HOW TO REVIEW 2D MODELS AND WHAT TO SUBMIT IN CLIENT SUBMITTALS

Presented By:

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Eric Simmons, FEMA

Scott Hogan, FHWA

The good news about computers is that they do what you tell them to do. The bad news is that they do what you tell them to do.

-Ted Nelson

Presentation Overview

History

2D Guidelines

How to Review 2D Models

What to Submit to Clients

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History

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History

then to now…

1- Day of 2-D Highlights

2-D MODELING SYMPOSIUM INTER/

Sacramento, California * S

Kathy Schaefer, Symposium (

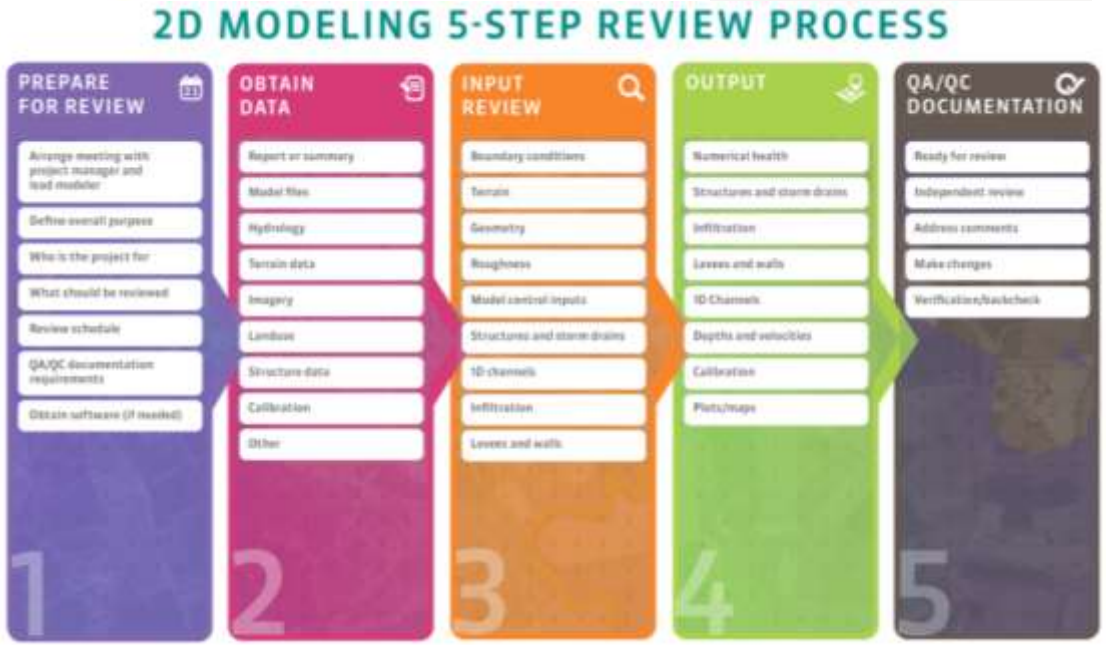
SYMPOSIUM OBJECTIVE: *To discuss issues and identify needed communities regarding the use of 2-Dimensional hydraulic mo riverine flood analysis.*

(Speakers at the Symposium and participants in the Challenge M

ACTIVITIES

8:30 **WELCOME AND INTRODUCTIONS**

8:50 **HOW DO 1-D AND 2-D MODELS MAKE THEIR WAY ONTO FEMA MAPS AND HOW DO COMMUNITIES USE THIS INFORMATION TO ADMINISTER THE NATIONAL FLOOD INSURACE**



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2D Guidelines

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2D Guidelines Categories

- Pre-Modeling Guidelines
  - Planning
- Modeling Guidelines
  - User Manuals
  - Best Management Practices
- Post-Modeling Guidelines
  - Deliverables

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2D Guidelines Document

- Discussion of 2D Models
- Data Requirements
- 2D Modeling References
- Modeling and Mapping
- Model Review
- What to Submit for Review
- What to Submit to FEMA

http://html.investis.com/A/Atkins/FMA.zip

How to Review 2D Models

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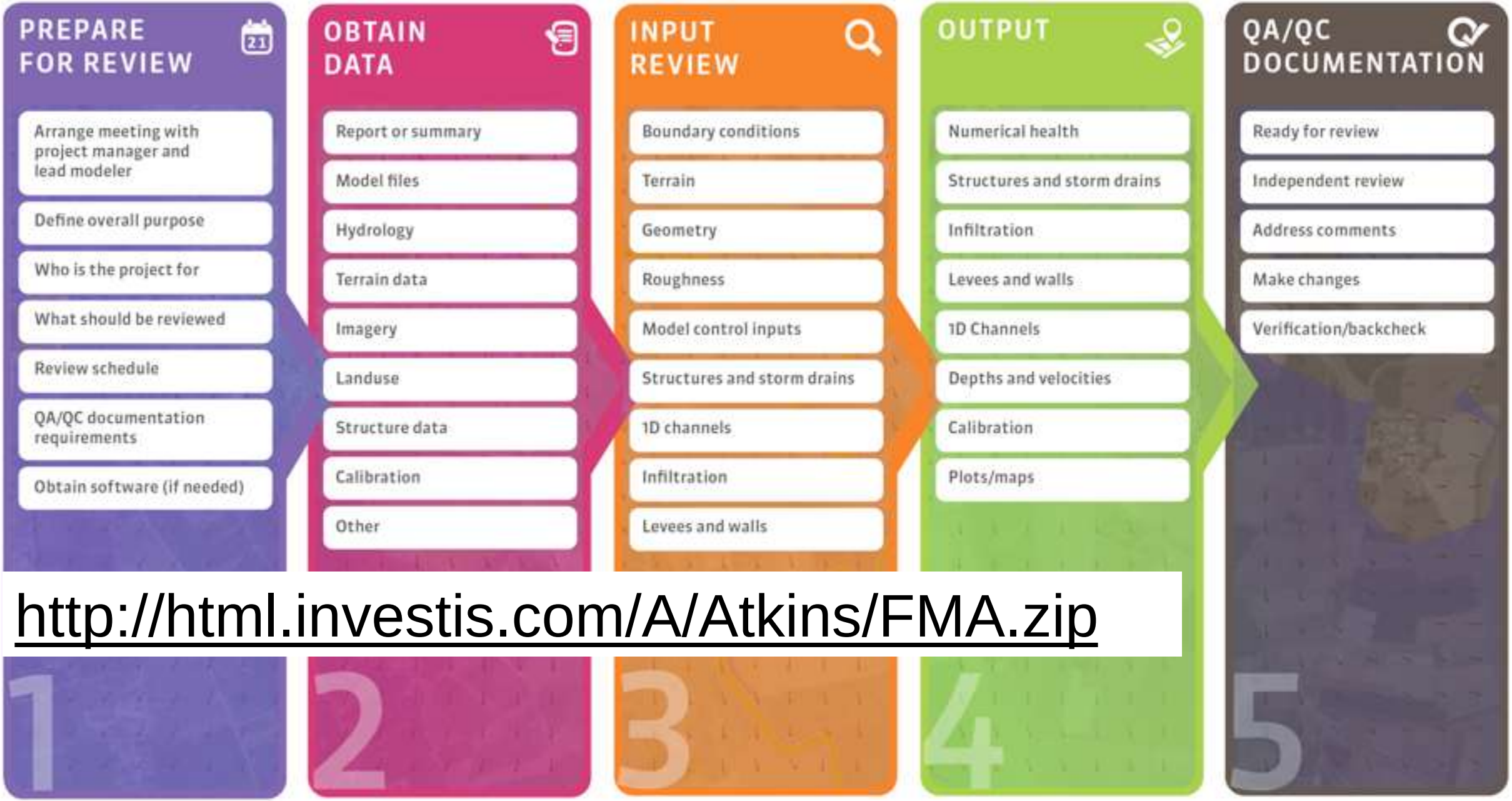
2D MODELING 5-STEP REVIEW PROCESS



http://html.investis.com/A/Atkins/FMA.zip

“Getting up to Speed Phase” :

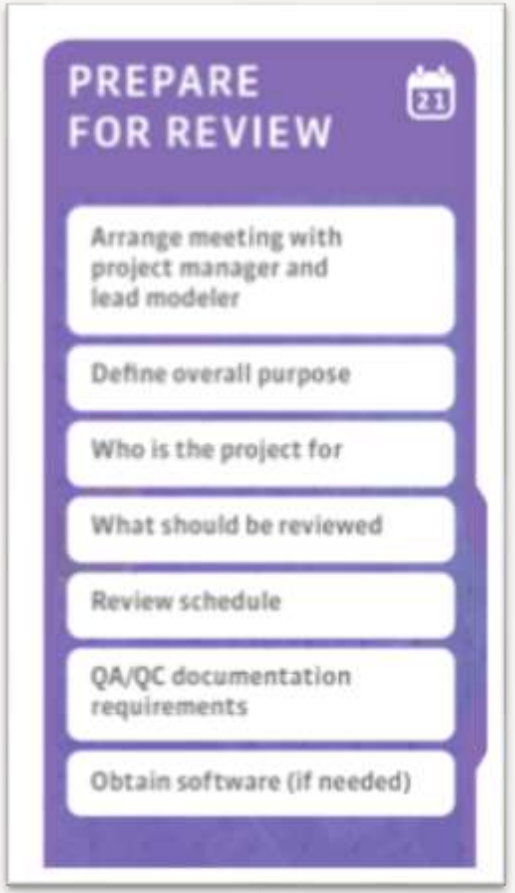
Purpose of the analysis

Who is the analysis for? (FEMA, local Agency, Federal Highways)

Do you have the ability to review it? (Qualifications and Resources)

Am I Independent?

What elements of the analysis require review?



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How to Review 2D Models
1. PREPARE FOR REVIEW

“Getting up to Speed Phase” :

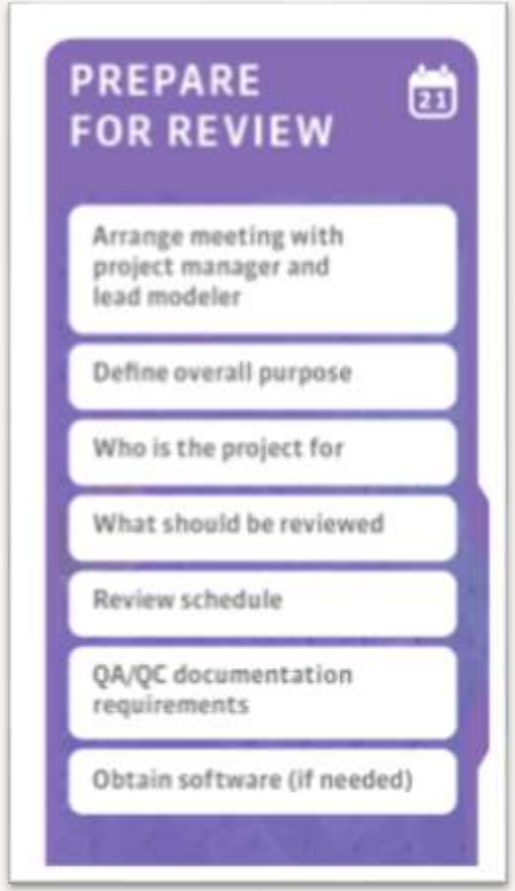
Is the time allotted for review adequate (schedule)?

What is the intended projection and datum for the analysis?

Data: What format is it in? how do we obtain it? Is it ready for review?

What level of QA/QC information is required? (work with model preparation team with this in advance)

Do I have adequate software to review (version number, known bugs or issues, etc…)



Items to Obtain:

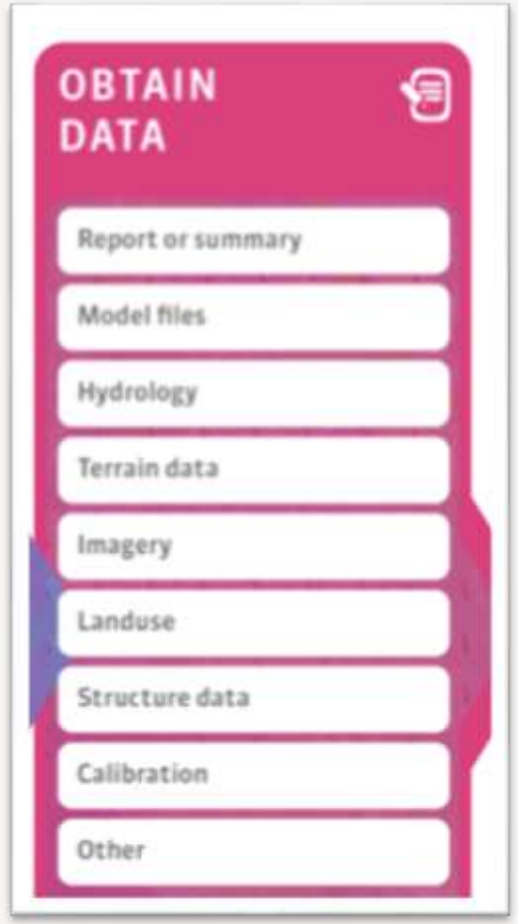
Report or Technical Memorandum Summary

Agency Requirements, Standards, Policies, Protocols, Guidelines

Model Input and Output

Horizontal and Vertical Datum

Structure Data: surveys, measurements, photographs



Items to Obtain:

Terrain Data: survey points, TIN, DEM, LiDAR, etc…

Resource Data: soils, land cover, erosion potential, infiltration, aerial imagery, impediments

Rainfall Data: rainfall specifications and methodology (or other source for inflows)

QA/QC Documentation

Data Types: GIS/database/CAD/spreadsheet, MT forms, hardcopy Maps, emails, etc…

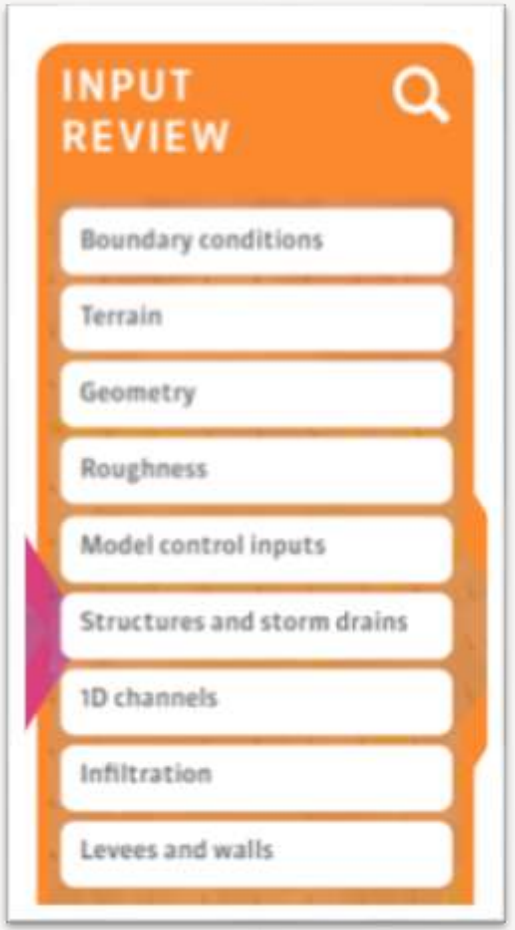
Input to Review:

Boundary Conditions Verification

Terrain Review

Model Geometry Decision Review

Roughness Review



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How to Review 2D Models
3. INPUT REVIEW

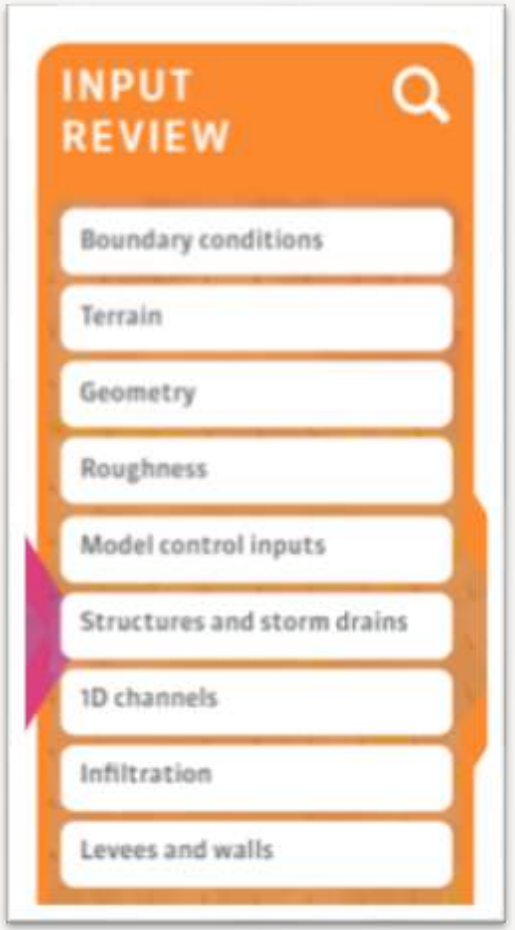
Input to Review:

Model Control Variable Inputs Review

Structures, Special Facilities and other embedded 1D Elements Input Review

Infiltration

Levees and Walls



What can be/needs to be reviewed is very dependent on which software is being used

It is important in ALL CASES to review:

- Primary Variable Results (wse and velocity)
- Secondary Variable Results (depth, flow, D*V, Fr)
- Tertiary variable results (mass/volume, sticky cells, and warnings/errors)

1D elements channels, pipes, ditches, etc

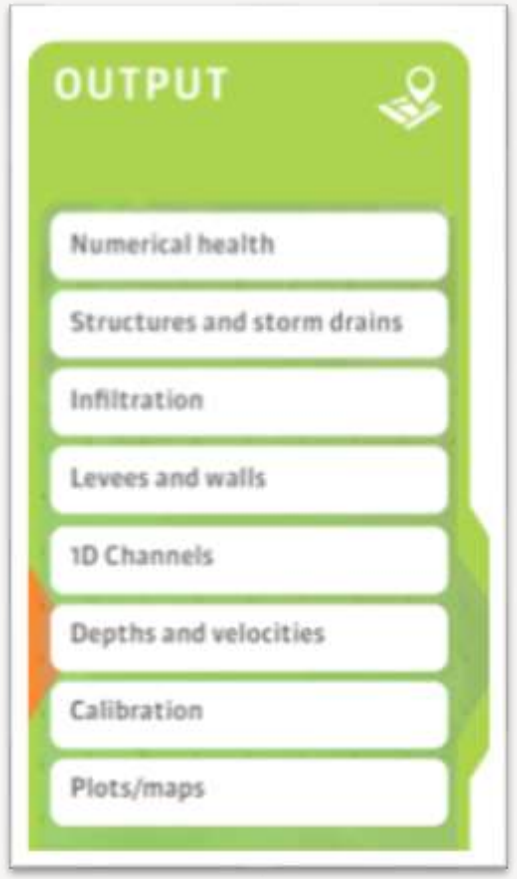
Levees and Walls

Flooding Extents

Calibration

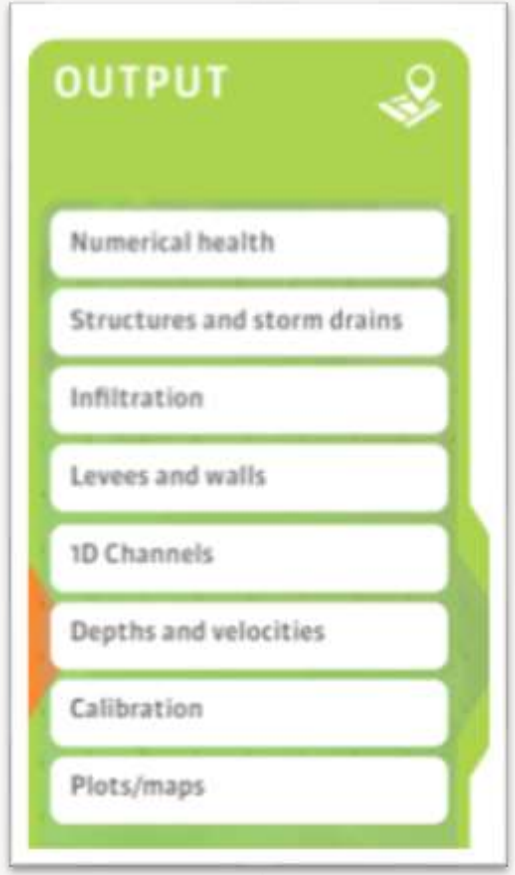
Documentation, plots and exhibits

RE-EXECUTE THE MODEL



How to Review 2D Models
4. OUTPUT REVIEW

Animation



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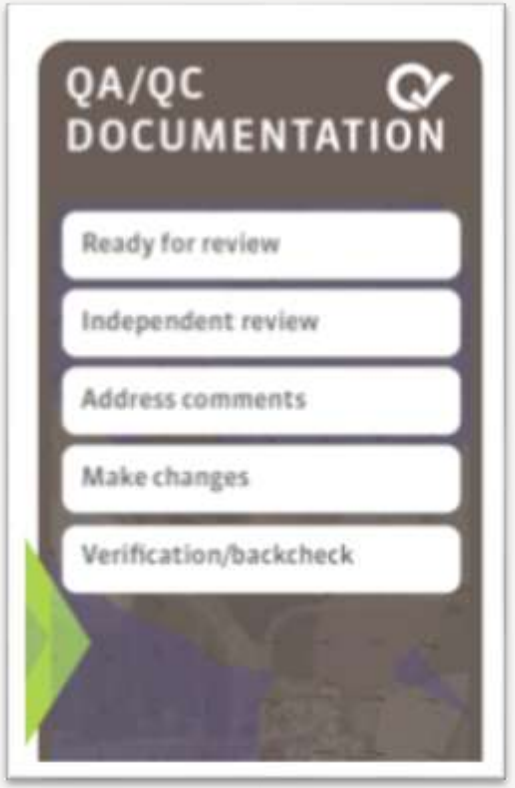
How to Review 2D Models
4. OUTPUT REVIEW

Use a SYSTEM of Review and DOCUMENT every step of the review:

Document who performed which elements of the review

Document each step of review each so subsequent review does not have to repeat a review of a previously reviewed element:

- Reviewers could highlight in yellow items that were verified, in red things they found in error
- Comments need to be documented or summarized when returned
- Provide a means for the Project Team to respond to comments in an orderly way:
- Provide a means to chronology back checks and responses



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How to Review 2D Models
5. QA/QC Documentation Review

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QA/QC - FLO-2D REVIEW CHECKLIST

	Project Title:						
	Project No.:		**Project Task:**		**Date Submitted for Review:**	**Date of Review:**	
	Preparer Name:			**Reviewer Name:**			
	Preparer Company:			**Reviewer Company:**			

Item No.	Hydraulic Model Review Item	Comments	Status	Response to Comments
	1. Data Requirements			
1.1	FLO-2D model version documented?			
1.2	Vertical and horizontal datum of project provided?			
1.3	Topographic information provided (vertical and horizontal datum, what kind)? If multiple data sets are used, are the extents for each one known?			
1.4	Soil data information used documented and provided?			
1.5	Land use information documented and provided?			
1.6	Documentation on techniques and procedures provided?			
	2. SUMMARY.OUT			
2.1	Check total rainfall volume.			
2.2	Check total inflow volume.			
2.3	Check percent infiltration. In general, should be 20-40% for heavily urbanized, 25-50% for urbanized, and 40-70% for natural of total rainfall.			
2.4	Verify that volume conservation errors are minimal.			
2.5	Verify that the file was written to completion.			
	3. CONT.DAT			
3.1	Check the limiting Froude number setting (typically 0.9-0.95 unless in steep areas).			
3.2	Check that the Shallow n value is reasonable (typically 0.1-0.2, but it may be turned off for some projects).			
3.3	Verify that model run time is adequate (i.e., all TIMETOPEAK.OUT values < run time).			
3.4	Check to see if IBACKUP switch is turned off to increase model speed.			
3.5	Check that all required component switches are turned on.			
	4. TOLER.DAT			
4.1	Check TOL value to make sure it is reasonable; if this is a hydrology model, it should be lowered to 0.03 or smaller.			
4.2	If rainfall model, check TOL and see if it correlates to IA. TOL should be subtracted from IA to avoid double counting. (TOL is in feet, IA is in inches)			
4.3	Verify that DEPTOL is a reasonable value, if set to 0, it is turned off.			
	WAVEMAX should normally be set to 0, which turns it off and speeds up the model runtime. It may need to be turned on			

What are the Data needs to make this Happen?

What You Should Submit

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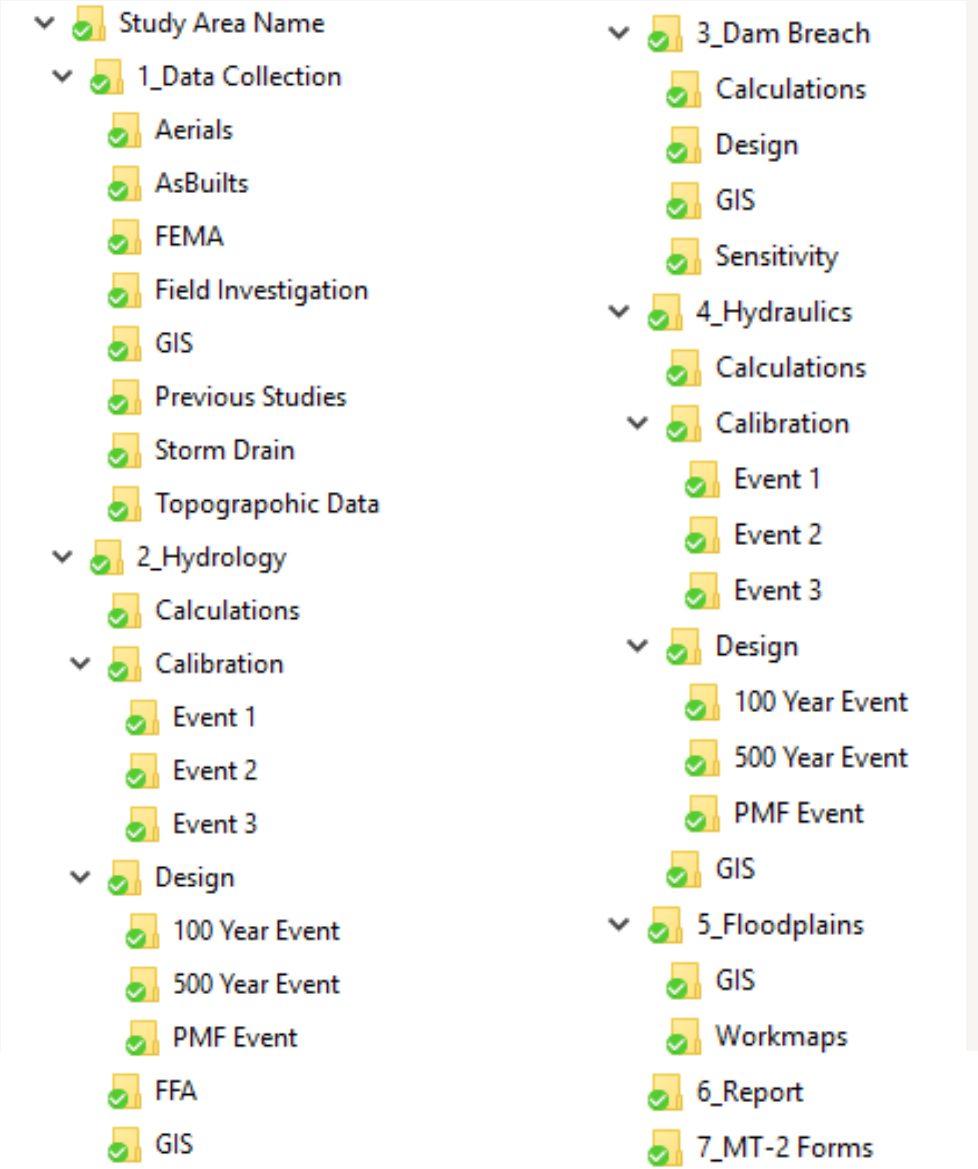
Folder Structure

Organized

Readme File

List of data being provided

Don’t make FEMA search through thousands of documents



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Report

Title Page

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Section 3 Survey and Mapping info

Section 4 Hydrology

Section 5 Hydraulics

Section 6 Erosion, Sediment Transport, and Geomorphic Analysis

Section 7 Draft FIS Data

Appendix A References

Appendix B General Documentation and Correspondence

Appendix C Survey Field Notes

Appendix D Hydrologic Documentation

Appendix E Hydraulic Documentation

Appendix F Erosion, Sediment Transport, and Geomorphic Documentation

Exhibit Maps

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Data Collection and Correspondence

As-builts

Imagery

Field notes

Meeting notes

Previous studies

Effective FEMA Data

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Model Files

Correct model files

Inputs

Outputs

Existing conditions

Proposed conditions

Calibration

GIS Layers

Floodplains

Cross-sections

BFE’s

Channel centerline

Levees

Other useful data

Terrain

Raw data

Final terrain

Datums

Certification of data

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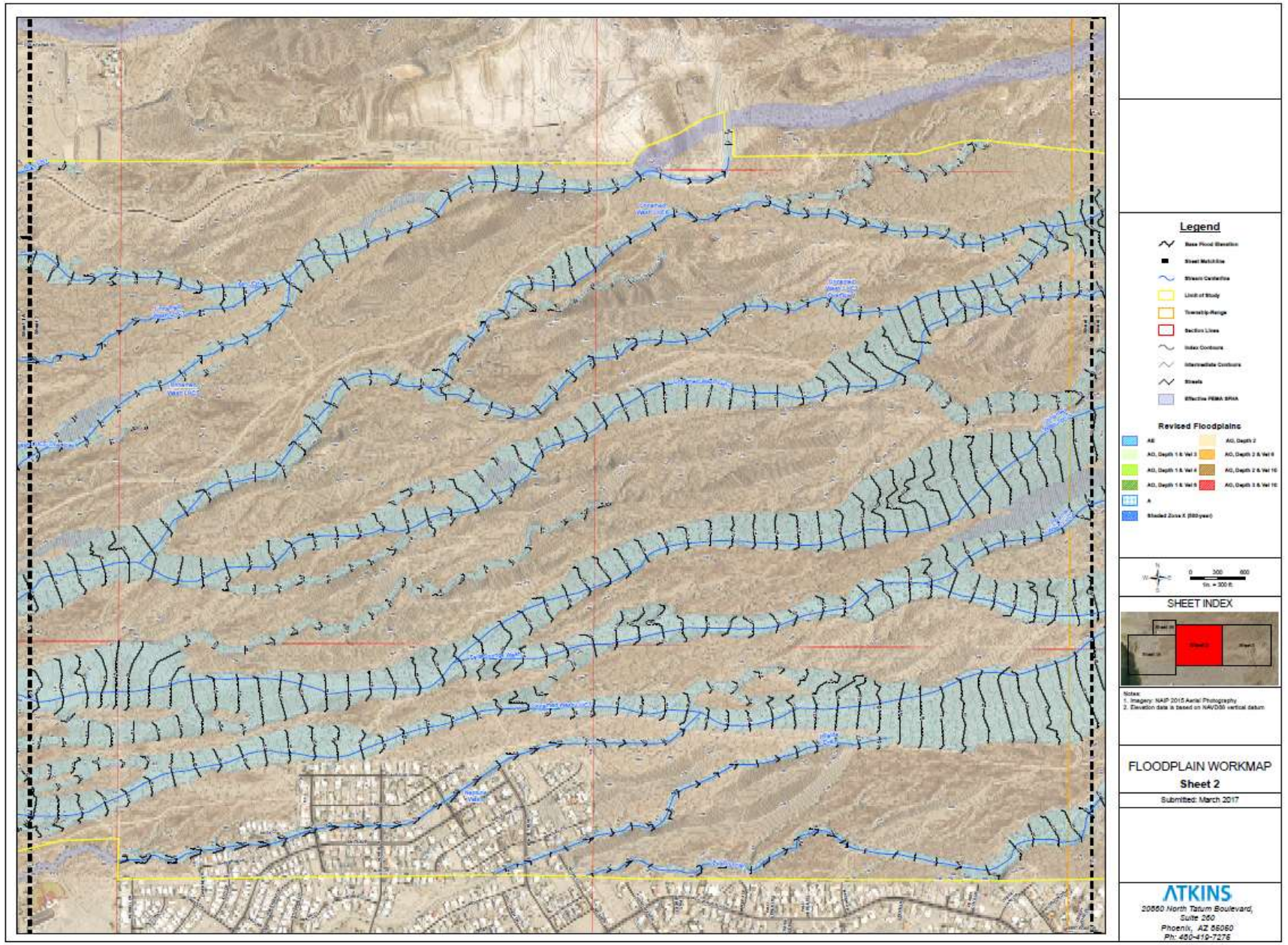
Workmap

Legend

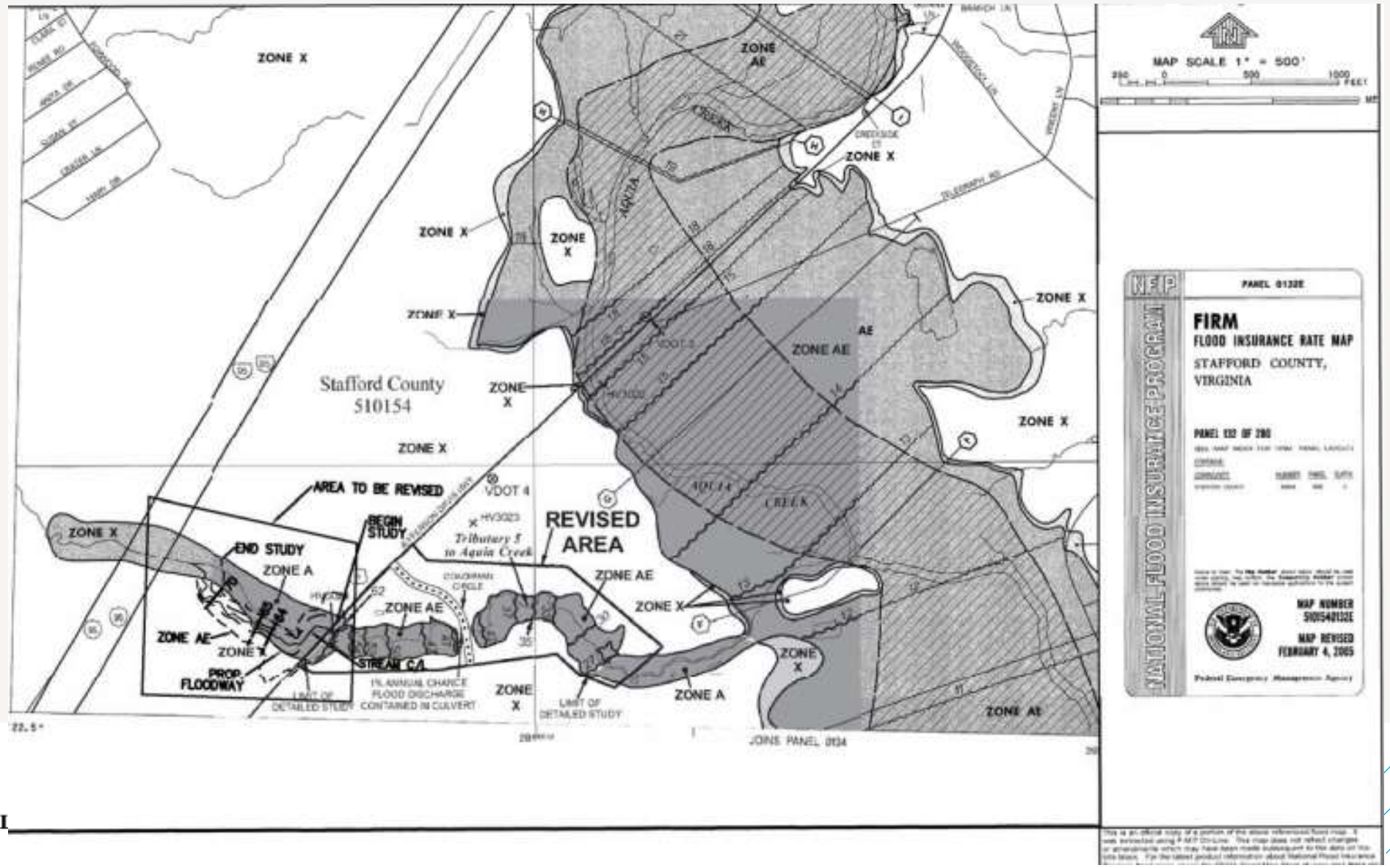
- Base Flood Elevation
- Sheet Matchline
- Stream Centerline
- Limit of Study
- Township-Range
- Section Lines
- Index Contours
- Intermediate Contours
- Streets
- Effective FEMA SFHA

Revised Floodplains

- AE
- AO, Depth 2
- AO, Depth 1 & Vel 3
- AO, Depth 2 & Vel 6
- AO, Depth 1 & Vel 4
- AO, Depth 2 & Vel 10
- AO, Depth 1 & Vel 6
- AO, Depth 3 & Vel 10
- A
- Shaded Zone X (500-year)



Annotated FIRM Map



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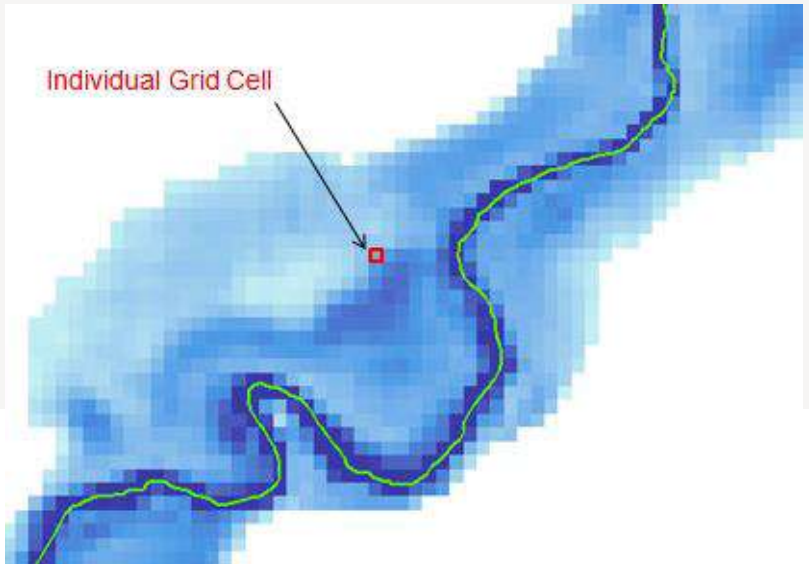
Analysis Grids

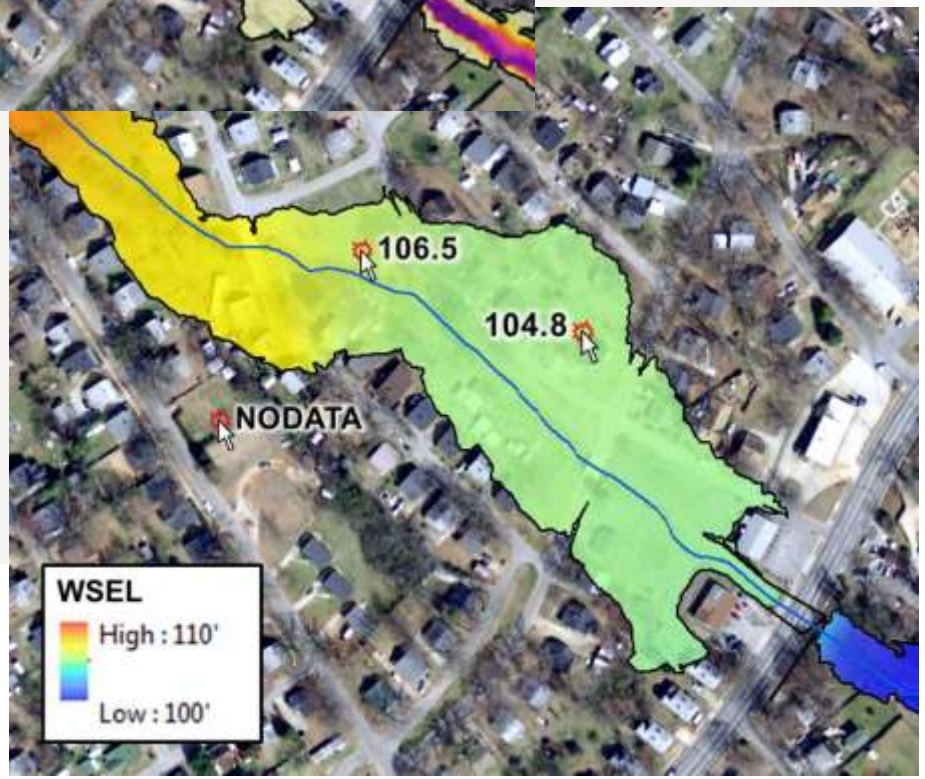
Depth Grids

Water Surface Grids

Velocity Grids

See FEMA Guidance





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Flood Severity/Hazard Grid (Optional)

Depth * Velocity

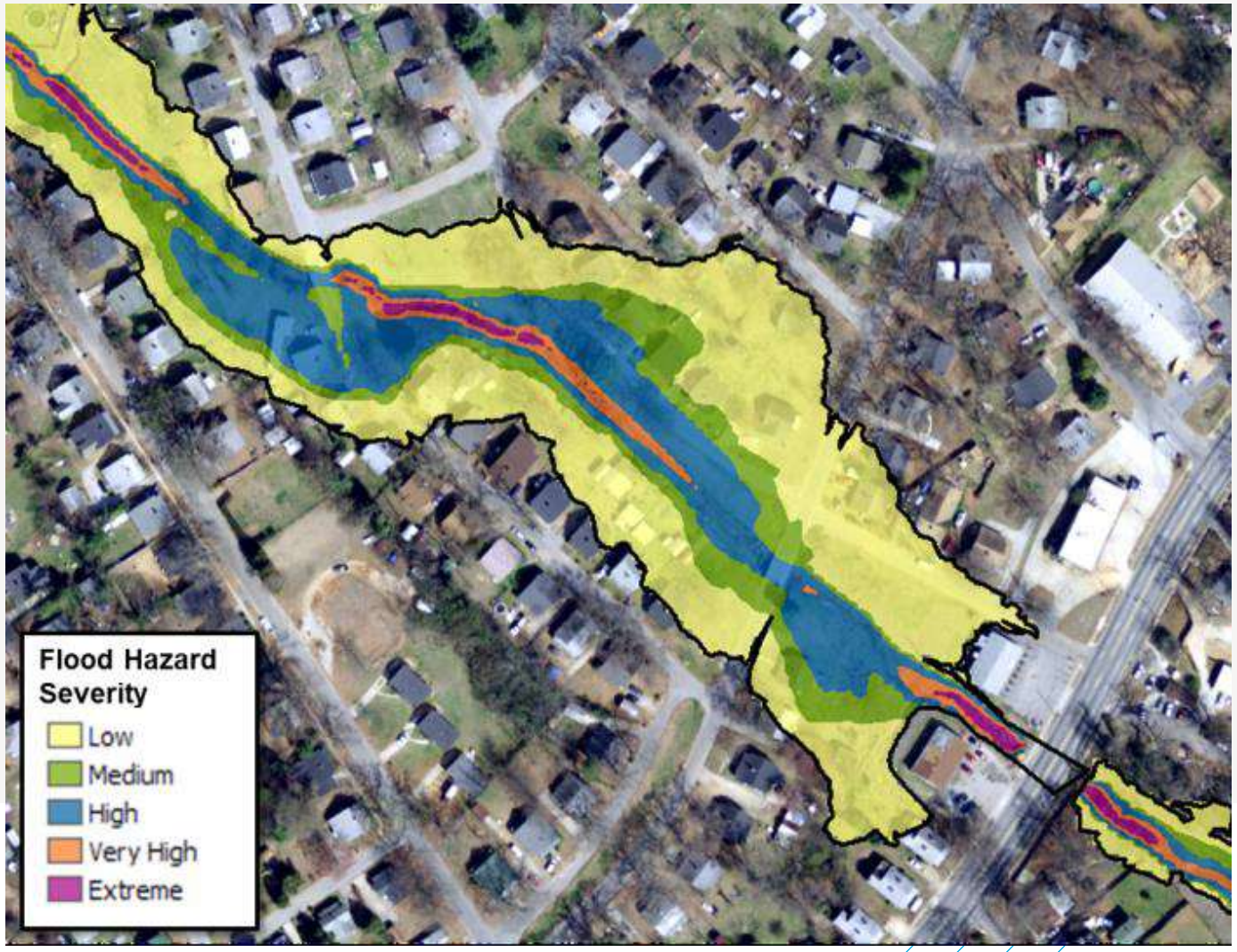
Different methods

USBR

Australia

Europe

See FEMA Guidance



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Model results are just approximations and should not just be accepted as absolute (Engineers Australia 2012)

Questions

How to Review a 2D Hydraulic Model and What to Submit

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Common MT-2 Mistakes

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General Mistakes

MT-2 Forms Missing/Incorrect

Missing back-up data

No as-builts

Missing Annotated FIRM

Notifications to public of BFE increase or floodway change

Community Acknowledgement

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General Mistakes

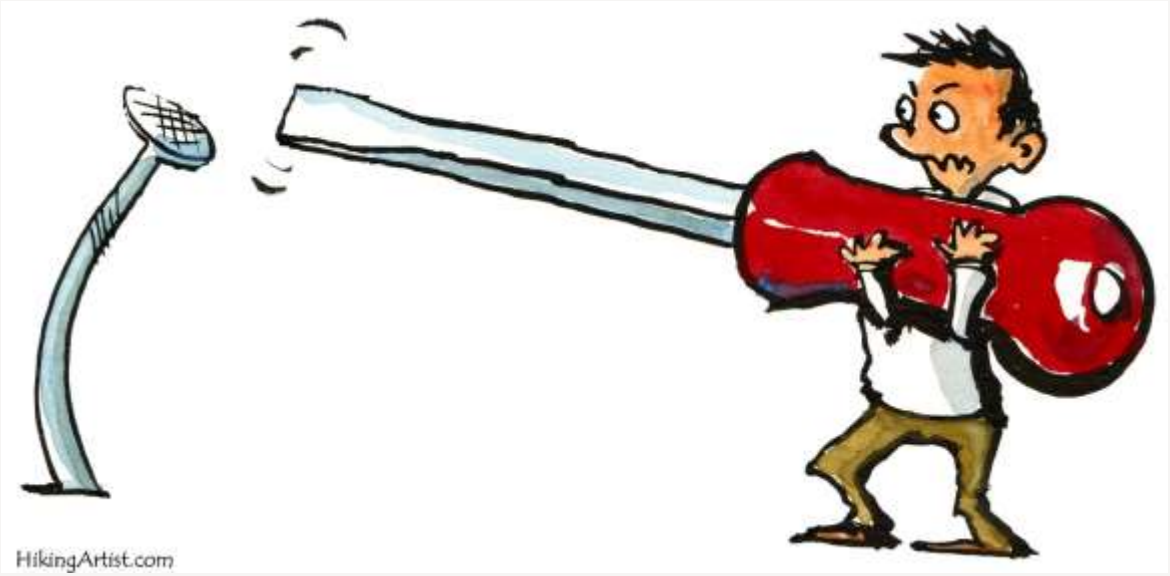
State and Local regulations may be different than FEMA's

Incorrect effective info used

check for LOMRs

Comparing wrong effective data with proposed data

Two adjacent studies being done at the same time



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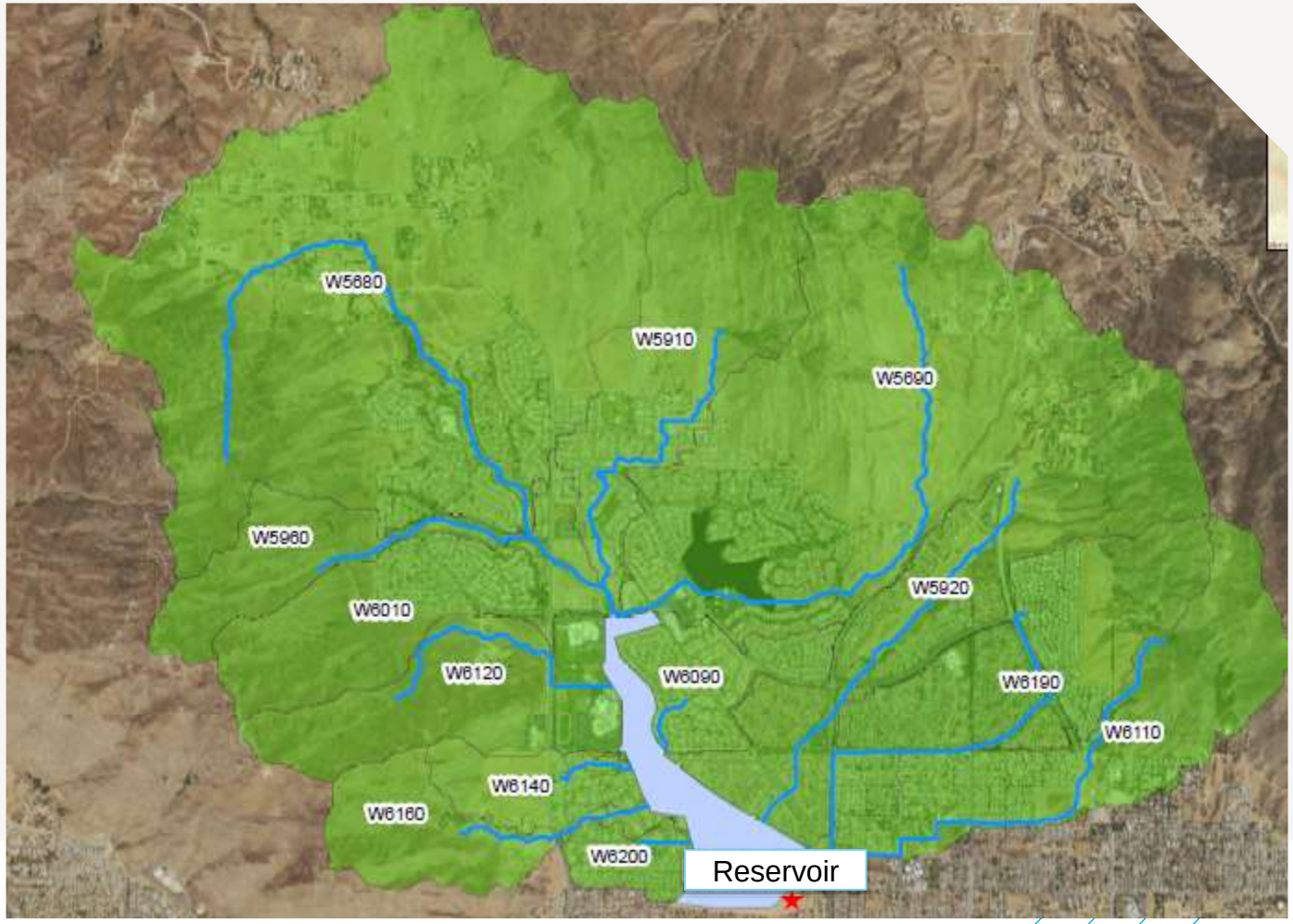
MT-2 Hydrology Mistakes

Unaccepted model or hydrology used

No backup to models



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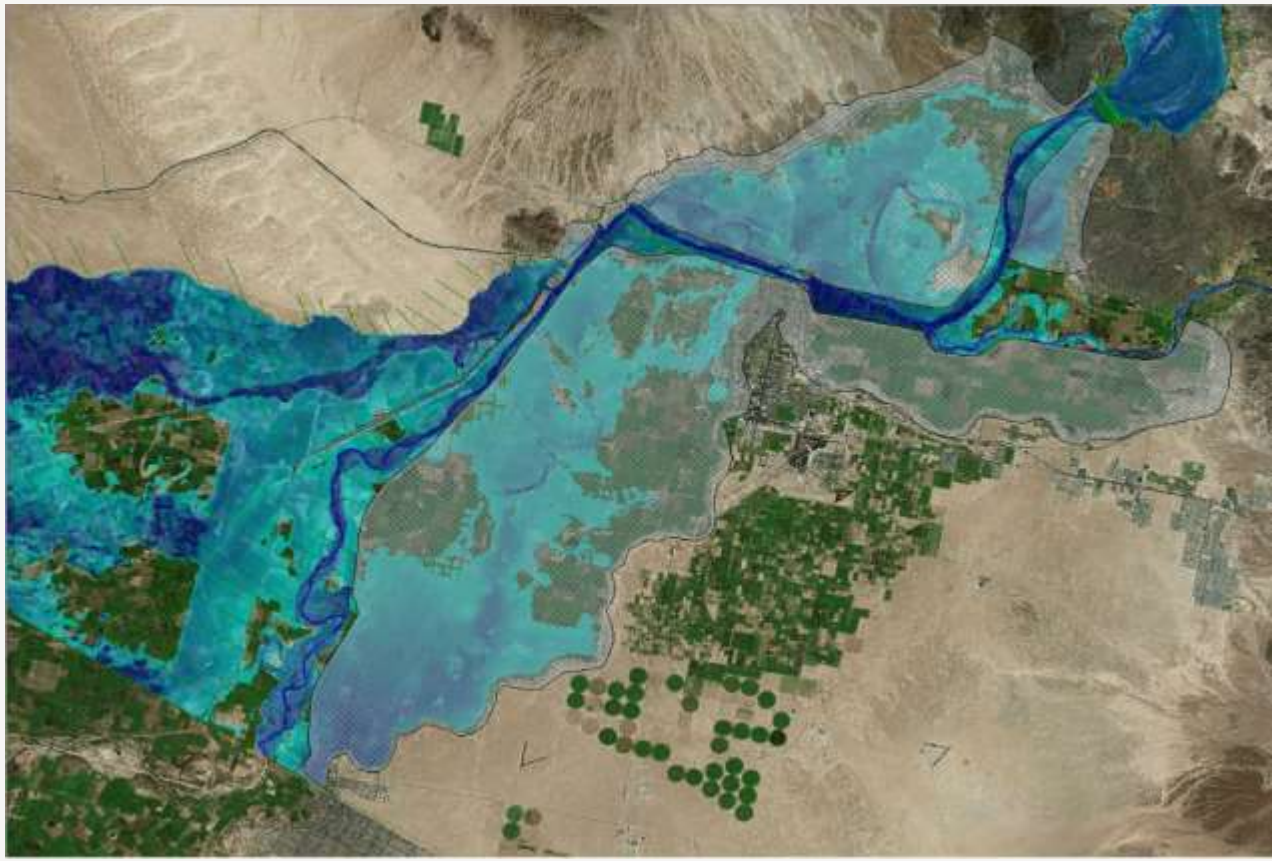
MT-2 Hydraulic Mistakes

Unaccepted model used

No backup to models

Model sequence (Effective, Duplicate Effective, Existing, Proposed



MT-2 Hydraulic Mistakes

Levees/walls

65.10 requirements

Incorrectly modeling uncertified levees

Missing structural information

Results don’t match calibration data

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MT-2 Mapping Mistakes

Not providing Topographic workmap

Missing data on workmap

Vertical datum not included

Mapping an uncertified levee

Tie-ins are not within 0.5 ft

Awkward transitions in floodplain/floodway widths

Model does not match maps

No profiles for 2D areas

Review MT-2 Application

Include all backup data

Good explanations in report

QA/QC