprons
INVUS	Invert Up Stream	channel invert at upstream end of structure, used to define aprons
LC	Low Chord	change in bridge deck thickness, usually at center of a pile row or pier. Multiple low chord codes can be used to define irregular shaped bridges such as arched bridges with the explanation of the multiple LC shots shown in the sketch for the structure.
LCDSL	Low Chord Down Stream Left	bottom of deck and beam at the downstream left corner of bridge[1]
LCDSR	Low Chord Down Stream Right	bottom of deck and beam at the downstream right corner of bridge[1]
LCUSL	Low Chord Up Stream Left	bottom of deck and beam at the upstream left corner of bridge[1]

Code	Description	Field Survey Location
LCUSR	Low Chord Up Stream Right	bottom of deck and beam at the upstream right corner of bridge[1]
LV	Levee	Centerline of the top of a levee
PIER	Pier	the up and downstream centerline of a pier
PILE	Pile	the up and downstream centerline of a row of piles
RAIL	Rail	top of rail to define limits and height of railing on structures
RAILBOT	Rail Bottom	bottom of rail to define limits and height of railing on structures
RDCL	Road Centerline	the centerline on a crowned road or the high side of a road with super elevation
SFLOOR	Sea Floor	shots either direct or combination of bathymetric and conventional/GPS survey of coastal area which can be collected during structure or transect survey
TEMP	Temporary Control Point	temporary control point used for data collection of cross sections and structures. TEMPs are established when ERMs are not present.
TOB	Top Of Bank	top of bank in a multiple channel scenario
TOBL	Top Of Bank Left	break point from over bank to channel on the left side when looking downstream
TOBR	Top Of Bank Right	break point from over bank to channel on the right side when looking downstream
TOD	Top Of Deck	to show an irregular arch or dip in a bridge deck between the bridge corner shots
TODDSL	Top Of Deck Down Stream Left	downstream left corner of a bridge on the deck directly above the LCDSL shot to measure deck thickness and width[1]
TODDSR	Top Of Deck Down Stream Right	downstream right corner of a bridge on the deck directly above the LCDSR shot to measure deck thickness and width[1]
TODUSL	Top Of Deck Up Stream Left	upstream left corner of a bridge on the deck directly above the LCUSL shot to measure deck thickness and width[1]
TODUSR	Top Of Deck Up Stream Right	upstream right corner of a bridge on the deck directly above the LCUSR shot to measure deck thickness and width[1]
TOS	Toe Of Slope	the toe in a multiple channel scenario
TOSL	Toe Of Slope Left	break point from channel bank to channel bed on the left side when looking downstream
TOSR	Toe Of Slope Right	break point from channel bank to channel bed on the right side when looking downstream
WALL	Wall	top of a retaining wall, also used outside TOBL and TOBR when the stream banks are vertical walls or rock cuts
WALLBOT	Wall Bottom	bottom of a retaining wall, also used outside TOBL and TOBR when the stream banks are vertical walls or rock cuts
WEIR	Weir	top of dam spillways and outlet structures. Multiple weir codes may be used to collect data for gates, flashboards, and other operable structures. The explanation of the multiple shots must be shown in the structure sketch.
WW	Wing Wall	top face of each end of a wing wall or headwall on a structure to define height and length
WWBOT	Wing Wall Bottom	base of each end of a wing wall or head wall on a structure to define height and length

[1] The four bridge corner shots need to be taken outside of any rail to accurately measure hydraulic length.

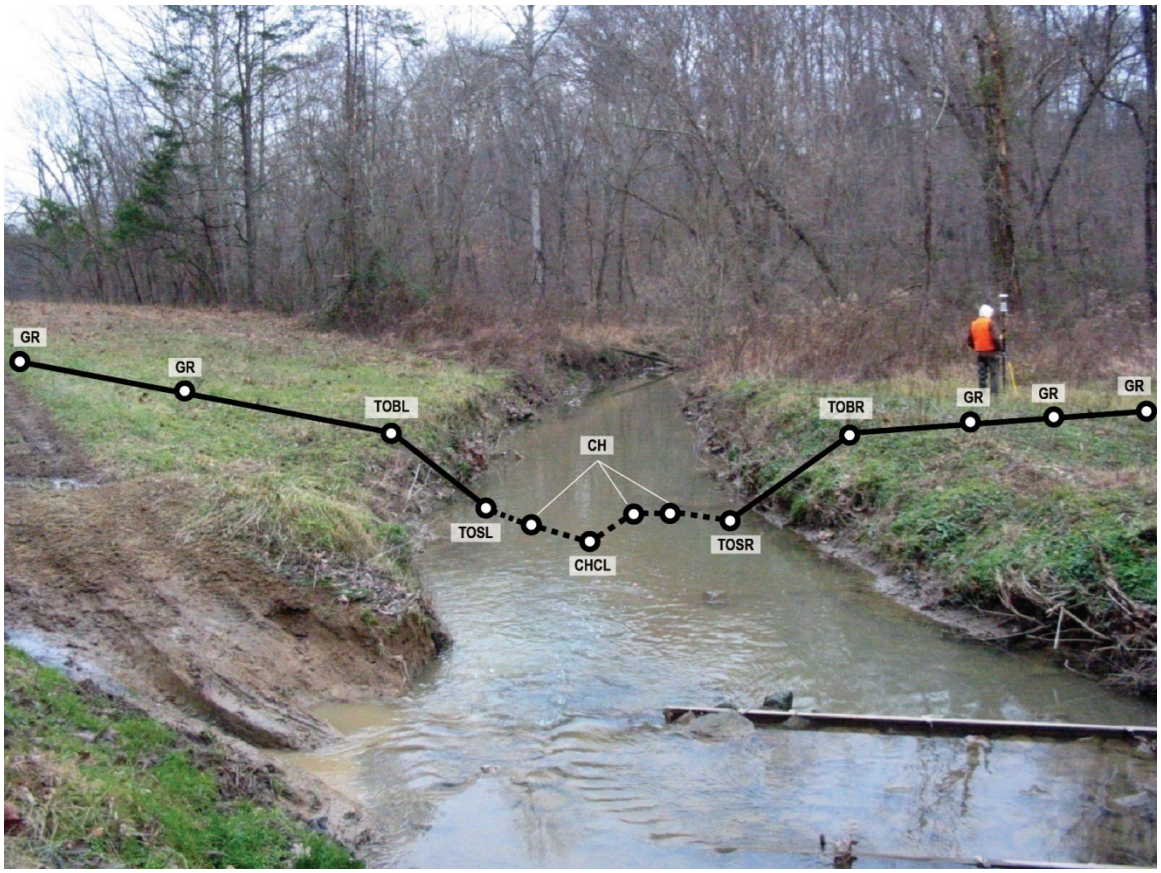


Figure M.5-1. Typical Cross-Section Photograph: Indian Creek IND-6600 (Displays Survey Code Locations)

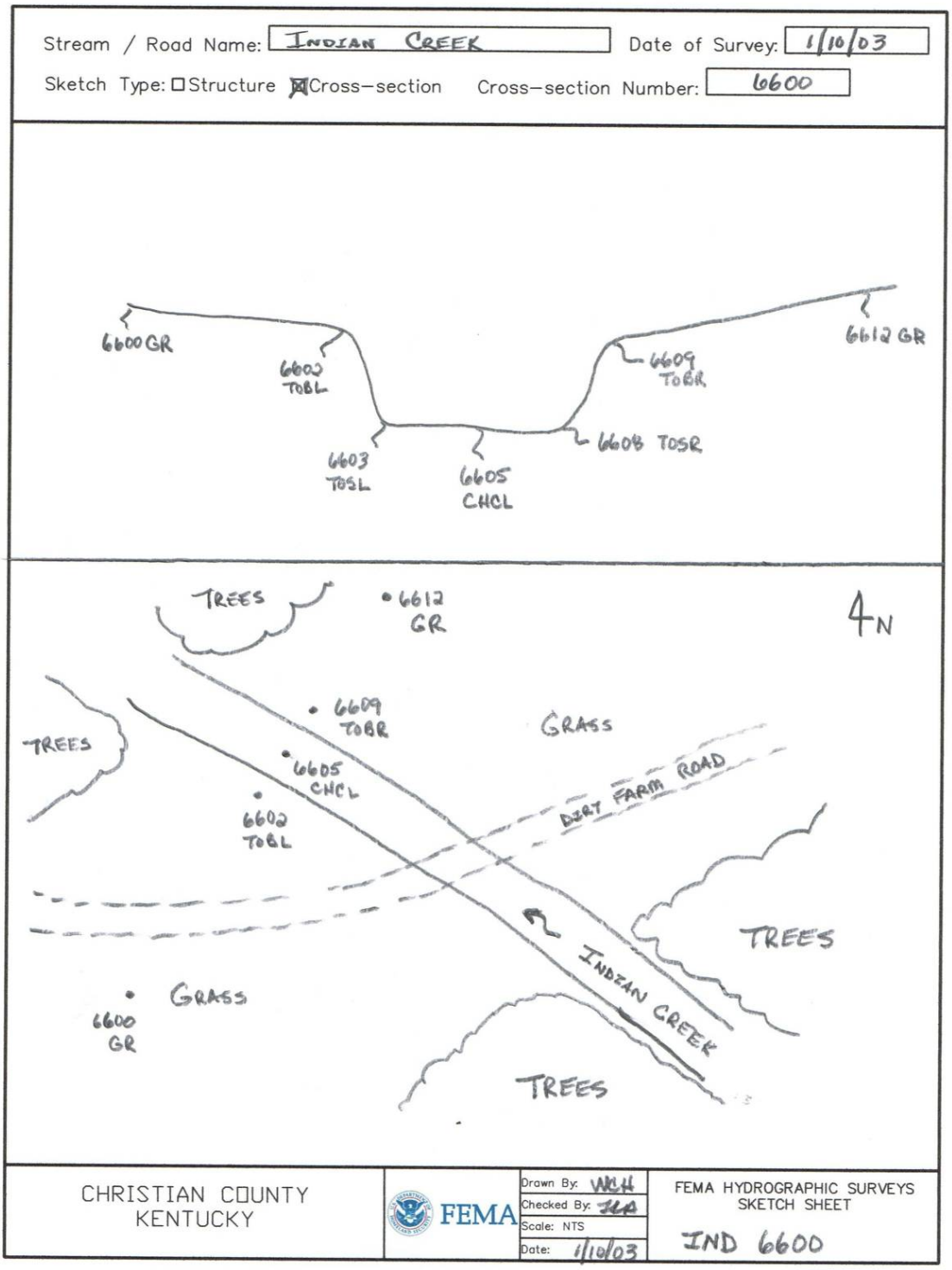


Figure M.5-2. Typical Cross-Section Sketch: Indian Creek IND-6600

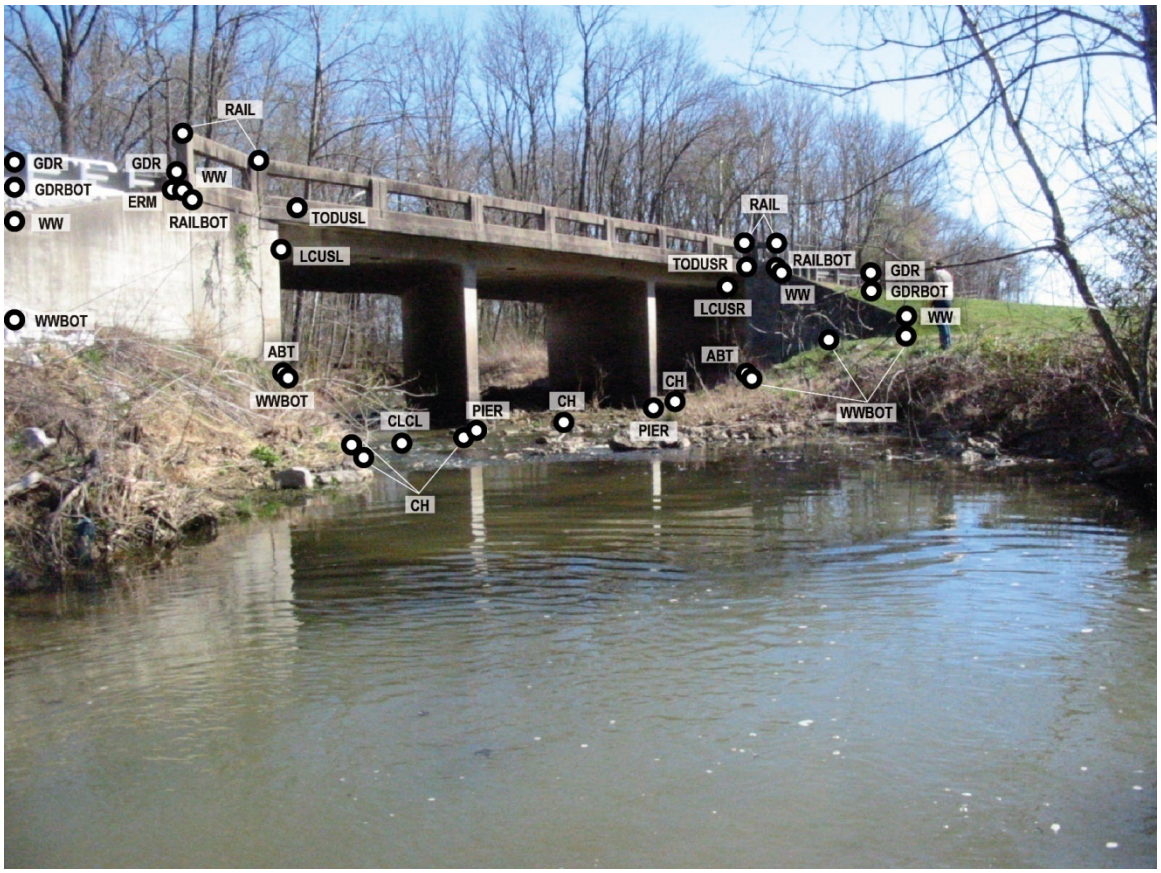


Figure M.5-3. Typical Bridge Photograph: White Creek WHI-1800 (Displays Survey Code Locations)

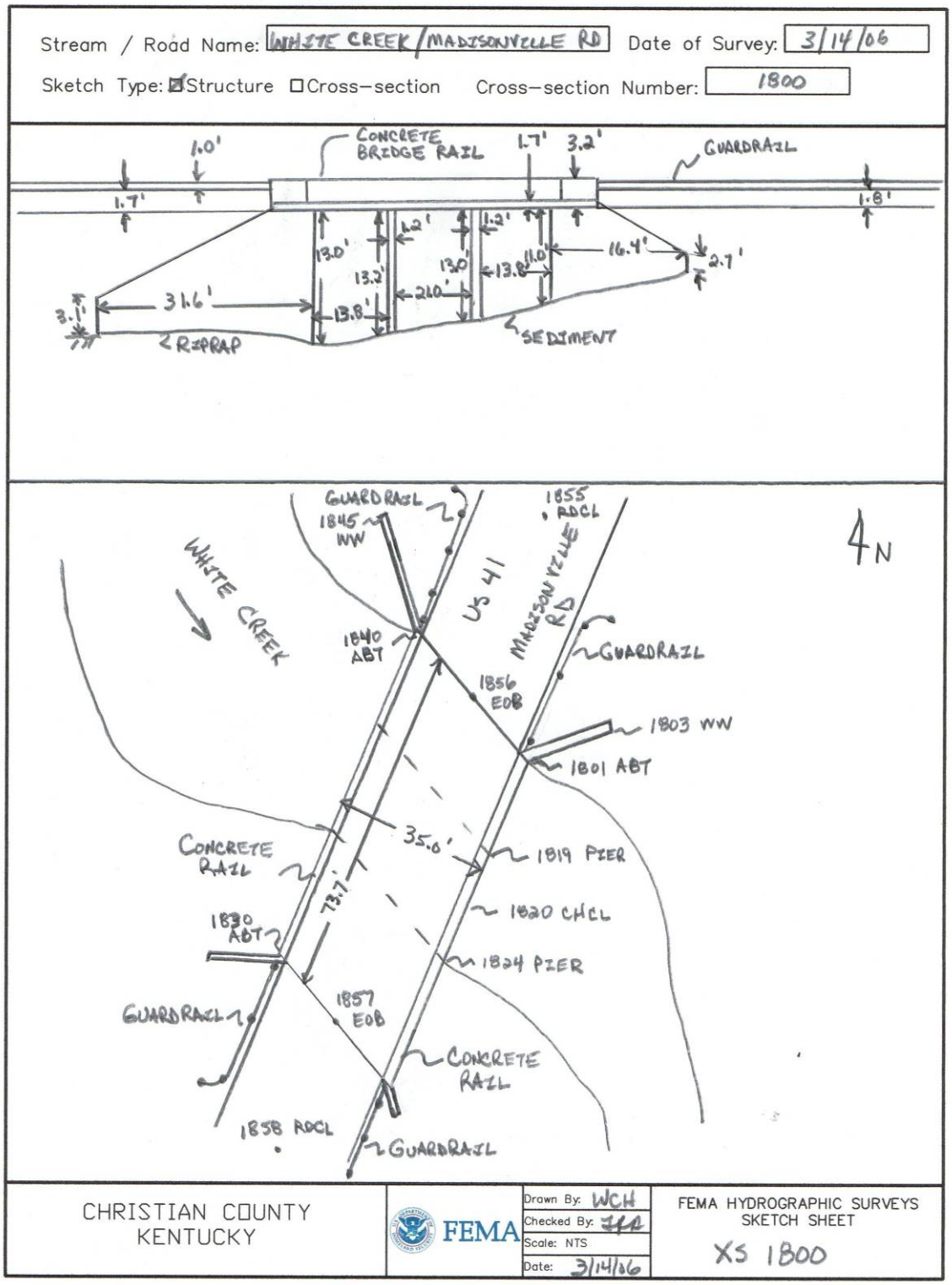


Figure M.5-4. Typical Bridge Sketch: White Creek WHI-1800

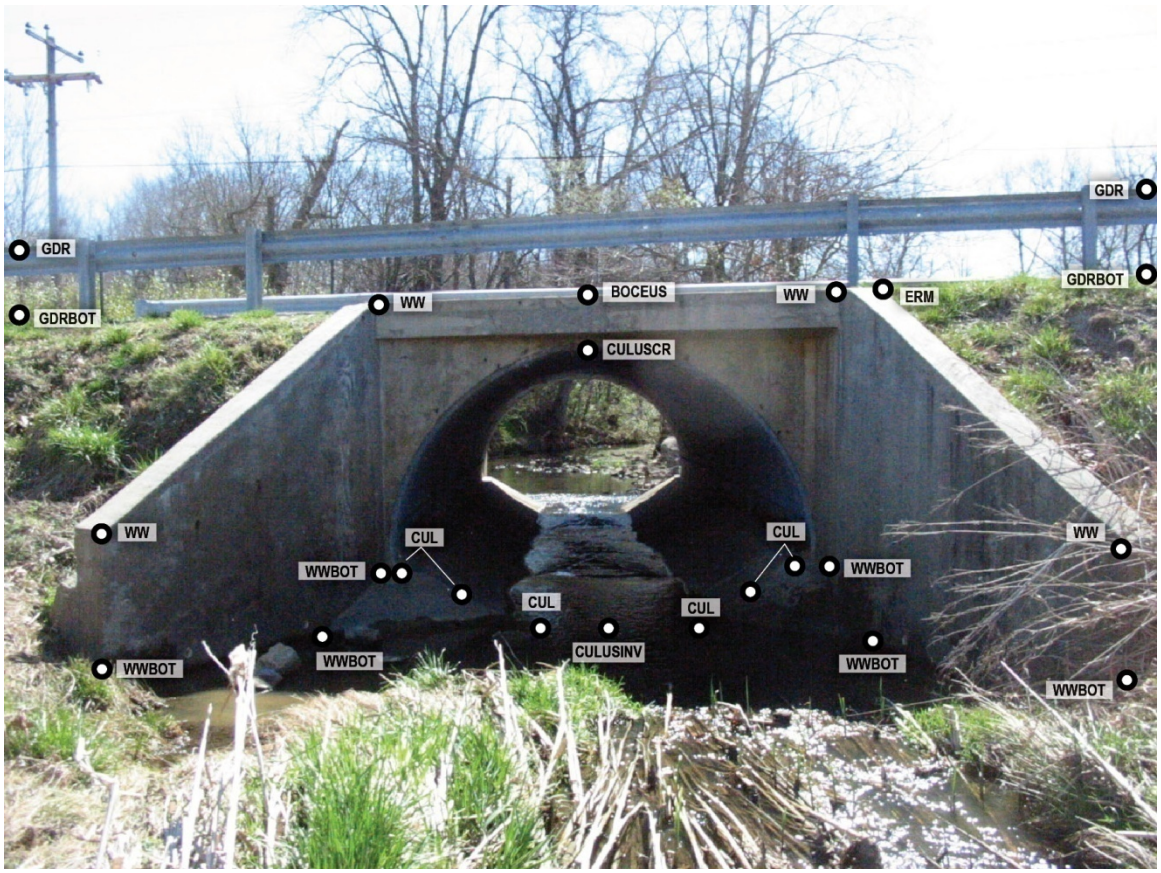


Figure M.5-5. Typical Culvert Photograph: Sanderson Creek SAN-0880 (Displays Survey Code Locations)

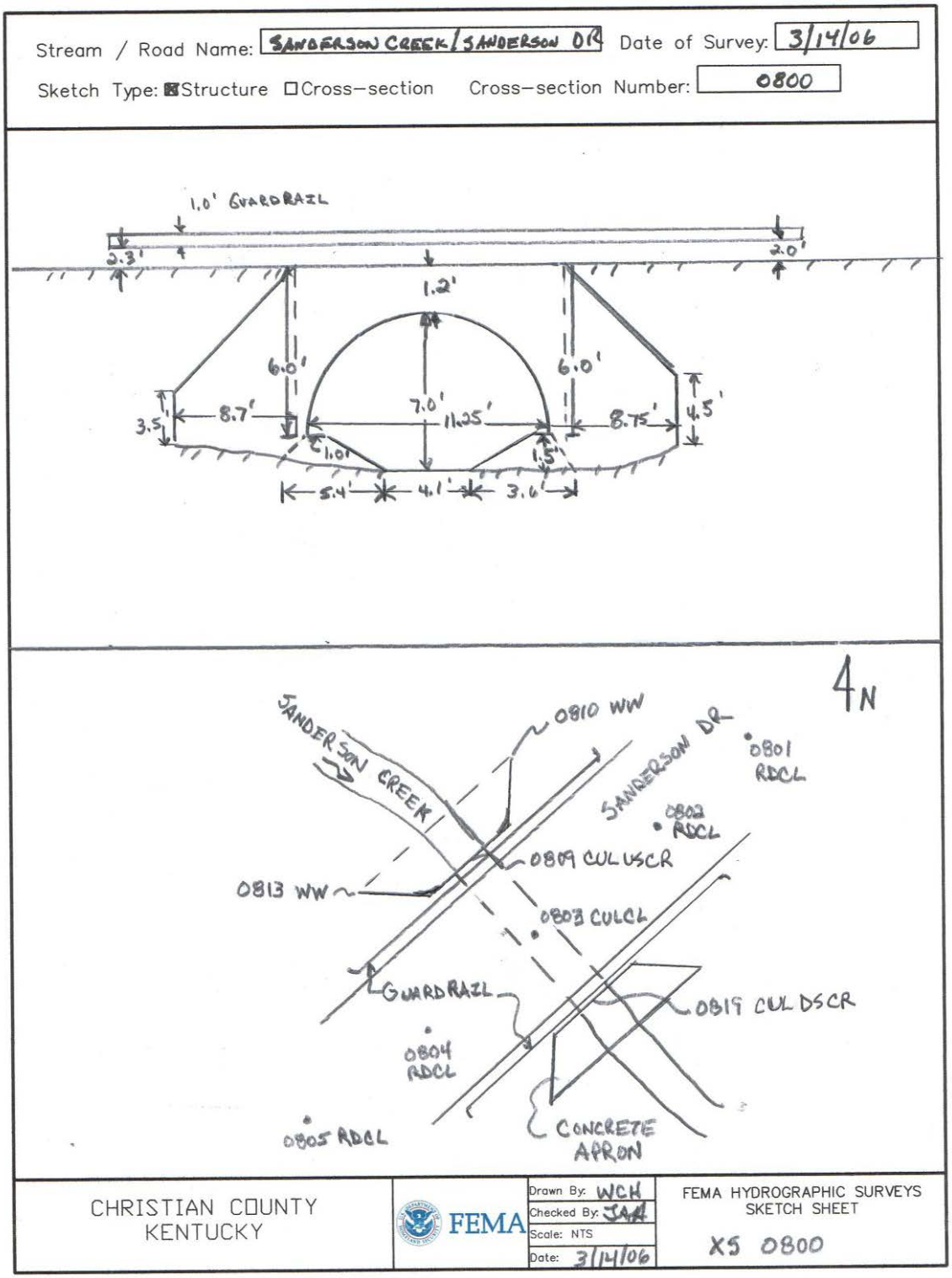
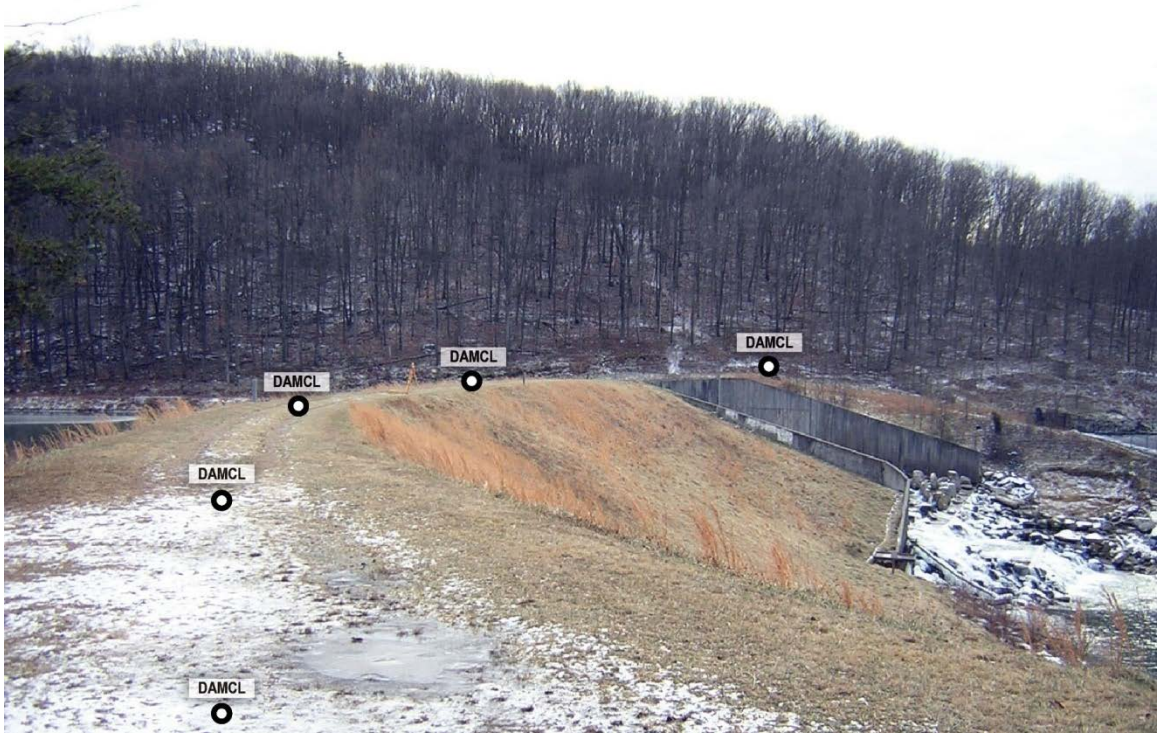
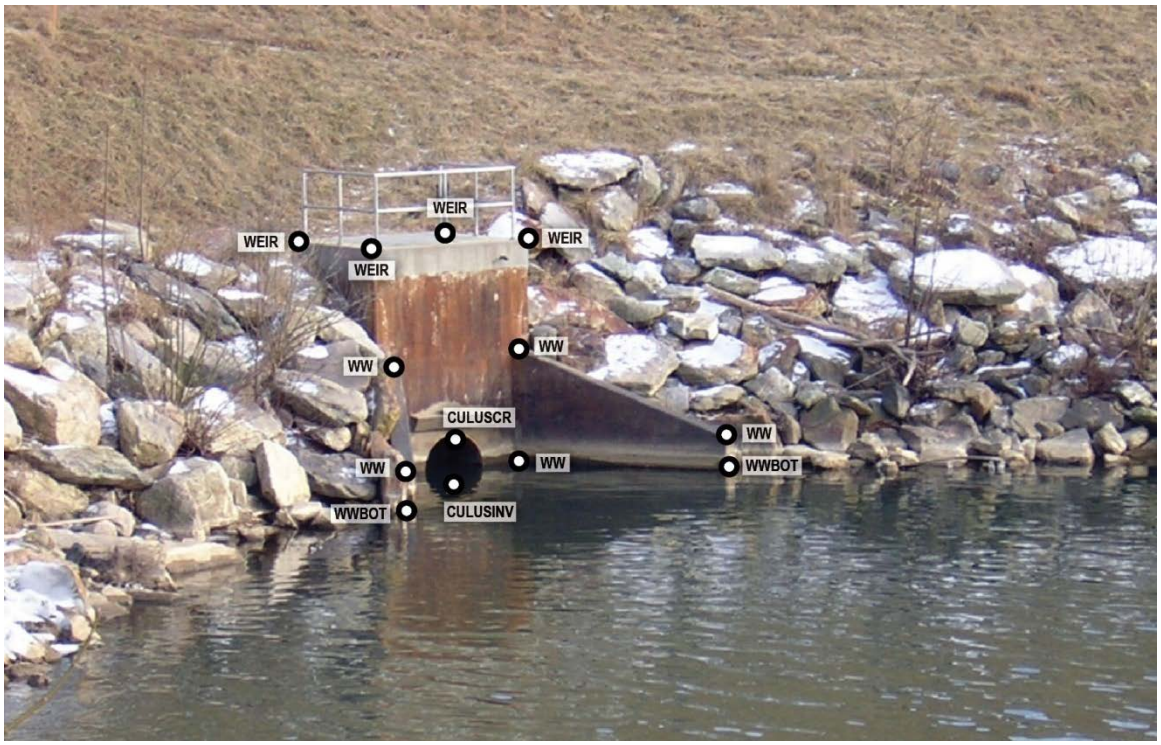


Figure M.5-6. Typical Culvert Sketch: Sanderson Creek SAN-0880



DAM CENTERLINE

SPILLWAY



OUTLET STRUCTURE

Figure M.5-7. Typical Dam Data (Displays Survey Code Locations)

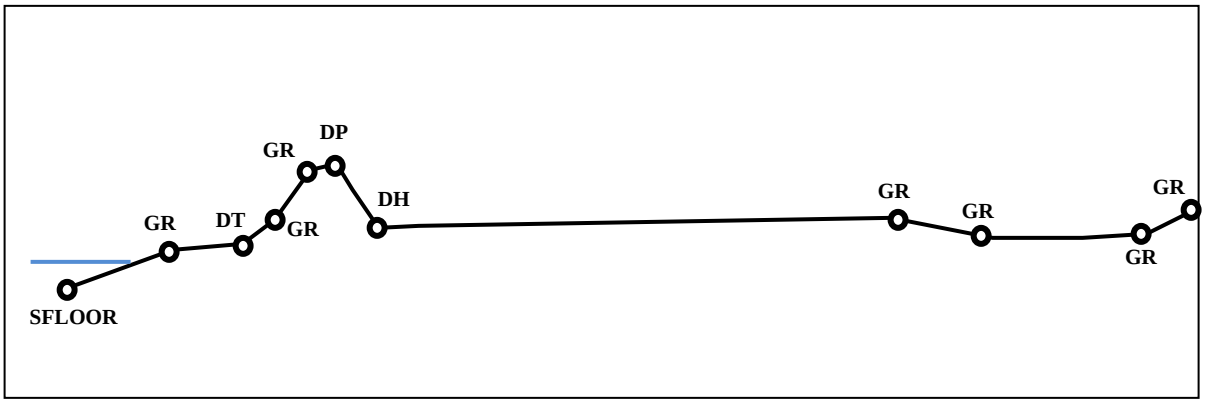


Figure M.5-8. Typical Transect (Displays Survey Code Locations)

Figure M.5-9. Typical Levee (Displays Survey Code Locations)

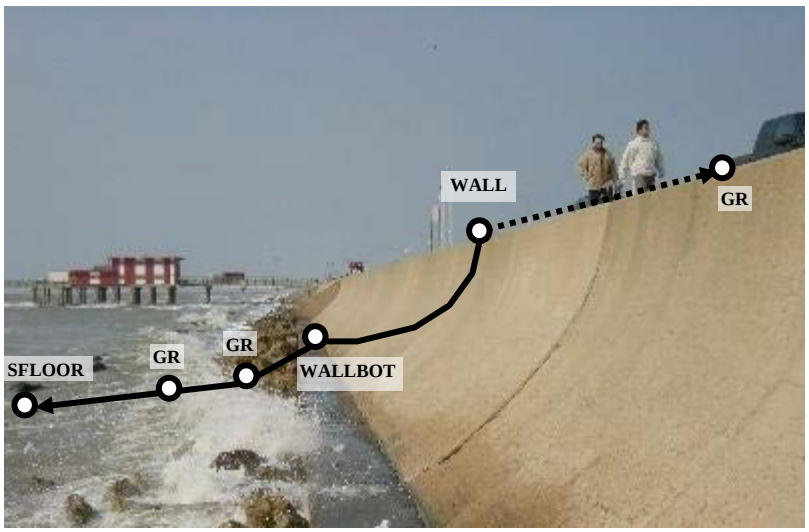


Figure M.5-10. Typical Coastal Structure (Displays Survey Code Locations)

M.5.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Perform Field Survey." General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of performing field survey. Correspondence includes any documentation generated during this task, such as letters, transmittals, memoranda, general status reports and queries, SPRs, technical issues that need to be documented, and direction given by FEMA. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.5.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) survey data development must be certified using the Certification of Compliance Form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the "Perform Field Survey" workflow step is required if this is the only task performed by the mapping partner. Mapping Partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF file of this form, with the original signature, date, and seal affixed to the form, must be submitted digitally in the general directory identified in Section M.5.2.8. This form must be signed by a registered or certified professional from the firm contracted to perform the work, or by the responsible official of a government agency. A digital version of this form is available at www.fema.gov.

M.5.2.4 Acceptable File Formats August 2011]

The GIS spatial data submitted for survey must be in a Georeferenced digital format. The following formats are acceptable for files:

- JPG, TIFF, BMP format for image files (for sketches, photographs, etc.);
- MS Word format for Project narrative;
- PDF format for correspondence and certification

- MDB/GDB format for Microsoft Access / Esri personal/file Geodatabase or (for X, Y, Z points);
- XLS or XLSX – Microsoft Excel (for X, Y, Z points);
- DBF – Database (for X, Y, Z points); and
- ASCII format (comma delimited for X, Y, Z points).

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document.

M.5.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Survey Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. The mapping partner must assign a Source Citation Abbreviation for each spatial data source in the metadata file. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Survey Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation – Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.5.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://hazards.fema.gov) or by mailing the files to FEMA on one or more of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted must be labeled with at least the following information:

- Mapping partner name;
- Community name and State for which the FIS was prepared;
- Survey Data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.5.2.7 Transfer Methodology [August 2011]

Survey Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.5.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files presented in Section M.5.2 – Requirements must be submitted to the MIP or mailed to FEMA within the following directory structure. Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8). The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

- \HUC-8\General
  - Project narrative
  - Certification
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes.
- \HUC-8\ Survey \Photos
  - All digital photographs
- \HUC-8\Survey \Sketches
  - All digital sketches
- \HUC-8\Survey \Supplemental Data
  - All other survey files
- \HUC-8\ Survey \As-built
  - As-built data

M.6 Hydrology Submittal Standards

M.6.1 Overview [August 2011]

This section describes the hydrologic data that must be submitted to FEMA for the FIS with respect to rivers, lakes, closed basins and ponds. All data must be submitted in digital format. The mapping partner(s) contracted to "Develop Hydrologic Data" is required to submit the data described in this section. Hydrologic data for the area contracted for analysis must be submitted by the mapping partner.

Appendix C of these Guidelines describes three broad categories of hydrologic procedures used in the NFIP:

- Flood-frequency analyses for gaged streams using Bulletin 17B, "Guidelines For Determining Flood Flow Frequency" (Interagency Advisory Committee on Water Data, 1982);
- Regional regression equations for ungaged streams, generally those developed by the USGS (http://water.usgs.gov/osw/programs/nss/pubs.html); and
- Rainfall runoff models.

Within the category of rainfall runoff models, the HEC-HMS model (or its predecessor, HEC-1) developed by the USACE Hydrologic Engineering Center (HEC), is used most frequently in the NFIP. In addition to the USACE models, FEMA accepts hydrologic results from over a dozen other rainfall runoff models (see http://www.fema.gov/plan/prevent/fhm/en_hydro.shtm for a list of accepted models), and it is likely that new models will be added in the future.

The hydrologic data and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.6.2 Requirements [August 2011]

M.6.2.1 Data Files [August 2011]

The resulting flood hazard products are generally determined based on the level of flood risk along a stream reach. The following data files are required for mapping projects based on the methodology used and products produced for each stream reach studied. The details on the spatial and look-up tables required in this section are provided in Appendix L. The tables in Appendix L include DFIRM_ID (study identifier) and VERSION_ID (product identifier) fields. For data submittals required in this section,

VERSION_ID must be populated in these tables. However, DFIRM_ID field can be left blank until the creation of the FIRM Database. Although Appendix M and Appendix L share the same data structure, the spatial extent of the data required to be submitted under each appendix is different. For Appendix L, the mapping partner is generally responsible for submitting data that covers the entire county (or community). For Appendix M, the spatial extent of the data required is determined by the scope for the specific task being performed.

Special Flood Hazard Areas for Stream Reaches with High Flood Risk (such as AE zones with regulatory water surface elevations and/or a regulatory floodway)

- A table file (L_Source_Cit, described in Appendix L) that documents the sources used in the study;
- A geospatial file (S_Nodes, described in Appendix L) showing the locations of computed discharges for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) with their associated drainage area and the flood discharges used in the hydrologic analysis that can be converted to an FIS Summary of Discharges table;
- A table file (L_Summary_Discharges, described in Appendix L) that contains information only for those nodes that will be included in the FIS Summary of Discharges table.
- Floodplain mapping submittal information (S_Submittal_Info, described in Appendix L) that describes the spatial extent of the flood risk project areas (there will be one S_Submittal_Info layer for a given mapping partner, but possibly multiple polygons describing the areal extent of different levels of a flood risk project);
- A geospatial file (S_Subbasins, described in Appendix L) of watershed or subwatershed areas contributing runoff to the discharge points in the S_Nodes file;
- A geospatial file (S_Hydro_Reach, described in Appendix L) that represents the connectivity between the subbasins and the flow direction between nodes;
- A table file (L_Summary_Elevations, described in Appendix L) that contains elevation information for lakes, reservoirs, and ponds for those water areas that will be included in the FIS Summary of Elevations table;
- A geospatial file (S_Gage, described in Appendix L) containing information about gages for the flood risk project area;
- Input and output files for the hydrologic model(s) used in the flood risk project;
- A hydrology report that documents the methodology, assumptions, and data used in hydrologic analyses;
- A draft text file that provides the required information for inclusion in Section 5.1 – Hydrologic Analyses of the FIS report;
- Files of backup data and analyses that are not described or included in the hydrology report. Some examples of backup data that could be included are as follows:
  - Computations for time of concentration, such as the National Resources Conservation Service (NRCS) travel time computations for sheet flow, shallow concentrated flow, and channel flow (could be Excel spreadsheets or PDFs of worksheets in TR-55);
  - Runoff curve number computations that document the percentage of the watershed with various land uses and NRCS hydrologic soil types (soil maps are not required);

  - Ancillary data for estimating infiltration parameters for the Green-Ampt equation; derivations of unit hydrographs or S-graphs or estimation of synthetic unit hydrographs like the Snyder's or NRCS unit hydrographs;
  - Hourly (unit) rainfall and discharge data used to calibrate the rainfall-runoff model;
  - Input and output files for frequency analyses of rainfall data;
  - Geospatial files and supporting data for the computation of watershed and climatic characteristics for regional regression equations such as drainage area, channel slope, soils data (e.g., percent D soils), impervious area, and mean annual precipitation. These files support and complement the input files for the hydrologic model; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

Special Flood Hazard Areas for Stream Reaches with Medium Flood Risk (such as A zones with water surface elevations published only in FIS Report)

- A table file (L_Source_Cit, described in Appendix L) that documents the sources used in the study;
- A geospatial file (S_Nodes, described in Appendix L) showing the locations of computed discharges for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) with their associated drainage area and the flood discharges used in the hydrologic analysis that can be converted to an FIS Summary of Discharges table;
- A table file (L_Summary_Discharges, described in Appendix L) that contains information only for those nodes that will be included in the FIS Summary of Discharges table.
- Floodplain Mapping submittal information (S_Submittal_Info, described in Appendix L) that describes the spatial extent of the flood risk project areas (there will be one S_Submittal_Info layer for a given mapping partner but possibly multiple polygons describing the areal extent of different levels of a flood risk project);
- A geospatial file (S_Subbasins, described in Appendix L) of watershed or subwatershed areas contributing runoff to the discharge points in the S_Nodes file;
- A geospatial file (S_Gage, described in Appendix L) containing information about gages for the flood risk project area;
- A geospatial file (S_Hydro_Reach, described in Appendix L) that represents the connectivity between the subbasins and the flow direction between nodes;
- A table file (L_Summary_Elevations, described in Appendix L) that contains elevation information for lakes, reservoirs, and ponds for those areas that will be included in the FIS Summary of Elevations table;
- Input and output files for the hydrologic model(s) used in the flood risk project;
- A hydrology report that documents the methodology, assumptions, and data used in hydrologic analyses;
- A draft text file that provides the required information for inclusion in Section 5.1 – Hydrologic Analyses in the FIS report;
- Files of backup data and analyses that are not described or included in the hydrology report. Some examples of backup data that could be included are as follows:

  - GIS files and supporting data for the computation of watershed and climatic characteristics for regional regression equations such as drainage area, channel slope, soils data (e.g., percent D soils), impervious area, rainfall intensity and mean annual precipitation;
  - Input and output files from the USGS NFF or NSS computer programs for implementing the USGS regression equations; and
  - Computations for times of concentration, runoff curve numbers, infiltration parameters, or unit hydrographs (if an existing rainfall-runoff model was used); and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc..

Special Flood Hazard Areas for Stream Reaches with Low Flood Risk (such as A zones without published water surface elevations)

- A table file (L_Source_Cit, described in Appendix L) that documents the sources used in the study;
- A geospatial file (S_Nodes, described in Appendix L) showing the locations of computed discharges for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) with their associated drainage areas and the flood discharges used in the hydrologic analysis, if available;
- Floodplain Mapping submittal information (S_Submittal_Info, described in Appendix L) that describes the spatial extent of the flood risk project areas (there will be one S_Submittal_Info layer for a given mapping partner but possibly multiple polygons describing the areal extent of different levels of a flood risk project);
- A geospatial file (S_Subbasins, described in Appendix L) of watershed or subwatershed areas contributing runoff to the discharge points identified in the S_Nodes file, if available;
- A geospatial file (S_Hydro_Reach, described in Appendix L) that represents the connectivity between the subbasins and the flow direction between nodes, if available;
- A geospatial file (S_Gage, described in Appendix L) containing information about gages for the flood risk project area;
- Input and output files for the hydrologic model(s) used in the flood risk project, if available;
- A project description outlining how flood discharges for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) were determined;
- A draft text file that provides the required information for inclusion in Section 5.1 – Hydrologic Analyses in the FIS report;
- Any files of backup data and supporting analyses that were not described or included in the hydrology report. These could include geospatial files and supporting data for the computation of watershed characteristics for regional regression equations such as drainage area, channel slope, soils data (e.g., percent D soils), impervious area, rainfall intensity and mean annual precipitation; and input and output files from the USGS NFF or NSS computer programs for implementing the USGS regression equations; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

M.6.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Develop Hydrologic Data." General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of developing hydrologic data. It includes any documentation generated during this task such as letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; direction given by FEMA; and internal communications, routing slips, and notes that were relevant to the performance of this task. A narrative should be prepared that describes the SOW (streams studied, type of flood risk project, etc.), direction from FEMA, assumptions and issues, and any information that may be useful for the mapping partner performing the hydraulic analyses. Contractual documents, such as a signed SOW or MAS, are not to be submitted as part of this appendix.

M.6.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) hydrologic data development must be certified using the form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the "Develop Hydrologic Data" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF of the form must be submitted digitally and must have the original signature, date, and seal affixed to the form. This form must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work, or by the appropriate government official. A digital version of this form is available at www.fema.gov.

M.6.2.4 Acceptable File Formats [August 2011]

Any supporting documentation and data can be submitted in native format. The following formats are accepted for files:

- PDF and MS Word format for hydrology report, FIS text (Section 5.1);
- MS Word format for project narrative;
- PDF format for correspondence and certification;
- Esri shapefiles or personal/file Geodatabase for all hydrology spatial and tabular files;
- Geography Markup Language (GML) for all hydrology spatial files; and
- Native format for input and output files for hydrologic models.

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected (refer to Appendix L for additional information).

M.6.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Hydrology Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign

a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care."

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Hydrology Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.6.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or on one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted must be labeled with the following information:

- Mapping partner name;
- Community name and State for which the FIS was prepared;
- Hydrologic Data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.6.2.7 Transfer Methodology [August 2011]

Hydrology Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.6.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files in Section M.6.2 Requirements must be submitted within the following directory structure. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

The mapping partner is required to submit the input and output files for any flood risk project using hydrologic models. If the data that were used to estimate the hydrologic parameters are available, they must be documented in the hydrology report and submitted in the database files.

Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8) and watershed name with all model files in the *Simulations* folder and supporting spatial files in the *Spatial Files* folder. The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. Database files are stored in a *Hydrology Supplemental Data* folder. Data must be located in the appropriate directory, as follows:

- \HUC-8\General
  - Hydrology report
  - Certification
  - Draft FIS Section 5.1
  - Project narrative
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes
- \HUC-8\Hydrology Data
  - "Watershed Name"\Hydrology_Models\Supplemental_Data
    - Database file(s) such as data and analyses for stream and rainfall gages and computations for regional regression equations in native format such as output from USGS PeakFQ, NFF or NSS computer programs
  - "Watershed Name"\Hydrology_Models\Simulations
    - Model input and output files
    - Readme file explaining contents of each named file
  - "Watershed Name"\Hydrology_Models\Spatial_Files
    - Spatial files

M.7 Hydraulics Submittal Standards

M.7.1 Overview [August 2011]

This section describes the hydraulic data that must be submitted to FEMA for the FIS with respect to rivers, lakes, closed basins and ponds. All data must be submitted in digital format. The mapping partner(s) contracted to "Develop Hydraulic Data" is required to submit the data described in this section. Hydraulic data for the stream reaches contracted for analysis must be submitted by the mapping partner.

Hydraulic methods include a variety of steady and unsteady hydraulic models representing one-dimensional (1-D) or two-dimensional (2-D) flow conditions. The 1-D models utilize cross-sectional data while the 2-D models utilize a grid of ground-elevation points. Information on the procedures used to develop hydraulic models is provided in Appendix C of these Guidelines. FEMA-accepted hydraulic models can be found at http://www.fema.gov/plan/prevent/fhm/en_hydro.shtm.

The hydraulic data and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all Project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.7.2 Requirements

M.7.2.1 Data Files [August 2011]

The technical approach and the related backup data are generally determined based on the level of flood risk along a stream reach. It is assumed that a 1-D or 2-D hydraulic (steady or unsteady) model is used to estimate the BFEs regardless of the level of flood risk. The following data files are required for mapping projects based on the level of risk determined for each stream reach studied. The details on the spatial and look-up tables required in this section are provided in Appendix L. The tables in Appendix L include DFIRM_ID (study identifier) and VERSION_ID (product identifier) fields. For data submittals required in this section, VERSION_ID must be populated in these tables. However, DFIRM_ID field can be left blank until the creation of the FIRM Database. Although Appendix M and Appendix L share the same data structure, the spatial extent of the data required to be submitted under each appendix is different. For Appendix L, the mapping partner is generally responsible for submitting data that covers the entire county (or community). For Appendix M, the spatial extent of the data required is determined by the scope for the specific task being performed.

Special Flood Hazard Areas for Stream Reaches with a High Flood Risk (such as AE zones with regulatory water surface elevations and/or a floodway):

- A table file (L_Source_Cit, described in Appendix L) that documents the sources used in the study;
- Geospatial file showing the flow path used for modeling (S_Profil_Basln spatial file, described in Appendix L);
- Geospatial file that shows the locations of cross sections used for the computation of water-surface profiles for simplified hydraulic methods or 1-D models (S_XS spatial file described in Appendix L);
- Geospatial file showing the Base Flood Elevation lines for backwater and ponding areas, not on profile baseline (S_BFE described in Appendix L);
- A table file (L_XS_Elev, described in Appendix L) that stores elevation data for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods), if applicable, and streambed elevation for all cross sections in the model, and floodway data for only those cross sections included in the Floodway Data Table (FWDT);
- Geospatial files that show the regulatory floodway, 1-percent-annual-chance floodplain boundaries, and 0.2-percent-annual-chance floodplain boundaries (S_Fld_Haz_Ar spatial file described in Appendix L). If applicable, a S_Zone_AR file, described in Appendix L should be submitted to show the areas defined as Zone AR;
- Floodplain Mapping submittal information (S_Submittal_Info, described in Appendix L) that describes the spatial extent of the flood risk project areas (there will be one S_Submittal_Info layer but possibly multiple polygons describing the aerial extent of different levels of a flood risk project for a given mapping partner);
- A geospatial file (S_Stn_Start, described in Appendix L) that contains information on the reference point that was used as the origin for distance measurements along streams and rivers;
- A table file (L_ManningsN, described in Appendix L) that contains information on Manning's "n" or "k" roughness coefficients used in the flood risk project;
- A geospatial file (S_HWM, described in Appendix L) that contains information about high water marks for the flood risk project area;
- A geospatial file (S_Gen_Struct ,described in Appendix L) that contains information on hydraulic structures used in the hydraulic model;
- A geospatial file (S_Levee, described in Appendix L) that contains information on levees used in the hydraulic model;
- A geospatial file (S_Riv_Mrk, described in Appendix L) that contains information on river mile marker locations;
- Input and output files for the hydraulic model used for the studied reaches that include data for flood profiles for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods), if within the scope of the mapping project (if applicable, 1-percent-annual-chance profiles with and without levees) and the floodway analysis;
- A hydraulics report that describes the hydraulic analyses and assumptions;
- A draft text file that provides the required information for inclusion in Section 5.2 Hydraulic Analyses of the FIS report;

- A RASPLOT, DXF or DWG file containing profiles for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) for inclusion in the FIS report;
- A table file (L_XS_Struct, described in Appendix L) that contains stream profile cross section information when the cross section is associated with a structure. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- A table file (L_ Profil_Backwtr_El, described in Appendix L) that contains stream profile backwater elevation information. This table stores the backwater elevations for each flood frequency by stream. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- A table file (L_ Profil_Label, described in Appendix L) that contains stream profile user-defined landmark labels that are not associated with specific cross sections or structures. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- Additional geospatial and database tables, if utilized (e.g., overbank distances used in certain models such as HEC-RAS; hydraulic computations used as input to the hydraulic model such as stage-discharge relations at culverts for 2-D models; calibration information, such as high-water marks; maps of historical flooding; spatial files of n-value polygons used in model calibration). The structure of these tables is at the discretion of the submitting mapping partner; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

Special Flood Hazard Areas for Stream Reaches with a Medium to Low Flood Risk (such as A zones with water surface elevations published only in FIS Report):

- A table file (L_Source_Cit, described in Appendix L) that documents the sources used in the study;
- A geospatial file (S_Profil_Basln spatial file, described in Appendix L) showing the flow path used for modeling;
- A geospatial file (S_XS spatial file, described in Appendix L) that shows the cross sections used for the computation of water-surface profiles for simplified hydraulic methods or 1-D models;
- A geospatial file (S_Fld_Haz_Ar spatial file, described in Appendix L) that shows the 1-percent-annual-chance floodplain boundaries;
- A geospatial file (S_Stn_Start, described in Appendix L) that contains information on the reference point that was used as the origin for distance measurements along streams and rivers;
- A table file (L_ManningsN, described in Appendix L) that contains information on Manning's "n" or "k" roughness coefficients used in the flood risk project;
- A geospatial file (S_HWM, described in Appendix L) that contains information about high water marks for the flood risk project area;
- A geospatial file (S_Gen_Struct and S_Levee ,described in Appendix L) that contains information on levees used in the hydraulic model;
- A geospatial file (S_Riv_Mrk, described in Appendix L) that contains information on river mile marker locations;

- Floodplain Mapping submittal information (S_Submittal_Info, described in Appendix L) that describes the spatial extent of the flood risk project areas (there will be one S_Submittal_Info layer but possibly multiple polygons describing the aerial extent of the different levels of a flood risk project for a given mapping partner);
- Input and output files for the hydraulic model used in the analysis that include data for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods);
- A hydraulics report that describes the hydraulic analyses and assumptions;
- A draft text file that provides the required information for inclusion in Section 5.2 Hydraulic Analyses of the FIS report;
- A RASPLOT, DXF or DWG file containing profiles for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) for inclusion in the FIS report, if available;
- A table file (L_XS_Struct, described in Appendix L) that contains stream profile cross section information when the cross section is associated with a structure. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- A table file (L_ Profil_Backwtr_El, described in Appendix L) that contains stream profile backwater elevation information. This table stores the backwater elevations for each flood frequency by stream. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- A table file (L_ Profil_Label, described in Appendix L) that contains stream profile user-defined landmark labels that are not associated with specific cross sections or structures. This table is only required if and when the data can be exported from RASPLOT into Appendix L format;
- A file containing Flood Hazard Data table, if applicable;
- All backup data used in the analysis, such as overbank distances used in certain models such as HEC-RAS; any hydraulic computations used as input to the hydraulic model; maps of historical flooding; spatial files of n-value polygons; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

M.7.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Develop Hydraulic Data." General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of developing hydraulic data. Correspondence includes any documentation generated during this task such as letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; direction given by FEMA; and internal communications, routing slips, and notes that were relevant to the performance of this task. A narrative should be prepared that describes the SOW (streams studied, type of flood risk project, etc.), direction from FEMA, assumptions and issues, and any information that may be useful for the mapping partner preparing the Preliminary FIRM. Contractual documents, such as a signed SOW or MAS, are not to be submitted.

M.7.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) hydraulic data development must be certified using the form provided in Figure M.10-1. Submittal of this certification at the "Develop Hydraulic Data" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF of the form must be submitted digitally and must have the original signature, date, and seal affixed to the form. This form must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work, or by the appropriate government agency official. A digital version of this form is available at www.fema.gov.

M.7.2.4 Acceptable File Formats [August 2011]

Any supporting documentation can be submitted in native format. The following formats are acceptable for files:

- PDF and MS Word format for the hydraulics report, FIS text (Section 5.2);
- MS Word format for project narrative;
- PDF for correspondence and certification;
- FWDT in Database or Excel format;
- Esri shapefiles or personal/file Geodatabase for all hydraulics spatial files;
- GML for all hydraulics spatial files;
- Native format of input and output files for hydraulic models in native formats; and
- RASPLOT, DXF or DWG format for profiles.

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected (refer to Appendix L for additional information).

M.7.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Hydraulics Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Hydraulics Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.7.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or through one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all submitted digital media must be labeled with the following information:

- Mapping partner name;
- Community name and State for which the FIS was prepared;
- Hydraulic data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.7.2.7 Transfer Methodology [August 2011]

Hydraulic Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.7.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files in Section M.7.2 Requirements must be submitted in the following directory structure. The following folders can be created either on a local work space (i.e., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8) and stream name with all model files in the *Simulations* folder and all support spatial files in the *Spatial Files* folder. The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. In studies where multiple reaches of a stream are studied within the same county, there may be more than one hydraulic model for the same stream. In such cases, the mapping partner must add the starting river stationing (distance along the profile from a reference point, e.g., “280 ft from Key Bridge”) to the stream name to distinguish the different hydraulic models. Any additional data not described by these standards and used to assist in the modeling of this flood risk project must be submitted in the *Supplemental Data* folder. Data must be located in the appropriate directories as follows:

- \HUC-8\General
  - Hydraulics report
  - Certification

  - Draft FIS Section 5.2
  - Project narrative
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes
- \HUC-8\Hydraulic_Data
  - \"Stream name (starting river stationing)"\Hydraulic_Models\Simulations
    - Model input and output files by stream for all flood frequencies required by the task order (e.g., the 10-, 4-, 2-, 1-, 0.2-percent-annual-chance floods) and floodway analysis if within the scope of the mapping project
    - Model input and output files for levee analyses for the 1-percent-annual-chance flood including, if applicable: de-accredited left levee and hold right levee; de-accredited right levee and hold left levee; both levees in place; and both levees de-accredited (for floodway analysis)
    - Model input and output files for levee analyses for all flood frequencies required by the task order [e.g., the 10-, 4-, 2-(normally with levees in place), 1-, 0.2-(normally without levees) percent-annual-chance floods]
  - \"Stream name"\Hydraulic_Models\Spatial_Files
    - Spatial files by stream (starting river stationing)
  - \"Stream name"\Hydraulic_Models\Profiles
    - Profiles in RASPLOT, DXF or DWG format
  - \"Stream name"\Hydraulic_Models\FWDT
    - Floodway Data tables
    - Flood Hazard Data tables
  - \"Stream name"\Hydraulic Models\Supplemental_Data
    - Database file(s) such as high water mark data for model calibration
    - Zone A backup files

M.8 Alluvial Fan Submittal Standards

M.8.1 Overview [August 2011]

This section describes the type and format of data needed to map the 1-percent-annual-chance flood associated with alluvial fans. All data must be submitted in digital format. The mapping partner(s) contracted to "Perform Alluvial Fan Analysis" is required to submit the data described in this section. Alluvial fan data for the areas contracted for analysis must be submitted by the mapping partner.

Appendix G of these Guidelines provides guidance for the identification and mapping of flood hazards that occur on alluvial fans. As described in Appendix G, the approach for the identification and mapping of alluvial fan flooding can be divided into three stages:

Stage 1 – Recognizing and characterizing alluvial fan landforms;

Stage 2 – Defining the nature of the alluvial fan environment and identifying active and inactive areas of the fan; and

Stage 3 – Defining and characterizing the 1-percent-annual-chance flood within the defined areas.

Under Stage 3, there are several acceptable methods for defining the base flood depending on the characteristics of the alluvial fan. These methods are as follows, and are also described in Appendix G of these Guidelines:

- FAN computer program (FEMA, 1990 http://www.fema.gov/plan/prevent/fhm/en_stat.shtm): used for highly active, conical fans – definition of Zone AO areas with depths and velocities;
- Sheetflow Analysis: used for shallow flooding across uniformly sloping surfaces – definition of Zone AO with depths;
- Hydraulic Analytical Methods: used for entrenched channel networks or constructed channels (1-D model) or uncertain flow paths (2-D model) – definition of Zone A, Zone AE, and/or Zone X;
- Geomorphic Data, Post-Flood Hazard Verification, and Historical Information: used for alluvial fans with little or no urbanization – definition of Zone X and/or Zone A areas;
- Composite Methods: used for fans with unique physical features in some locations – some combination of the above methods.

The alluvial fan data and validation status within the CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all Project-related data for a period of three years. The submitting mapping partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and

- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.8.2 Requirements [August 2011]

M.8.2.1 Data Files [August 2011]

The following files and data must be submitted for alluvial fan analysis. The details on the spatial and look-up tables required in this section are provided in Appendix L. The tables in Appendix L include the DFIRM_ID (study identifier) and VERSION_ID (product identifier) fields. For data submittals required in this section, VERSION_ID must be populated in these tables. However, the DFIRM_ID field can be left blank until the creation of the FIRM Database. Although Appendix M and Appendix L share the same data structure, the spatial extent of the data required to be submitted under each appendix is different. For Appendix L, the mapping partner is generally responsible for submitting data that covers the entire county (or community). For Appendix M, the spatial extent of the data required is determined by the scope for the specific task being performed.

- Under Stage 1, materials such as geologic maps, field reconnaissance reports, topographic maps, and aerial photographs used to identify the landform as an alluvial fan must be submitted;
- Under Stage 2, historic records of flooding, photographs, time-sequence aerial photography, and geomorphic information must be submitted to illustrate either active or inactive alluvial fan flooding;
- Under Stage 3, input and output files for the FAN program (FEMA, 1990) or 1-D or 2-D hydraulic programs must be submitted, including the following datasets:
  - Source Citation Information (L_Source_Cit described in Appendix L);
  - Floodplain Mapping submittal information (S_Submittal_Info described in Appendix L);
  - A geospatial file (S_Profil_Basln described in Appendix L) showing the flow path used for floodplain mapping if hydraulic models were utilized;
  - A geospatial file (S_XS spatial file described in Appendix L) showing the locations of cross sections (if applicable) used for the computation of water-surface profiles for 1-D models;
  - A table file (L_XS_Elev described in Appendix L) that stores elevation data for the 1-percent-annual-chance elevation and streambed elevation for all cross sections in the model, if applicable;
  - A geospatial file (S_Alluvial_Fan described in Appendix L) showing the 1-percent-annual-chance flood boundaries with depths and velocities and BFEs for 1-D and 2-D models, if applicable;
  - A file containing profiles for the 1-percent-annual-chance flood. Profiles created as DXF or DWG files and edited for content;
  - Input and output files for the 1-percent-annual-chance flood for the hydraulic model used in the analysis; and
  - All geospatial datasets used for parameter calculation, if applicable, such as a spatial file of n-value polygons
- A draft text file that provides the required information for inclusion in Section 5.4 Alluvial Fan Analysis of the FIS report

- A technical report that describes the processes for identifying the alluvial fan, the areas of active and inactive alluvial fan flooding, and the procedures for determining the aerial extent and/or elevation of the base flood; and
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

M.8.2.2 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner assigned to "Develop Alluvial Fan Data." General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of performing alluvial analysis. Correspondence includes any documentation generated during this task such as letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; direction given by FEMA; and internal communications, routing slips, and notes that were relevant to the performance of this task. A narrative should be prepared that describes the SOW, direction from FEMA, assumptions and issues, and any information that may be useful for the mapping partner preparing the Preliminary FIRM. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.8.2.3 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) alluvial fan data development must be certified using the form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the "Perform Alluvial Fan Analysis" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF of the form must be submitted digitally with the original signature, date, and seal affixed to the form. This form must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work or by the appropriate government agency official. A digital version of this form is available at www.fema.gov.

M.8.2.4 Acceptable File Formats [August 2011]

Any supporting documentation and data can be submitted in model or native format. The following formats are acceptable for files:

- PDF and MS Word format for the technical report and FIS Section 5.4;
- MS Word format for project narrative;
- PDF for correspondence and certification;
- Esri shapefiles or personal/file Geodatabase for all alluvial fan spatial files;
- GML for all alluvial fan spatial files;
- Native formats for hydraulic model input and output files; and
- RASPLOT, DXF or DWG format for profiles.

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow

copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected (refer to Appendix L for additional information).

M.8.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Alluvial Fan Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Alluvial Fan Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.8.2.6 Transfer Media [March 2009]

Mapping partners must submit files on one of the following electronic media or via the internet by uploading to the MIP (http://www.hazards.fema.gov):

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all submitted digital media must be labeled with the following information:

- Mapping partner's name;
- Community name and State for which the FIS was prepared;
- Alluvial Fan Data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.8.2.7 Transfer Methodology [August 2011]

Alluvial fan data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.8.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files in Section M.8.2 Requirements must be submitted within the following directory structure. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8) and stream name with all model files in the *Simulations* folder and supporting spatial files in the *Spatial Files* folder. The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. Data must be located in the appropriate directories as follows:

- \HUC-8\General
  - Alluvial fan technical report
  - Draft FIS Section 5.4
  - Certification
  - Project narrative
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; direction by FEMA; and internal communications, routing slips, and notes
- \HUC-8\Hydraulic_Data
  - “Stream name”\Alluvial_Fan_Hydraulic_Models\Simulations
    - Model input and output files in native format
  - “Stream name”\Alluvial_Fan_Hydraulic_Models\Profiles
    - Profiles in RASPLOT, DXF or DWG format
  - “Stream name”\ Alluvial_Fan_Hydraulic_Models\Spatial Files
    - Spatial files
  - “Stream name”\Alluvial_Fan\Hydraulic_Databases
    - Database file(s)
  - “Stream name”\FAN_program_files\Simulations
    - Model input and output files in native format

M.9 Coastal Submittal Standards

M.9.1 Overview [August 2011]

This section describes the type and format of data that must be submitted to FEMA for the coastal FIS. All data must be submitted in digital format. The mapping partner(s) contracted to "Perform Coastal Analysis" is required to submit the data in this section. Details on FEMA guidance for coastal flood hazard analyses and mapping are provided in Appendix D of these Guidelines. Coastal data for the entire project (area studied) contracted must be submitted by the mapping partner.

The CNMS database must be updated, as applicable, based on the information and data collected and revised as part of this section. The data model provided in the CNMS Database User's Guide must be used to enter the data and update CNMS.

The submitting mapping partner must retain copies of all project-related data for a period of three years. The submitting Partner will need these data for responding to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.9.2 Requirements [August 2011]

M.9.2.1 Data Files [August 2011]

The following data files must be submitted for coastal studies. The details on the spatial and look-up tables required in this section are provided in Appendix L. The tables in Appendix L include DFIRM_ID (study identifier) and VERSION_ID (product identifier) fields. For data submittals required in this section, VERSION_ID must be populated in these tables. However, DFIRM_ID field can be left blank until the creation of the FIRM Database. Although Appendix M and Appendix L share the same data structure, the spatial extent of the data required to be submitted under each appendix is different. For Appendix L, the mapping partner is generally responsible for submitting data that covers the entire county (or community). For Appendix M, the spatial extent of the data required is determined by the scope for the specific task being performed.

- Storm climatology and meteorological event selection
  - A database or spatially compatible file (with lat/long locations), or an Esri shapefile or personal Geodatabase containing the regional historical storm data or database
  - A database or spatially compatible files containing storm events selected, their storm parameters (storm tracks, etc.), and their use (calibration, verification, production runs, etc.)
  - A report describing the technical approach for storm event selection
- Stillwater Elevations (SWELs)
  - Grid system files of storm wind field and pressure field data for selected events (model input files – if water levels are simulated/hindcast)

  - A report describing hydrodynamic model calibration and validation (if water levels are simulated/hindcast). If 2-D wave models were used for setup calculations, these should be included here as well.
  - Model input files, in their native format, of calibrated hydrodynamic models (grid and parameter specifications – if water levels are simulated/hindcast). If setup is being calculated by 2-D wave models, wave model input files would also be included.
  - A database file, spreadsheet, or spatially compatible file containing water level maxima at surge station locations for each storm event (if water levels are simulated/hindcast). If statistics on stillwater and 2-D wave results are calculated separately, both sets of maxima for each storm event should be included. Spatial coordinates (X,Y) of station locations must be provided for each record.
  - A database file, spreadsheet, or spatially compatible file containing water level maxima at available tide gage locations for each storm event (if historical data are used for statistical analyses or model calibration) for hindcasting or validation.
  - Historic high water marks and their elevation and location should be submitted if used during the flood risk project.
  - A report describing the technical approach for flood frequency analyses.
  - A report describing the approach adopted for sheltered water areas (if applicable).
  - A database file, spreadsheet, or spatially compatible file containing the 10-percent, 2-percent, 1-percent, and 0.2-percent-annual-chance stillwater levels at the surge station locations.
- Offshore wave characteristics
  - Grid system files of wave model wind field data (model input files – if waves are simulated/hindcast).
  - A report describing the wave model calibration and validation (if waves are simulated/hindcast).
  - Model input files, in their native format, of the calibrated wave model (grid and parameter specifications – if waves are simulated/hindcast).
  - A database file, spreadsheet, or spatially compatible file containing the significant or controlling wave height, clearly labeled, and peak wave period at surge station locations for each storm event (if waves are simulated/hindcast).
  - A database file, spreadsheet, or spatially compatible file containing wave heights and wave periods at available wave stations/buoys (if historical wave data were used or if used for model calibration).
  - A report describing the technical approach for wave simulation and/or statistical analyses.
  - A report describing the approach adopted for sheltered water areas.
  - A database file, spreadsheet, or spatially compatible file containing the 1-percent-annual-chance controlling wave heights and wave periods (by transect).
- Nearshore hydraulics
  - Model input and output files from WHAFIS or CHAMP (if applicable).
  - A database file, spreadsheet, database (such as CHAMP or WISE), or spatially compatible file containing pre- and post-eroded transect profiles (if applicable).
  - A report describing the technical approach adopted for wave-height, wave setup, wave run-up, and wave-overtopping calculations.
  - Input and output files for any other models used in coastal hydraulic analyses including spreadsheet calculations.

  - As applicable, a report describing the technical approach adopted for tsunami modeling and mapping.
- Spatial Files
  - Source Citation Information (L_Source_Cit described in Appendix L).
  - Floodplain mapping submittal information (S_Submittal_Info described in Appendix L).
  - Flood hazard zone map boundary delineations (S_Fld_Haz_Ar spatial file described in Appendix L).
  - Primary frontal dune delineations (S_PFD_Ln spatial file described in Appendix L).
  - Transects (S_Cst_Tsct_Ln spatial file and L_Cst_Tsct_Elev table described in Appendix L).
  - Coastal Gage Data (S_Cst_Gage spatial file described in Appendix L).
  - Shoreline (S_Tsct_Basln spatial file described in Appendix L).
  - Coastal Barrier Resource System (CBRS) and Other Protected Areas (OPAs) (S_CBRS spatial file described in Appendix L).
  - Coastal Structures (S_Gen_Struct spatial file, S_Levee, and associated S_Stn_Start file, described in Appendix L and L_Cst_Struct file described in Appendix L).
  - Limit of Moderate Wave Action (S_LiMWA spatial file described in Appendix L).
  - Coastal models used in engineering analysis (L_Cst_Model, described in Appendix L).
  - A table (L_Summary_Elevations, described in Appendix L).
- A draft text for inclusion in the FIS report that provides the required information for the section labeled 5.3 Coastal Analyses.
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

M.9.2.2 1-Percent-Annual-Chance Wave Envelope [August 2011]

A 1-percent-annual-chance wave envelope profile for each transect must be submitted showing the wave heights, wave runup elevation, SWELs, zone gutter locations, and where applicable, the location of primary frontal dunes, pre-and post eroded ground profile, and the location of coastal structures included in analyses. If the modeled transect numbers differ than those shown on the FIRM, then a transect key, correlating the modeled transects to the mapped transects, should also be submitted. These files must be submitted in a DXF, DWG or a spatially compatible file format, to allow for graphic format changes, and as a PDF or JPEG file for the FIS narrative report. These files must be located in the simulations folder of this submittal.

M.9.2.3 0.2-Percent-Annual-Chance Wave Envelope [August 2011]

Calculating the 0.2-percent-annual-chance wave height is an optional coastal flood risk project task. When included as part of the coastal studies, profiles showing the 0.2-percent-annual-chance wave envelope and ground elevations are added to the end of the FIS. All profiles must be submitted using a file name convention of “County_TransectNumber***,” in a DXF, DWG or a spatially compatible file format, to allow for graphic format changes, and as a PDF or JPEG file for the FIS narrative report. These files must be located in the simulations folder of this submittal.

M.9.2.4 1-Percent-Annual-Chance Total Stillwater Elevation Contour Map [August 2011]

A contour map of the flood study area for the 1-percent-annual-chance total stillwater elevation (storm surge plus wave setup), should be provided in the FIS report narrative. The map scale should be chosen for clarity of depicting 1-foot contours for the entire overland flood risk project area. This map must be submitted in a JPEG or PDF file format, named "SWEL_Contours.***." These files must be located in the coastal database directory of the submittal. The standards for 1-Percent-Annual-Chance Total Stillwater Elevation Contour Map are provided in the sample report in Appendix J of these Guidelines.

M.9.2.5 Transect Location Map [August 2011]

A transect location map illustrates the location of transects used in coastal analyses and should be provided in the FIS report narrative. This map must be submitted in JPEG or PDF file format, named "Transect_Location.***." Transect location maps are not required in the FIS when transects are shown on the FIRM. If a transect location map is included in the FIS, only transects used for mapping should be shown. These files must be located in the coastal database directory of the submittal. The standards for the transect location map are provided in the sample report in Appendix J of these Guidelines.

M.9.2.6 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner performing coastal analysis. General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of performing coastal analysis. Correspondence includes any documentation generated during this task such as: letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; direction from FEMA; and documentation of the final independent review and approval for each coastal intermediate submission that is not otherwise captured in the MIP workflow process. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.9.2.7 Certification of Work [March 2009]

FEMA-funded (including CTP-funded projects if they are a part of FEMA's flood mapping program) coastal work must be certified using the form provided in Figure M.10-1 in Section M.10. Submittal of this certification at the "Perform Coastal Analysis" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF of the form must be submitted digitally with the original signature, date, and seal affixed to the form. This form must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work or by the appropriate government agency official. A digital version of this form is available at www.fema.gov.

M.9.2.8 Acceptable File Formats [August 2011]

Any spatial features must be stored in a spatially compatible format. Model input and output files and other data files used to support the flood risk project can be provided in their native format.

- PDF format for reports, correspondence, and certifications;

- PDF and MS Word format for FIS report Sections 5.1 and 5.3;
- MS Word format for project narrative;
- Esri Shapefiles or Personal/file Geodatabase for all coastal spatial files;
- GML for all coastal spatial files;
- PDF or JPEG for coastal map products;
- Models in native formats; and
- 0.2-percent-annual-chance wave envelope profiles in PDF and DXF or spatially compatible file.

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the Mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected (refer to Appendix L for additional information).

M.9.2.9 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Coastal Study Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the Mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Coastal Study Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.9.2.10 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or on one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted must be labeled with the following information:

- Mapping partner name;
- Community name and State for which the FIS was prepared;

- Coastal data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.9.2.11 Transfer Methodology [August 2011]

Coastal Data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.9.2.12 Directory Structure and Folder Naming Conventions [August 2011]

The files in Section M.9.2 Requirements must be submitted in the following directory structure. Coastal data must be submitted to the appropriate subfolder associated with the flooding source (water body) studied (such as the Atlantic Ocean) and the project name that best describes the location of the project within that water body. The following folders can be created either on a local work space (e.g., a personal computer) or within the work space for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

Data must be located in the appropriate directories, as follows:

- \Water Body\Project Name\General
  - Coastal analyses and mapping reports
  - Draft FIS Coastal Hydrologic and Hydraulic Analysis Sections (typically 5.1 and 5.3), including applicable graphics and tables and 0.2-percent-annual-chance Wave Envelope (if applicable)
  - Project narrative
  - Certification
  - Metadata File
- \Water Body\Project Name\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; and direction by FEMA

Stillwater and offshore wave models are organized by type (surge, 2-D waves), with all model files in the *Simulations* folder and all support spatial files in the *Spatial Files* folder. Any additional data not described by these standards and used to assist in the modeling of this flood risk project must be submitted in the *Coastal Databases* folder. Data must be located in the appropriate directories as follows:

- \Water Body\Project Name\Stillwater_Models\“Software Name”\Simulations\Calibration
  - Model input and output files for calibration runs
- \Water Body\Project Name\Stillwater_Models\“Software Name”\Simulations\Verification
  - Model input and output files for Verification runs
- \Water Body\Project Name\Stillwater_Models\“Software Name”\Simulations\Production_Runs
  - Model input and output files for production runs including statistics analysis
- \Water Body\Project Name\Stillwater_Models\“Model Name”\Spatial_Files
  - Spatial files by Model

- \Water Body\Project Name\Stillwater_Models\"Software Name"\Coastal_Databases
  - Database file(s) such as high water mark data for model calibration
- \Water Body\Project Name\Offshore_Wave_Models\"Software name"\Simulations\Calibration
  - Model input and output files for calibration runs
- \Water Body\Project Name\Offshore_Wave_Models\"Software Name"\Simulations\Verification
  - Model input and output files for Verification runs
- \Water Body\Project Name\Offshore_Wave_Models\"Software Name"\Simulations\Production_Runs
  - Model input and output files for production runs including statistics analysis
- \Water Body\Project Name\Offshore_Wave_Models\"Model Name"\Spatial_Files
  - Spatial files by Model
- \Water Body\Project Name\Offshore_Wave_Models\"Software Name"\Coastal_Databases
  - Database file(s) such as wave buoy data for model calibration

Nearshore models (including wave-height, wave setup, wave run-up and wave-overtopping models) are organized by Transect Number, with all model files in the *Simulations* folder and all support spatial files in the *Spatial Files* folder. Any additional data not described by these standards and used to assist in the modeling of this flood risk project must be submitted in the *Coastal Databases* folder. Data must be located in the appropriate directories as follows:

- \Water Body\Project Name\Nearshore_Wave_Models\"Flooding Source"
  - Geographic designation of the flooding source represented by the modeling. This designation may be the same as the "surface water feature name" (WTR_NM), or may identify a larger or smaller geographic feature, depending on the spatial scale of the modeling
- \Water Body\Project Name\Nearshore_Wave_Models\"Software Name"\Simulations\
  - Model input and output files for WHAFIS 1-D wave calculations, runup calculations, or other overland wave models
  - Wave envelope files
- \Water Body\Project Name\Nearshore_Wave_Models\"Software Name"\Spatial_Files
  - Spatial files by Model including the Transect Layout file
- \Water Body\Project Name\Nearshore_Wave_Models\"Software Name"\Coastal_Databases
  - Database file(s) such as CHAMP or WISE
- \Water Body\Project Name\Transects
  - Transects (if one-dimensional model was used)

M.10 Floodplain Mapping Submittal Standards for Redelineation and Digital Conversion

M.10.1 Overview [August 2011]

This section describes the type and format of data that must be submitted to FEMA for floodplain mapping performed by redelineation of floodplains using updated topographic data and conversion of non-revised effective FIRM information to digital format. All data must be submitted in digital format. The mapping partner performing "Floodplain Mapping" for redelineation and digital conversion is required to submit the data in this section. Floodplain mapping data for all areas contracted for redelineation or conversions to digital format must be submitted.

The submitting mapping partner must retain copies of all project-related data for a period of three years. The submitting mapping partner will need these data in order to respond to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of the preliminary maps; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.10.2 Requirements [August 2011]

M.10.2.1 Data Files [August 2011]

The following files must be submitted for floodplain mapping:

- A draft FIS report;
- Certification of Work;
- Redelineation files described in Section M.10.2.3
- Digital conversion files described in Section M.10.2.4

M.10.2.2 Draft FIS [August 2011]

The mapping partner performing redelineation and digital conversion must produce the draft FIS report by updating relevant sections of the effective FIS report, including all profiles and tables converted to NAVD88, as well as any other necessary items for the preparation of the preliminary FIS. The submitting mapping partner must ensure that the draft FIS report complies with Appendix J of these Guidelines.

M.10.2.3 Redelineation [August 2011]

M.10.2.3.1 *Riverine Redelineation* *[August 2011]*

If the floodplain mapping involves the redelineation process for riverine areas, then the following files must be submitted:

- The following spatial files and tables, where applicable:
  - Source Citation Information (L_Source_Cit described in Appendix L)

  - Floodplain Mapping submittal information (S_Submittal_Info described in Appendix L)
  - Cross sections (S_XS, L_XS_Elev, and S_Stn_Start described in Appendix L)
  - Base Flood Elevation lines for backwater and ponding areas, not on profile baseline (S_BFE described in Appendix L)
  - Profile baseline (S_Profil_BasLn described in Appendix L)
  - Floodplain mapping (S_Fld_Haz_Ar and S_Zone_AR described in Appendix L)
  - Structures (S_Gen_Struct and S_Levee described in Appendix L)
- Topographic data files as described in Section M.4 (if not submitted under "Develop Topographic Data" described in Section M.4)
- A project narrative describing the SOW, direction from FEMA, source and description of topographic data, issues, etc..

M.10.2.3.2 *Coastal Redelineation* *[August 2011]*

If the floodplain mapping involves the redelineation process for coastal areas, then the following files must be submitted:

- Spatial files and tables, where applicable:
  - Source Citation Information (L_Source_Cit described in Appendix L)
  - Floodplain Mapping submittal information (S_Submittal_Info described in Appendix L)
  - Transect Baseline (S_Tsct_Basln described in Appendix L)
  - Coastal transects (S_Cst_Tsct_Ln and L_Cst_Model described in Appendix L)
  - Floodplain mapping (S_Fld_Haz_Ar and S_Zone_AR described in Appendix L)
  - Primary frontal dune delineations (S_PFD_Ln described in Appendix L)
  - CBRS and OPAs (S_CBRS described in Appendix L)
  - Structures (S_Gen_Struct, S_Levee and L_Cst_Struct described in Appendix L)
- Topographic data files as described in Section M.4 (if not submitted under "Develop Topographic Data" described in Section M.4)
- A project narrative describing the SOW, direction from FEMA, issues, etc.

M.10.2.4 Digital Conversion [August 2011]

M.10.2.4.1 *Riverine Digital Conversion* *[August 2011]*

If the floodplain mapping involves conversion of non-revised effective FIRM information to digital format for riverine areas, then the following files must be submitted:

- The following spatial files, where applicable:
  - Source Citation Information (L_Source_Cit described in Appendix L)
  - Floodplain Mapping submittal information (S_Submittal_Info described in Appendix L)
  - Cross sections (S_XS, L_XS_Elev, and S_Stn_Start described in Appendix L)
  - Base Flood Elevation lines for backwater and ponding areas, not on profile baseline (S_BFE described in Appendix L)
  - Profile baseline (S_Profil_BasLn described in Appendix L)
  - Floodplain mapping (S_Fld_Haz_Ar and S_Zone_AR described in Appendix L)
  - Structures (S_Gen_Struct and S_Levee described in Appendix L)

- Base map data files as described in Section M.3 (if not submitted under "Acquire Base Map" described in Section M.3)
- A project narrative describing the SOW, direction from FEMA, issues, etc.

M.10.2.4.2 *Coastal Digital Conversion* *[August 2011]*

If the floodplain mapping involves conversion of non-revised effective FIRM information to digital format for coastal areas, then the following files must be submitted:

- Spatial files, where applicable:
  - Source Citation Information (L_Source_Cit described in Appendix L)
  - Floodplain Mapping submittal information (S_Submittal_Info described in Appendix L)
  - Transect Baseline (S_Tsct_Basln described in Appendix L)
  - Coastal transects (S_Cst_Tsct_Ln described in Appendix L)
  - Floodplain mapping (S_Fld_Haz_Ar and S_Zone_AR described in Appendix L)
  - CBRS and OPAs (S_CBRS described in Appendix L)
  - Structures (S_Gen_Struct, S_Levee and L_Cst_Struct described in Appendix L)
- Base map data files as described in Section M.3 (if not submitted under "Acquire Base Map" described in Section M.3)
- A project narrative describing the SOW, direction from FEMA, issues, etc.

M.10.2.5 General Correspondence [March 2009]

A file that compiles general correspondence must be submitted by the mapping partner performing floodplain mapping associated with redelineation and/or digital conversion described in this section. General correspondence is the written correspondence generated or received by the mapping partner assigned to fulfill the requirements of performing redelineation and/or digital conversion. Correspondence includes any documentation generated during this task such as letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; and direction given by FEMA that were relevant to the performance of this task. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.10.2.6 Certification of Work [March 2009]

Work funded by FEMA (including CTP-funded projects if they are a part of FEMA's flood mapping program) must be certified using the form provided in Figure M.10-1 in this section. Submittal of this certification at the "Perform Floodplain Mapping" workflow step is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. In addition, a Flood Boundary Standard (FBS) self-certification is also required for redelineation (based on revised topography) and digital conversion projects completed. FBS self-certification requirements are described in Section M.11.2.3 and must be submitted as part of requirements outlined in Section M.11 Post-Preliminary Data Submittal Requirements. A PDF of the form must be submitted digitally with the original signature, date, and seal affixed to the form. These forms must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work, or by the appropriate government agency official. A digital version of these forms is available at www.fema.gov.

M.10.2.7 Acceptable File Formats [August 2011]

Any supporting documentation and data can be submitted in model or native format. The following formats are accepted for files:

- Esri Shapefiles for all riverine and coastal spatial files;
- Personal/file Geodatabase for all riverine and coastal spatial files;
- GML for all riverine and coastal spatial files;
- PDF for correspondence and certifications;
- PDF and MS Word format for draft FIS report;
- MS Word format for project narrative;
- MS Word or Excel format for FWDT; and
- RASPLOT access database, DXF or DWG format for stream profiles (redelineation).

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected with projection information defined (refer to Appendix L for additional information).

M.10.2.8 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Floodplain Mapping and Redelineation Metadata Profiles must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the NFIP Floodplain Mapping and Redelineation Metadata Profiles. Reference the data providers' original metadata record in the Lineage section of the NFIP metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.10.2.9 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or on one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted must be labeled with the following information:

- Mapping partner name;
- Community name and State for which the FIS was prepared;
- Coastal data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission

M.10.2.10 Transfer Methodology [August 2011]

Floodplain Mapping data artifacts can be uploaded to the MIP by following the guidelines located on the MIP for data upload (https://hazards.fema.gov).

M.10.2.11 Directory Structure and Folder Naming Conventions [August 2011]

The files in Section M.10.2 Requirements must be submitted within the following directory structure which is created by the contractor within their workspace prior to upload. Data files must be organized under an applicable 8-digit Hydrologic Unit Code (HUC-8). The standard to be used for the definition of HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Survey and the Natural Resources Conservation Service. The following folders can be created either on a local work space (i.e., a personal computer) or within the work space available for the community on the MIP. If the following folders are generated locally, these newly created folders and their contents must be uploaded to the MIP.

Data must be located in the appropriate directories as follows:

- \HUC-8\General
  - Draft FIS report
  - Project narrative
  - Certification
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues; and direction by FEMA
- \HUC-8\Redelineation \Spatial_Files
  - Spatial files
- \HUC-8\Redelineation\Topographic_Data
  - Topographic data files
- \HUC-8\Digital Conversion\Spatial_Files
  - Spatial files
- \HUC-8\Digital Conversion \Base_Map
  - Base map data files (if not submitted as part of data requirements described in Section M.3)

- \HUC-8\Redelineation\Supplemental_Data
  - Rectified effective maps and any other data that was used to re-create effective profiles and delineations

Certificate of Compliance Form	
Project Name:	
Statement of Work No.:	
Interagency Agreement No.:	
CTP Agreement No.:	
Statement/Agreement Date:	
Certification Date:	

	Tasks/Activities Covered by This Certification (Check All That Apply)
☐	Base Map
☐	Topographic Data Development
☐	Survey
☐	Hydrologic Analysis
☐	Hydraulic Analysis
☐	Alluvial Fan Analysis
☐	Coastal Analysis
☐	Floodplain Mapping
☐	Flood Risk Assessment
	This is to certify that the work summarized above was completed in accordance with the statement/agreement cited above and all amendments thereto, together with all such modifications, either written or oral, as the Regional Project Officer and/or Assistance Officer or their representative have directed, as such modifications affect the statement/agreement, and that all such work has been accomplished in accordance with the provisions contained in *Guidelines and Specifications for Flood Hazard Mapping Partners* cited in the contract document, and in accordance with sound and accepted engineering practices within the contract provisions for respective phases of the work. This is also to certify that data files submitted for the work summarized above are complete and final. Any revisions made to the already submitted data are included in the final submittal. The content of the files submitted is sufficient for subsequent users with appropriate professional expertise to be able to understand the scientific and technical basis of the analysis and reproduce the findings.

Name:	
Title:	
Firm/Agency Represented:	
Registration No.:	
Signature:	
	This form must be signed by a representative of the firm or agency contracted to perform the work, who must be a registered or certified professional in the area of work performed, in compliance with Federal and State regulations.

Figure M.10-1. Certification of Compliance Form

M.11 Post-Preliminary Data Submittal Standards

M.11.1 Overview [August 2011]

This section describes the type and format of data that must be submitted to FEMA for the post-preliminary phase of the mapping process. All data must be submitted in digital format. The mapping partner(s) contracted to "Manage Post Preliminary Processing" is required to submit the data in this section.

There are a number of data artifacts generated for studies throughout the post-preliminary processing, such as the Flood Elevation Determination Docket (FEDD), preliminary and final SOMAs, and Revalidation letters. These do not have associated workflow steps in the MIP workflow, but include important information about the studies. In addition, meeting reports, minutes and/or other artifacts are generated from several community engagement meetings, such as the Flood Study Review meeting, CCO Meeting/Open House, and Resilience meeting, throughout the life cycle of a mapping project. It is extremely important that FEMA captures these data artifacts as studies are completed, to ensure a complete set of technical and administrative project data is available when questions arise about these studies and/or these studies are updated in the future.

All mapping partners must submit FEDD files to FEMA Headquarters (or its designee) for review during Quality Review 6 (60 days before the LFD is scheduled to be issued). FEMA Headquarters (or its designee) will maintain the FEDD file beginning with the issuance of the LFD and will add copies of all correspondence issued after that date. This correspondence will include the LFD, Final SOMA, Final Federal Register notice, suspension letters, Revalidation letter, and all applicable proof of receipt. The complete FEDD file for each community will be archived to the MIP by FEMA Headquarters (or its designee) no later than 60-days following the FIRM effective date in accordance with the directory structure and folder naming conventions specified in this section.

The submitting mapping partner must retain copies of all Project-related data for a period of three years. The submitting mapping partner will need these data in order to respond to the following:

- Questions from FEMA or the receiving mapping partner during the review of the final draft materials;
- Comments and appeals submitted to FEMA during the 90-day appeal period following the issuance of preliminary maps; and
- Other concerns and issues that may develop during the processing of the revised FIS report and FIRM.

M.11.2 Requirements [August 2011]

M.11.2.1 Data Files [August 2011]

There are a number of documents and data generated after a FIRM is issued as preliminary. These documents and data are generated at various steps of the mapping process until the FIRM becomes effective. The following data must be submitted at the end of each mapping project:

- Preliminary SOMA; Contact Information Sheet, Preliminary transmittal letter;

- Floodplain Boundary Standard (FBS) Self-Certification Document (this document must be submitted within 30 days after issuance of preliminary maps);
- Revised Floodplain Boundary Standard Self-Certification Document (this document must be submitted within 30 days after issuance of the LFD if floodplain boundaries were revised during the post-preliminary phase);
- Flood Elevation Determination Docket (FEDD), including the following documents in the FEDD file, per 44 CFR 67.3:
  - Notice of proposed flood elevation determination to CEO (101/155 letter);
  - Notice of proposed flood elevation determination published in prominent local newspaper, or signed/dated affidavit;
  - Notice of proposed flood elevation determination published in Federal Register;
  - Appeals received by FEMA from community CEO;
  - Comments received by FEMA on the notice of the proposed flood elevation determination published in the Federal Register;
  - Community's appeal or copy of its decision not to appeal the proposed flood elevation determination;
  - Final determination with supporting documents (LFD);
  - Final SOMA;
  - Name of community subject to the flood elevation determination;
  - FIS report;
  - All correspondence between FEMA and the community concerning the flood risk project, reports of meetings among the Agency representatives, property owners, State coordinating agency, flood risk project contractors, or other interested persons; Meeting minutes and meeting attendance list;
  - Relevant publications; and
  - Copy of materials maintained in the flood elevations flood risk project consultation docket.
- Copies of acknowledgement letters by FEMA to community CEO;
- Copies of resolution letters by FEMA to community CEO;
- Revalidation letter;
- Notice of final flood elevation determination published in Federal Register; and
- Certified Return Receipts or comparable proof of receipt for the proposed flood elevation determination letter to the CEO and the LFD.

M.11.2.2 Certification of Work [March 2009]

Floodplain Boundary Standard self-certification must be submitted for flood mapping projects funded by FEMA, as described in the following section. The *Floodplain Boundary Standard Audit Procedures* – available on FEMA's Guidelines and Standards website – outline the documentation needed for FBS compliance through self-certification. A PDF of the self-certification form must be submitted digitally and must have the original signature and date. This form must be signed by a registered Professional Engineer from the firm contracted to perform the work, and/or by the appropriate government agency official.

M.11.2.3 Floodplain Boundary Standard Self-Certification [March 2009]

The FBS self-certification documentation and data must be submitted within 30 days after a mapping project is issued preliminary and also within 30 days of the issuance of the LFD if there were changes to the SFHA boundaries during the post-preliminary phase using the upload step in the MIP workflow for each Flood Map Project funded in FY06 and later. The final floodplain (SFHA) boundaries (after tie-ins to structures and smoothing of boundaries, if necessary, are completed) must be used for FBS compliance checks. The *Floodplain Boundary Standard Audit Procedures* – located on FEMA's website – outline the documentation needed for FBS compliance through self-certification. The following data must be captured and submitted for each Flood Mapping Project in the report format provided in Attachment B of the *Floodplain Boundary Standard Audit Procedures*:

- Self-Certification review type (GIS or WISE)
- Mapping partner performing the audit
- Self-Certification approver and date
- Description of materials used to perform the audit
- Reference Information and Identification of Study being certified
- Reviewer Name and Date Submitted to Region
- Names of stream reaches and/or coastal water bodies audited
- Total stream length and/or shoreline length audited
- Number of floodplain boundary points audited
- Number of floodplain boundary points passed
- Number of floodplain boundary points failed
- Pass/Fail percentages for flood risk project FBS risk classes
- Stream name and lengths that passed audit
- Shapefile of points tested including exceptions
- 100k NHD Subbasin Pass/Fail shapefile if reporting results below flood risk project level

M.11.2.4 Acceptable File Formats [August 2011]

Documents and other supporting information identified in this section must be submitted either in MS Word or PDF format. FIRM MXD and annotation files are also acceptable as supporting information. PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document.

M.11.2.5 Metadata [March 2009]

Currently, metadata profiles do not exist for post-preliminary data elements described in this section. Therefore, no metadata file is required for post-preliminary data submittals. However, supporting information during data submittals must be provided in the Abstract field of the MIP Tools and Links (see Section M.11.2.7 for directions to use Tools and Links and its Abstract field). The Abstract field must include the type of data being uploaded. For example, if a FEDD file is being uploaded, the word "FEDD" must be included in the abstract so it can be used as a search word in the "Abstract" field of

MIP's Search & Retrieve tool to retrieve the FEDD files under the "FEDD" folder. Caution: Entering the word "FEDD" in Project ID/Keyword field instead of the "Abstract" field in Search & Retrieve will not allow retrieval of FEDD files. If an additional file is uploaded under the same category (e.g., a corrected .ZIP file for that category), the abstract should then include the reason why, or specifically point out the differences. If it is intended to replace a file (e.g., the file already submitted is incorrect), and the existing file is not overwritten when the new file is uploaded (because filename does not exactly match), MIPHelp must be contacted to remove the incorrect file/duplicate entry to avoid confusion in the future.

M.11.2.6 Transfer Media [March 2009]

Mapping partners must submit files via the internet by uploading to the MIP (http://www.hazards.fema.gov) or on one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data are mailed to FEMA, all submitted digital media must be labeled with the following information:

- Mapping partner name;
- County/Community name and State for which the FIS was prepared;
- Case number;
- Study data type;
- Post-Preliminary Data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [*sequential number*] of [*number of disks*] (if not uploaded through workflow). The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission if the data is not uploaded through workflow on the MIP.

M.11.2.7 Directory Structure and Folder Naming Conventions [August 2011]

The files under Section M.11.2 Requirements must be submitted as a .ZIP file for each of the data categories organized in the following directory structure. For example, preliminary and final SOMA files, for all the communities in the county, must be grouped under the \SOMA folder and the entire \SOMA folder must be converted to a .ZIP file and uploaded to the MIP to the appropriate Federal Information Processing Standard (FIPS) code for that county. The .ZIP files should be created by the contractor in their workspace prior to upload. Once the .ZIP file is created, it must be submitted to the MIP .

The file naming convention for submitted files must include specific information as defined under each folder. Data must be located in the appropriate directories as follows:

- \FIPS\SOMA
  - Preliminary SOMA (File name: State Alpha-CID_SOMA_Preliminary, for example: NC-370125_SOMA_Preliminary)
  - Final SOMA (File name: State Alpha-CID_SOMA_Final, for example: NC-370125_SOMA_Final)
- \FIPS\FBS
  - Self-Certification (File name: County or Community_State_FBS_Preliminary)
  - Self-Certification (if needed) (File name: County or Community_State_FBS_Final)
- \FIPS\FEDD
  - All correspondence between FEMA and the community, during the post-preliminary phase, concerning the flood risk project, reports of meetings among the Agency representatives, property owners, State coordinating agency, flood risk project contractors, or other interested persons (File name: County_Community_State_FEDD_Correspondence_Date (mmddyyyy))
  - Notice of proposed flood elevation determination to CEO (File name: County_Community_State_FEDD_CEOLetter_Date (mmddyyyy))
  - Notice of proposed flood elevation determination published in paper (File name: County_Community_State_FEDD_ProposedBFENotice_Date (mmddyyyy))
  - Notice of proposed flood elevation determination published in Federal Register (File name: County_Community_State_FEDD_ProposedBFENoticeFR_Date (mmddyyyy))
  - Appeals received by FEMA from community CEO (File name: County_Community_State_FEDD_Appeals_Date (mmddyyyy))
  - Comments received by FEMA on the notice of the proposed flood elevation determination published in the Federal Register (File name: County_Community_State_FEDD_Comments_Date (mmddyyyy))
  - Community's appeal or copy of its decision not to appeal the proposed flood elevation determination (File name: County_Community_State_FEDD_Appeal_Date (mmddyyyy))
  - Final determination with supporting documents (File name: County_Community_State_FEDD_LFD_Date (mmddyyyy))
  - Name of community subject to the flood elevation determination
  - FIS report (File name: County or Community_State_FEDD_FISReport)
  - Relevant publications (File name: County_Community_State_FEDD_Publication Name_Date (mmddyyyy))
  - Copy of completed flood elevations flood risk project consultation docket (File name: County_Community_State_FEDD_Docket_Date (mmddyyyy))
  - Copy of the FEMA's final determination
- \FIPS\Revalidation
  - Revalidation letters (File name: County_Community_State_Revalidation)
  - \FIPS \Supplementary_Post_Preliminary_Data
  - Acknowledgement letters (File name: County_Community_State_AckLetter_Date (mmddyyyy))
  - Resolution letters (File name: County_Community_State_ResolutionLetter_Date (mmddyyyy))
  - Outcome of Community Engagement Meetings (File name: County_Community_State_MeetingName_Date mmddyyyy))

- Copy of BFE Notice published in Federal Register (File name: County_Community_State_FinalBFENoticeFR_Date (mmddyyyy))
- Certified Return Receipts or comparable proof of receipt for the proposed flood elevation determination letter and the LFD.
- FIRM MXD and annotation files for future map revisions.

M.12 Flood Risk Assessment Submittal Standards

M.12.1 Overview [August 2011]

This section describes the type and format of data that must be submitted to FEMA used to support flood risk assessments. All data must be submitted in digital format. The mapping partner(s) contracted to perform flood risk assessment analyses is required to submit the data in this section. Details on FEMA guidance for flood risk assessment are provided in Appendix N Flood Risk Data Development and Analysis of these Guidelines.

Flood risk assessment data created will be stored in the Flood Risk Database (Appendix O), which will be used to create flood risk products such as the Flood Risk Map, Flood Risk Report and other risk assessment products as needed. Any supporting data that are used in performing risk assessment analyses and the creation of flood risk products must be submitted in compliance with the requirements outlined in this section. Details on FEMA guidance for Flood Risk products are provided in Appendix O.

The submitting mapping partner must retain copies of all Project-related data for a period of 3 years. The submitting Partner will need these data for responding to questions from FEMA, another government agency and/or communities during the review of the final draft materials, and other concerns and issues that may develop during the processing of the flood risk products.

M.12.2 Requirements [August 2011]

M.12.2.1 Data Files [August 2011]

All data not uploaded elsewhere and not part of the final Flood Risk Database that are important to documenting the development of the Flood Risk Database should be submitted. This includes data files from other products, such as the regulatory floodplain boundary, that may have been modified from the original version (spatial or attribute) to support development of Flood Risk Products. In addition, any products that need to be handed off to mapping partners working on subsequent tasks should be uploaded to ensure the handoff between tasks is clearly documented. The submittals must include – if used in risk assessment – but not limited to:

- Flood Risk Datasets
  - Changes Since Last FIRM:
    - Input and Output data associated with the Changes Since Last FIRM Dataset
    - Should include directories for standard and enhanced data
  - Depth and Analysis Grids:
    - Input and Output data associated with the Flood Depth and Associated Grids Dataset
    - Should include directories for standard and enhanced data
  - Flood Risk Assessment:
    - Input and Output data associated with the Flood Risk Assessment Dataset, which include Hazus data
    - Should include directories for standard and enhanced data
  - Area of Mitigation Interest:
    - Input and Output data associated with the Areas of Mitigation Interest Dataset
    - Should include directories for standard and enhanced data

- Flood Risk Map
  - Input and Output data associated with the Flood Risk Map
  - Should include directories for standard and enhanced data
  - MXD file associated with the Flood Risk Map
- Flood Risk Report
  - Input and Output data associated with the Flood Risk Report
  - Should include directories for standard and enhanced data
- A project narrative describing the SOW, direction from FEMA, issues, information for the next mapping partner, etc.

M.12.2.2 General Correspondence [August 2011]

A file that compiles general correspondence must be submitted by the mapping partner performing the risk assessment activities described in this section. General correspondence is the written correspondence generated or received by the mapping partner assigned to risk assessment. It includes any documentation generated during this task such as letters; transmittals; memoranda; general status reports and queries; SPRs; technical issues that need to be documented; and direction given by FEMA that were relevant to the performance of this task. Contractual documents, such as a signed SOW or MAS, are not to be submitted as a part of the DCS.

M.12.2.3 Certification of Work [August 2011]

Work funded by FEMA (including CTP-funded projects if they are a part of FEMA's flood mapping program) must be certified using the form provided in Figure M.10-1 in this section. Submittal of this certification is required if this is the only task performed by the mapping partner. Mapping partners that are contracted to perform multiple mapping tasks can submit one certification form to certify all the work performed. A PDF of the form must be submitted digitally with the original signature, date, and seal affixed to the form. These forms must be signed by a registered Professional Engineer or licensed land surveyor from the firm contracted to perform the work, or by the appropriate government agency official. A digital version of these forms is available at www.fema.gov.

M.12.2.4 Acceptable File Formats [August 2011]

Any supporting documentation and data can be submitted in model or native format. The following formats are accepted for files:

- JPG, TIFF, BMP image files;
- XLS or XLSX – Microsoft Excel (for X, Y, Z points);
- DBF – Database (for X, Y, Z points);
- PDF for correspondence and certifications; and
- Esri shapefiles or personal/file Geodatabase for spatial and tabular files;

PDF files must be created using the source file (e.g., MS Word file), if the source file is created by the Mapping partner, rather than raster scans of hard copy text documents. PDF files created must allow copying of text and pasting to another document. In addition, Esri shapefiles and Geodatabase feature classes must be projected.

M.12.2.5 Metadata [August 2011]

A metadata file in XML format that complies with the NFIP Metadata Profiles for Flood Risk Datasets must be included with the submittal. The profiles follow the FGDC Content Standard for metadata and define additional domains and business rules for some elements that are mandatory for FEMA based on the specific submittal type. For each spatial data source in the metadata file, the Mapping partner must assign a Source Citation Abbreviation. FEMA NFIP Metadata Profiles can be accessed on the MIP, in the "Guides & Documentation" tab, under "MIP User Care".

If metadata is available from an agency or organization that provided data for use in the flood risk project, it should be included in the metadata submittal in addition to the metadata profiles prepared for the flood risk project. Reference the data providers' original metadata record in the Lineage section of the metadata profile. If there is a web-accessible metadata record for the original data set, the URL to the metadata may be provided in the optional Source Citation - Online Linkage element. Otherwise, the Source Contribution [free text] element may include information on how to access the metadata record for the data sets obtained.

M.12.2.6 Transfer Media [August 2011]

Mapping partners must submit files via the internet by uploading to the MIP (http://hazards.fema.gov) or on one of the following electronic media:

- CD-ROM;
- DVD; or
- External Hard Drive (for very large data submissions with a mailing label for return to the mapping partner).

In special situations or as technology changes, other media may be acceptable if coordinated with FEMA.

When data is mailed to FEMA, all digital media submitted must be labeled with the following information:

- Mapping partner name;
- Community name and State for which the Risk Assessment submittal was prepared;
- Risk Assessment data;
- Date of submission (formatted mm/dd/yyyy); and
- Disk [sequential number] of [number of disks]. The media must be numbered sequentially, starting at Disk 1. [Number of disks] represents the total number of disks in the submission.

M.12.2.7 Transfer Methodology [August 2011]

Risk Assessment data artifacts can be uploaded to the MIP by following the guidelines for Data Upload located on the MIP (https://hazards.fema.gov).

M.12.2.8 Directory Structure and Folder Naming Conventions [August 2011]

The files under Section M.12.2 Requirements must be submitted as a .ZIP file for each of the data categories organized in the following directory structure. For example, input and output data files associated with the Changes Since Last FIRM (CSLF) dataset, along with directories for standard and

enhanced data, must be grouped under the \CSLF folder, and the entire \CSLF folder must be converted to a .ZIP file and uploaded to the MIP under the appropriate HUC-8 for that county. The standard to be used for the definition of the HUC-8 cataloging unit is the Watershed Boundary Dataset (WBD) published by the U.S. Geological Service and the Natural Resources Conservation Service.

The .ZIP files should be created by the contractor in their workspace prior to upload. Once the .ZIP file is created, it must be submitted to the MIP.

The actual datasets, such as the CSLF, Flood Depth and Associated Grids (FDAG), Flood Risk Assessment (FRA), Areas of Mitigation Interest (AMI), and Flood Risk Database (FRD), and created/updated products such as the Flood Risk Report and Flood Risk Map are not to be included in the following directories. They will be submitted to FEMA through a separate mechanism.

Data must be located in the appropriate directories as follows:

- \HUC-8\General
  - Project narrative
  - Certification
  - Metadata File
- \HUC-8\Correspondence
  - Letters; transmittals; memoranda; general status reports and queries; technical issues; and direction by FEMA
- \HUC-8\Flood_Risk\Datasets\CSLF
  - Input and Output data associated with the Changes Since Last FIRM Dataset
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Datasets\FDAG
  - Input and Output data associated with the Flood Depth and Associated Grids Dataset
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Datasets\FRA
  - Input and Output data associated with the Flood Risk Assessment Dataset, which include Hazus data
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Datasets\AMI
  - Input and Output data associated with the Areas of Mitigation Interest Dataset
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Products\FRDB
  - Input and Output data associated with the Flood Risk Database
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Products\FRR
  - Input and Output data associated with the Flood Risk Report
  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Products\FRM
  - Input and Output data associated with the Flood Risk Map

  - Should include directories for Standard and Enhanced data
- \HUC-8\Flood_Risk\Supplemental_Data

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