HOW TO . . .

Organize and Submit Technical Documentation for Flood Studies

by

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ASFPM Mapping & Engineering Committee

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ASSOCIATION OF STATE FLOODPLAIN MANAGERS, INC.
MAPPING AND ENGINEERING STANDARDS COMMITTEE

INSTRUCTIONS FOR ORGANIZING AND SUBMITTING TECHNICAL DOCUMENTATION FOR FLOOD STUDIES

ENGINEERING STANDARD 1-91
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INSTRUCTIONS FOR ORGANIZING AND SUBMITTING TECHNICAL DOCUMENTATION FOR FLOOD STUDIES

I. INTRODUCTION

The purpose of these instructions is to ensure that adequate technical documentation for all flood studies will be available in the future. Past experiences with the documentation available from studies completed for FEMA indicate that many of the technical details of the studies have been lost. This results in additional costs to public agencies and private individuals whenever the studies need to be updated or changed. In addition, adequate review by states, communities, counties, and FEMA of any proposed revisions or additions to the floodplain areas of the county will insure that the quality of all studies remain adequate.

This publication requests that the study submitter incorporates all essential technical data into one comprehensive data package to be known as the Technical Data Notebook (TDN). Abstracts of key material are also required. The remainder of this publication outlines the documentation indexing system to be used in the TDN and the information required on the abstracts.

Submission of a completed TDN is requested whenever a study is to be reviewed by a floodplain administrator or forwarded to FEMA. ASFPM suggests that all communities require TDN submittal whenever floodplain studies are submitted that modify existing flood hazard areas or delineate new flood hazard areas.

II. DOCUMENTATION ABSTRACTS

The purpose of the documentation abstract is to provide, in a short form, a number of key facts about the study being documented. Sample abstract forms are contained in Appendix A of these instructions and a discussion of individual items is contained below.

Explanation of Study Documentation Abstract fields:

SECTION 1: GENERAL INFORMATION

- ❑ 1A Community name
- ❑ 1B NFIP Community Number
- ❑ 1C County or Counties where community is located
- ❑ 1D State where community is located
- ❑ 1E Date that study was accepted by FEMA.
- ❑ 1F Study Contractor-Firm or agency name, address and telephone number of firm or agency that completed the study. Name of contact person at firm or agency that would be able to discuss the technical aspects of the study. Study Contractor contract number and list of subcontractors.
- ❑ 1G FEMA Technical review contractor that reviewed study and telephone number of contractor.
- ❑ 1H FEMA Regional reviewer along with telephone number.
- ❑ 1I State reviewer (if any) along with telephone number.
- ❑ 1J County or community reviewer along with telephone number.
- ❑ 1K Name or names of rivers, streams or watercourses analyzed in the documented study.
- ❑ 1L Description of the reaches of each river, stream or watercourse studied in documented report. This should include FIRM panel numbers and EPA reach number, if available.
- ❑ 1M Type of study completed on each river, stream or watercourse. This item is meant to clearly identify whether the study was riverine, alluvial fans, or other special hazard type study.

SECTION 2: MAPPING INFORMATION

- ❑ 2A A list of map names and dates for the USGS 7.5' or 15' quadrangle maps that cover the study area. If desired, other maps that better describe the study area can be referenced instead of the USGS quads if these maps are easily obtainable. Dates of maps referenced should be included.
- ❑ 2B Description of maps used in the hydrologic portion of the study (if any) including type/source, scale, the dates of the maps, and the dates aerials were flown.
- ❑ 2C Description of maps used in the hydraulic portion of the study including type/source, scale, the dates of the maps, and the dates of aerial topography.

SECTION 3: HYDROLOGY

- ❑ 3A Description of the hydrologic methodology or computer model used to estimate the peak flow rates used in the study. This description should include computer model vendor and version of model used.
- ❑ 3B Indication of the storm duration used to estimate peak flow rate.
- ❑ 3C Description of hyetograph type used in modeling.
- ❑ 3D List of peak flow frequencies estimated in the hydrologic study (i.e., 10, 50, and 100-year, etc.).
- ❑ 3E List of gages used to calibrate the computer model or used in a statistical frequency computation. Information should include gage name, gage location, USGS number (if any), ownership and years of record.
- ❑ 3F List of rainfall amounts, duration and source of data.
- ❑ 3G Description of any unique conditions or problems found during the study.
- ❑ 3H Description of process to coordinate peak flows with applicable agencies. Should include date, agency name, person contacted and indication of agency concurrence or comments.

SECTION 4: HYDRAULICS

- ❑ 4A Description of hydraulic methodology or computer model used to determine flood elevations. This description should include computer model vendor and version of model used and any program modifications made by the contractor with supporting documentation.

- ❑ 4B Description of flow regime (i.e., subcritical, supercritical, mixed, etc.)
- ❑ 4C List of frequencies for which water surface elevations were calculated.
- ❑ 4D Description of method used to determine floodway (if any).
- ❑ 4E Description of any unique conditions or problems that impacted the study. This should include any hydraulic conditions such as jumps as well as any portion of the study where elevations were set, rather than computed by the computer model.

SECTION 5: ADDITIONAL STUDY INFORMATION

The third page of the abstract form should be used to further describe key information from the study. Items that may be included here include information on sedimentation transport analysis methodology, additional or expanded information from one of the previous section, etc.

III. GENERAL DOCUMENTATION STANDARDS

This Section will outline general standards about the appearance of the material to be contained in the TDN.

APPEARANCE AND LEGIBILITY

All materials contained in the TDN must be legible and of an appearance that makes tracking and review possible. It is not required that the material be typed, but if printed, it must be legible. Pencil and colored pens should be avoided unless the writing is dark enough to be reproduced on copier or microfiche. This is especially important in the case of technical analysis notes that describe the assumptions made in any analysis and the parameters selected by the engineer.

SIZE

All material in the TDN should be 8-1/2" by 11". Material which is larger than standard size may be folded and included in the notebook or it may be rolled separately, clearly marked and referenced in the TDN. Reduced maps and drawings may be included provided a bar scale is legible after reduction.

DATA IDENTIFICATION

All material included in the TDN or attached separately will be marked with the following minimum information.

- ❑ Community name, county and state.
- ❑ Date material prepared.
- ❑ Study contractor name and internal project number.
- ❑ Name of flooding sources.
- ❑ Appropriate documentation index number as outlined in Section IV of these instructions.
- ❑ Whether the product is one of several.
- ❑ Any other relevant information that can assist users in identifying the data.

MAPS

All maps, included in the TSDN or attached separately, will be marked with the following information in addition to the information listed under DATA IDENTIFICATION:

- ❑ Map bar scale.
- ❑ Source of base map and date including aerial mapping subcontractor, address, telephone number and internal project number, if applicable.
- ❑ North arrow.
- ❑ Names of streams, and major streets.
- ❑ Date flown (if aerial).
- ❑ Reference marks or known benchmarks. Maps should include section corners, NGVD or other used bench marks.

COMPUTER PRODUCTS

All computer printouts will be marked with the following information in addition to the list under DATA IDENTIFICATION:

- ❑ Multiple-profile or single profile.
- ❑ Enough information for the reviewer to understand whether this run is the final run or a supplementary run.
- ❑ Hydraulic model printouts will be further annotated to show the applicable cross/section lettering used on the draft report text. Include comment cards in the model to clearly identify road crossings, bridges and key concentration points.

Computer runs that are superseded but contained in the TDN for clarity of review will be marked "SUPERSEDED" or "VOID" in large letters.

Input of final runs of computerized hydraulic and hydrologic computations from standard programs such as HEC-1, TR-20 or HEC-2 will be submitted on 5-1/4-inch or 3-1/2-inch diskettes that meet the following

specifications:

- Disks will be formatted for MS DOS 2.1 or greater and have a capacity of 360 kilobytes for 5-1/4-inch or 720 kilobytes for 3-1/2-inch.
- Input files may not be partitioned to multiple diskettes.
- An ASCII text file named "README" will be created for each diskette and will contain a description of each computer file on the diskette along with the information required under DATA IDENTIFICATION.
- A list of files along with the information required under DATA IDENTIFICATION will be placed on the diskette label.
- The "backup.com" utility of MS DOS will not be used to copy files to the diskette; files should be created using the "copy" utility.
- All computer files should be "write protected" by the use of write protect tabs or MS DOS ATTRIB command to make files "read only". This should protect the file integrity after submittal.

Input and output from other types of computer compilations should be included under the appropriate index number and should clearly be identified by program name and source.

IV. DOCUMENTATION INDEX NUMBERING SYSTEM

The material contained within the TDN will be organized as listed below. Sections that are not applicable do not have to be contained in the TDN, however the numbering system should not be changed. Specific minimum standards are listed when appropriate. The TDN should only contain appropriate technical correspondence between the study contractor and various agencies, etc. It is not intended to burden the contractor by requiring a complete correspondence file.

SECTION 1: GENERAL DOCUMENTATION AND CORRESPONDENCE

1.1 Special Problem Reports.

1.2 Contact (Telephone) Reports.

1.3 Meeting Minutes or Reports.

1.4 General Correspondence.

1.4.1 Community

1.4.2 State Coordinator

1.4.3 Other Agencies

1.4.4 FEMA Regional Office

1.4.5 FEMA Washington

1.4.6 FEMA Technical Consultant

1.4.7 Copy of public notices

1.5 Contract Documents (Scope of Work, not financial documents).

SECTION 2: MAPPING AND SURVEY INFORMATION

2.1 Description of mapping, map control and any other survey information used in study.

Narrative description of mapping and survey information used in study.

2.2 Index of maps.

2.3 Survey field notes.

Identify datum (both horizontal and vertical) and when survey was done. Document who is the professional responsible for field work.

Notations should meet requirements of State Technical Board. Clear and concise survey notes with sketches are required.

2.4 Watershed maps, hydrologic analysis maps.

Should be sufficient to be used in verifying the adequacy of the models.

2.5 Hydraulic analysis maps.

Should be sufficient to be used in verifying the adequacy of the models. Maps should be

topographic and show the alignment of all cross-sections used in the analysis.

2.6 FIRM, FHBM draft maps.

2.7 Community maps.

Need current community map showing the identified named streets and a map showing current corporate limits and also date that was applicable. Enough street names should be included to define the study area.

2.8 Misc. maps.

Other referenced maps including soil, vegetation, geology, etc.

SECTION 3: HYDROLOGIC ANALYSIS

3.1 Method description.

Narrative description of hydrologic method or model.

If a computer model is used for hydrologic study, this section will include the model name, date and source.

3.2 Parameter estimation.

This section and its subsection should include all calculations used to develop the hydrology.

3.2.1 Drainage area boundaries

3.2.2 Physical parameters

Sheets for all other physical hydrologic parameters, time of concentration, lag, hydro CN number, channel, percolation loss estimations, N values used in hydro studies, transect photos, etc.

3.2.3 Statistical parameters

Narrative discussion of data record and information available on precipitation, runoff, and discharge for region and watershed used for assessment of adequacy and applicability of record under WRS Bulletin 17B, (March 1982), Discuss factors that effect the reasonableness of frequency analysis.

3.2.4 Precipitation

Narrative discussion with supporting data analyzing historic precipitation records in or adjacent to watershed in relation to watershed size, historic flooding, type of storm, extent, duration and distribution pattern. Relate hypothetical model design precipitation and distribution from stated reference source to historic record and statistical parameters.

3.2.5 Gage data

Identify and discuss locations of any NWS, USGS or other agency gage stations in or adjacent to the region and watershed in relation to historic precipitation, watershed runoff and statistical parameters.

3.3 Calibration.

Narrative discussion should describe what calibration was accomplished or attempted.

3.4 Special problems/solutions.

Narrative discussion of any special problems during the study and what solutions were proposed for them.

3.5 Final results/computer runs.

Should include output/discharge volumes, times, water surface elevations and peak flows. Results should be presented in tabular form as well as discussed in narrative text. Full input and output listings of all models should be included.

3.6 Final modeling results on diskette(s).

Should include all input files.

SECTION 4: HYDRAULIC ANALYSIS

4.1 Method description.

Detail water surface profile model used as well as an explanation of how the starting WSEL was determined.

4.2 Parameter estimation.

4.2.1 Manning's N-value

Sufficient documentation of the source or method in determining N value including photo of appropriate stream reaches.

4.2.2 Expansion and contraction coefficients

Sufficient documentation of the source or method used to determine expansion and contraction coefficients.

4.2.3 Hydraulic jump/drop analysis

4.3 Cross-section description.

This section and its subsections should include plotted cross-sections where appropriate.

4.3.1 Channel and Overbank

4.3.2 Bridge or Constriction

4.3.3 Grade Control Structures

4.4 Calibration.

Narrative description of calibration procedure attempted or accomplished.

4.5 Special problems/solutions.

Narrative discussion of any special problems identified during the study and what solutions were proposed for them.

4.6 Floodway modeling.

Description of the floodway methods used to determine encroachments.

4.7 Final results/computer runs.

Include full input and output listings.

4.8 Final modeling run on diskettes should include all input files.

SECTION 5: EROSION/SEDIMENT TRANSPORT AND COASTAL FLOODING ANALYSIS

5.1 Description of erosion/sediment transport analysis methodology used.

5.2 Parameter estimation.

5.3 Calibration.

5.4 Final results/computer model results.

5.5 Description of coastal flooding methodogy used.

5.6 Parameter estimation.

5.7 Calibration.

5.8 Final results/computer model results.

SECTION 6: REFERENCE MATERIALS

Methods, procedures, manuals, and data references for hydrologic design and rainfall-runoff prediction models are periodically or occcasionally revised, updated or superseded in whole or in part by the originator.

Updates for all data sources should be specifically given for the current study location. The historic rainfall record should be updated from the data given in any previous rainfall reference.

Soil survey data for runoff parameters should be based on the land management (USFS Terrestrial Ecosystems) or expert (SCS) agencies latest studies or guidance to update previous (1960-1970's) SCS general soils maps.

6.1 Other published flood studies.

6.2 Previous FEMA studies.

6.3 Other applicable studies.

6.4 Published/Unpublished historical flood information.

6.5 Referenced technical papers/documents pertaining to methodology used in study.

Technical methodology should be documented if there is any question on the reviewing agency having the referenced papers or documents.

SECTION 7: CROSS-REFERENCING AND LABELING INFORMATION

7.1 Other studies impacted.

A list of other flood studies in the area that would be effected by the results of this study and a narrative description of changes that would be necessary to resolve any differences.

7.2 Key to cross-section labeling.

It is important to have a cross reference table that allows accurate translation between survey data, the cross sections used in the water surface profile model, and the lettered cross-sections used in the Flood Insurance Study. A form similar to the one contained in Appendix B should be used. All cross-sections should be numbered using river miles along the channel centerline.

SECTION 8: DRAFT FIS REPORT - REVISED TEXT

APPENDIX A STUDY DOCUMENTATION ABSTRACT

STUDY DOCUMENTATION ABSTRACT		INITIAL STUDY		RESTUDY		LOMR		OTHER	
SECTION 1: GENERAL INFORMATION									
1A	COMMUNITY								
1B	COMMUNITY NUMBER								
1C	COUNTY								
1D	STATE								
1E	DATE STUDY ACCEPTED								
1F	STUDY CONTRACTOR CONTACT(S) ADDRESS PHONE								
1G	TECH. REVIEWER (FEMA) PHONE								
1H	FEMA REGIONAL REVIEWER PHONE								
1I	STATE REVIEWER PHONE								
1J	LOCAL REVIEWER PHONE								
1K	RIVER OR STREAM NAME								
1L	REACH DESCRIPTION								
1K	STUDY TYPE (Riverine, Coastal, Alluvial Fan,etc)								
SECTION 2: MAPPING INFORMATION									
2A	USGS QUAD SHEET(S)								
2B	MAPPING FOR HYDROLOGIC STUDY TYPE/SOURCE SCALE DATE								
2C	MAPPING FOR HYDRAULIC STUDY TYPE/SOURCE SCALE DATE								

STUDY DOCUMENTATION ABSTRACT		
SECTION 3: HYDROLOGY		
3A	MODEL OR METHOD USED (including vendor and version description)	
3B	STORM DURATION	
3C	HYETOGRAPH TYPE	
3D	FREQUENCIES DETERMINED	
3E	LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership)	
3F	RAINFALL AMOUNTS AND REFERENCE	
3G	UNIQUE CONDITIONS AND PROBLEMS	
3H	COORDINATION OF Q'S (agency, date, comments)	
SECTION 4: HYDRAULICS		
4A	MODEL OR METHOD USED (including vendor and version description)	
4B	REGIME	
4C	FREQUENCIES FOR WHICH PROFILES WERE COMPUTED	
4D	METHOD OF FLOODWAY CALCULATION	
4E	UNIQUE CONDITIONS AND PROBLEMS	

STUDY DOCUMENTATION ABSTRACT	
ADDITIONAL STUDY INFORMATION	
ITEM	DESCRIPTION/DISCUSSION

APPENDIX B KEY TO CROSS-SECTION LABELING

Community Name:

County:

State:

Prepared By:

Stream Name:

Run Date:

Field Survey Section No.	XS Letter-Draft FIS	Computer Stationing	XS Letter-Final FIS	EPA Reach No.

APPENDIX C KEY TO TRANSECT LABELING

Community Name:

County:

State:

Prepared By:

Coastal Flooding Source:

Run Date:

Study Contractor		**Technical Evaluation Contractor**	
Field Survey Transect No.	Transect No.-Draft FIS	EPA Reach File No.	Transect No.-Final FIS

[1]Erosion Considered

[2]Wave Setup Considered

[3]Wave Runup Considered