Flood Risk Assessment

FRA Template Workshop

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Overview

- Introduction
- Detailed Overview of Flood Risk Assessment Template
- Q&A
- 2D Model Example for Comparing Water Surface Elevations
- Q&A

Introduction

Purpose of Flood Risk Assessment

- Communication tool to identify potential risks of meeting 1) FEMA, 2) local jurisdiction and 3) public health and safety requirements in the preliminary stages of design
- Identify subsequent deliverables (e.g., floodplain analysis, no-rise, zero-rise, conditional letter of map revision (CLOMR), etc.) that may be needed for the permitting process
- Determine if the project may need a CLOMR, easement, right-of-way (ROW), temporary construction easement (TCE), etc. allowing the project schedule and budget to be modified, if needed, early in the project delivery process

Introduction

Process

- **Required for all water crossing projects**
- **Timing** - Completed after completion of PHD external review
- **Customer** - PEO/Region.
- **Audience** – WDFW and local jurisdiction. This also serves as a reference document for DB/PDB/Etc. projects

Introduction

Importance of Coordination with Local Jurisdiction

- Begin coordination with local jurisdiction for all WSDOT projects early in preliminary design to confirm local jurisdiction floodplain management requirements determined during scoping

- For more guidance on reaching out to locals, refer to WSDOT's Outreach to Local Governments on Flood Risk Assessment for WSDOT Fish Passage Projects (Exhibit 432-3)

Template Detailed Overview

2. Introduction

FRA identifies if there are potential risks:

1) of meeting Federal Emergency Management Agency (FEMA) Code of Federal Regulations (CFR) requirements;

2) of meeting local jurisdiction code floodplain development requirements; and

3) to public health and safety in order for a project to be considered for permitting as a fish habitat enhancement project, as required per RCW 77.55.181

Template Detailed Overview

2. Introduction

- FRA to be complete for all water crossing projects
- FRA uses SRH-2D model developed for PHD
- If in detailed SFHA, FRA uses effective FEMA flows and flows developed in PHD
- If not in detailed SFHA, FRA uses flows developed in PHD

Template Detailed Overview

2. Introduction

Existing and Proposed conditions results compared to determine:

1) How the project may affect floodplain water surface elevations (WSEs) and extents and;

2) Assess how these differences may pose potential risks to public health and safety

Template Detailed Overview

2.1 Project Description

Describe project as proposed and described in the PHD

Template Detailed Overview

2.2 FEMA SFHA Minimum Requirements

- Specify FEMA SFHA Zone (e.g., Zone A, Zone AE, Zone X, etc.) and associated minimum requirements

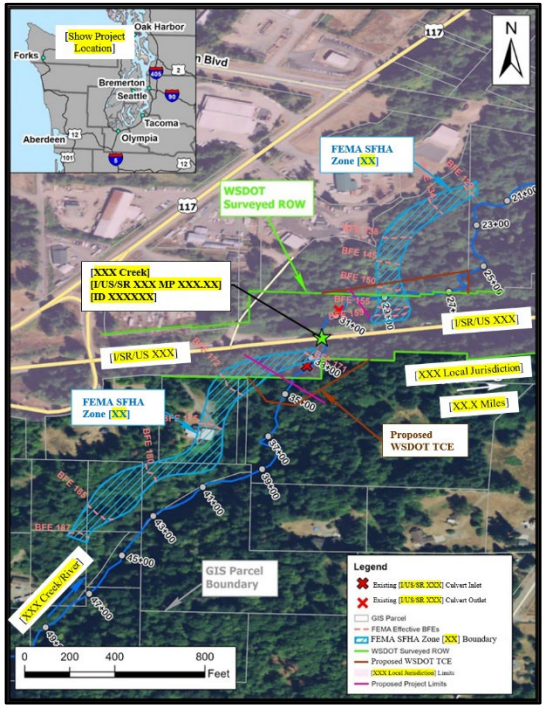
General Definitions:

- Special Flood Hazard Area (SFHA)
- Various FEMA SFHA Zones (Need to select “Z”, which will take you to all FEMA Zone definitions that include references to CFR zone requirements)

Template Detailed Overview

2.3 Local Jurisdiction Code Requirements

Specify FEMA SFHA Zone (e.g., Zone A, Zone AE, Zone X, etc.) and associated local jurisdiction code minimum requirements



Template Detailed Overview

3. Flood Risk Assessment

1) Perform an assessment of the project site;
2) Compile topographic, hydrologic, FEMA SFHA and local jurisdiction data;
3) Develop an existing (i.e., pre-project) conditions 2D floodplain model;
4) Develop a proposed (i.e., post-project) conditions 2D floodplain model;
5) Compared the proposed to existing conditions WSEs for the 1% annual chance (100-year) peak flow(s); and
6) Assessed potential risks and project effects to public health and safety

Template Detailed Overview

3.1 Site Assessment

Describe:

- Existing crossing and reach
- Any private property or structures

Template Detailed Overview

3.2.1 Topographic Data

Describe:

- Existing and proposed conditions surfaces
- Parcel boundaries, ROW, etc.
- TCE (if available) or need for TCE

Template Detailed Overview

3.2.2 Hydrologic Data

The hydrologic data in this FRA is used to assess:

1) Meeting FEMA requirements;
2) Meeting local jurisdiction code requirements utilizing; and
3) Potential risks to public health and safety based on best available flow information developed as part of the PHD.

Template Detailed Overview

3.2.3 FEMA and Local Jurisdiction SFHA Data

- Describe the location of the effective SFHA (if available) in proximity to the topography and the PHD 2D hydraulic results

- If within a FEMA SFHA detailed study area, add description for status of obtaining Effective FEMA model. Provide description of model (e.g., is it a pdf, HEC-2, RAS 1D, not able to be found by FEMA or local jurisdiction, etc.)

Template Detailed Overview

3.2.3 FEMA and Local Jurisdiction SFHA Data

- Not all projects will have digital data shown at the FEMA Map Service Center or available for download at the National Flood Hazard Layer website

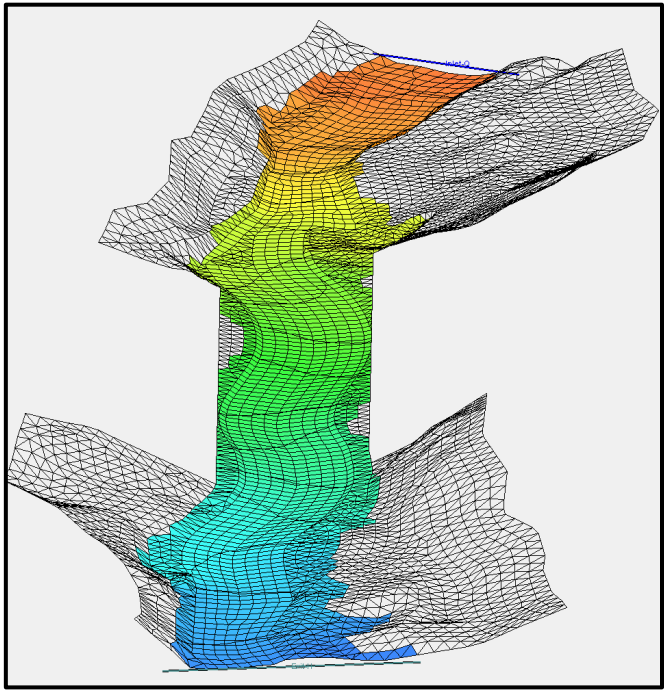
- If digital data is not available, it is not uncommon for the FEMA SFHA Zone boundary to not align with the actual creek location. If this is the case for your project, document accordingly and contact HQ Hydraulics for further assistance

Template Detailed Overview

3.3 2D Floodplain Model Development

Describe:

- Mesh Development
- Roughness Values
- Boundary Conditions
- Etc.



Template Detailed Overview

3.3.1 2D Floodplain Model Development – Utilizing Effective FEMA FIS and FIRM Information

- If project is not located in a FEMA SFHA, DELETE this section
- FEMA models are not used for the FRA
- Only the Effective FEMA 1% annual chance (100-year) flood flow and BFE for upstream and downstream boundary conditions, respectively, should be used

Template Detailed Overview

3.3.1.1 Existing Conditions 2D Floodplain Model

Describe:

- Existing Conditions Mesh Development
- Existing Conditions Roughness Values
- Existing Conditions Boundary Conditions
- How closely the 2D existing conditions model results match WSEs from the Effective FIS and FIRM

Template Detailed Overview

3.3.1.2 Proposed Conditions 2D Floodplain Model

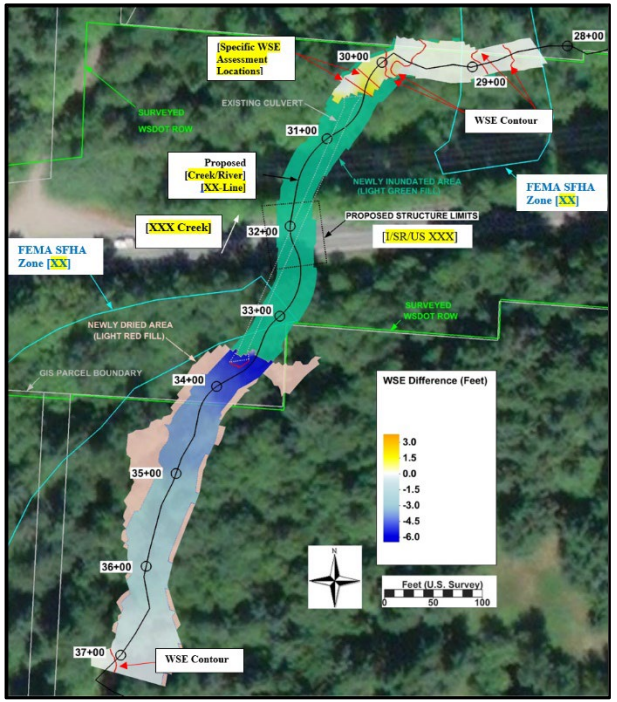
Describe:

- Proposed Conditions Mesh Development
- Proposed Conditions Roughness Values

Template Detailed Overview

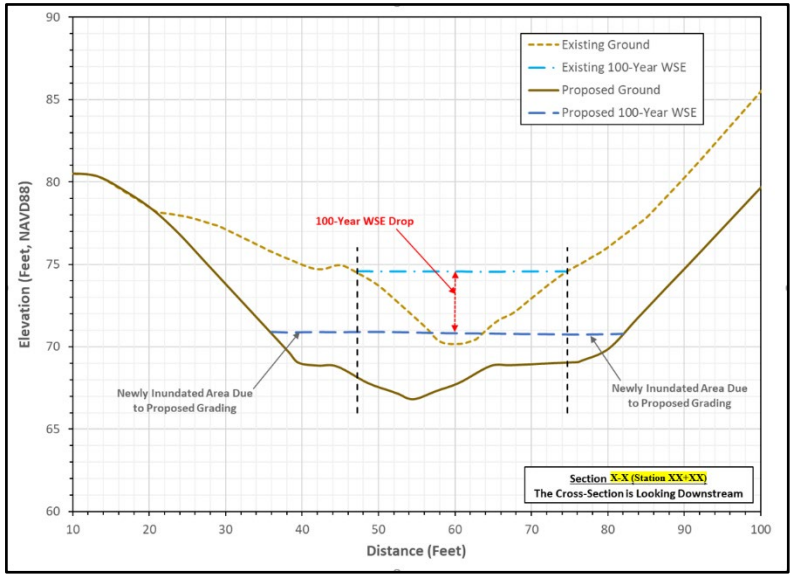
3.3.1.3 Comparison of Existing and Proposed 100-Year Water Surface Elevations

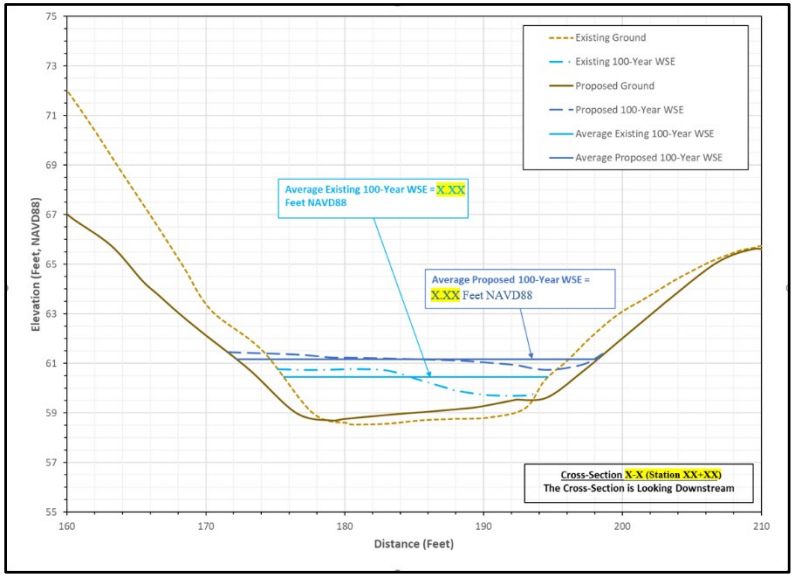
Describe differences between the 100-year existing conditions and proposed conditions water surface elevations downstream, through and upstream of crossing



Template Detailed Overview

3.3.1.3 Comparison of Existing and Proposed 100-Year Water Surface Elevations





Template Detailed Overview

3.3.1.3 Comparison of Existing and Proposed 100-Year Water Surface Elevations

Describe differences between the 100-year existing conditions and proposed conditions water surface elevations downstream, through and upstream of crossing

Observation Line Number	Station (Feet)	Existing (Feet, NAVD88)	Proposed (Feet, NAVD88)	Difference (Feet)
1	0+00	333.00	333.00	0.00
2	1+00	334.00	334.00	0.00
3	2+00	335.00	335.00	0.00
4	3+00	340.00	338.00	-2.00
5	4+00	341.00	339.00	-2.00

Template Detailed Overview

3.3.1.4 Assessment of Flood Risk

Describe:

- The potential risk of the preliminary design not being able to meet either FEMA SFHA minimum requirements or local jurisdiction code requirements and thus the project requiring a change in the design or a CLOMR

- How potential changes in modeled WSE or flood extents may affect any identified property and structures identified in Section 3.1

Template Detailed Overview

3.3.1.4 Assessment of Flood Risk

- If the project resides in a SFHA and the FEMA maps are incorrect, there may be a need to communicate to the local jurisdiction that the maps are incorrect and see if FEMA can update maps.

- WSDOT has monthly coordination calls with FEMA where project level questions can be presented

Template Detailed Overview

3.3.2 2D Floodplain Model Development – Utilizing PHD Information

Similar to Section 3.3.1, with the exception of using PHD flow information rather than FEMA flow information

Template Detailed Overview

3.3.2.4 Assessment of Flood Risk

Describe:

- Potential risk(s) the preliminary design may have to public health and safety in order for a project to be considered for permitting as a fish habitat enhancement project, as required per RCW 77.55.181
- Potential risk(s) of the preliminary design not being able to meet local jurisdiction code requirements
- How potential changes in modeled WSE or flood extents may affect any identified property and structures identified in Section 3.1

Template Detailed Overview

3.3.2.4 Assessment of Flood Risk

- If there is risk to public health and safety or meeting local jurisdiction code requirements, **describe whether the risks can be mitigated with a change in the preliminary design**, or if a CLOMR or other condition per local jurisdiction code may be required.

Template Detailed Overview

3.4 Summary

Summarize:

- If preliminary proposed project does/does not meet FEMA and local jurisdiction requirements

- If in a FEMA detailed study area, document any discrepancies more than 0.5 feet between 2D model discharge-weighted average WSE and Effective FIS/FIRM BFE / cross section WSE at tie-in locations

Template Detailed Overview

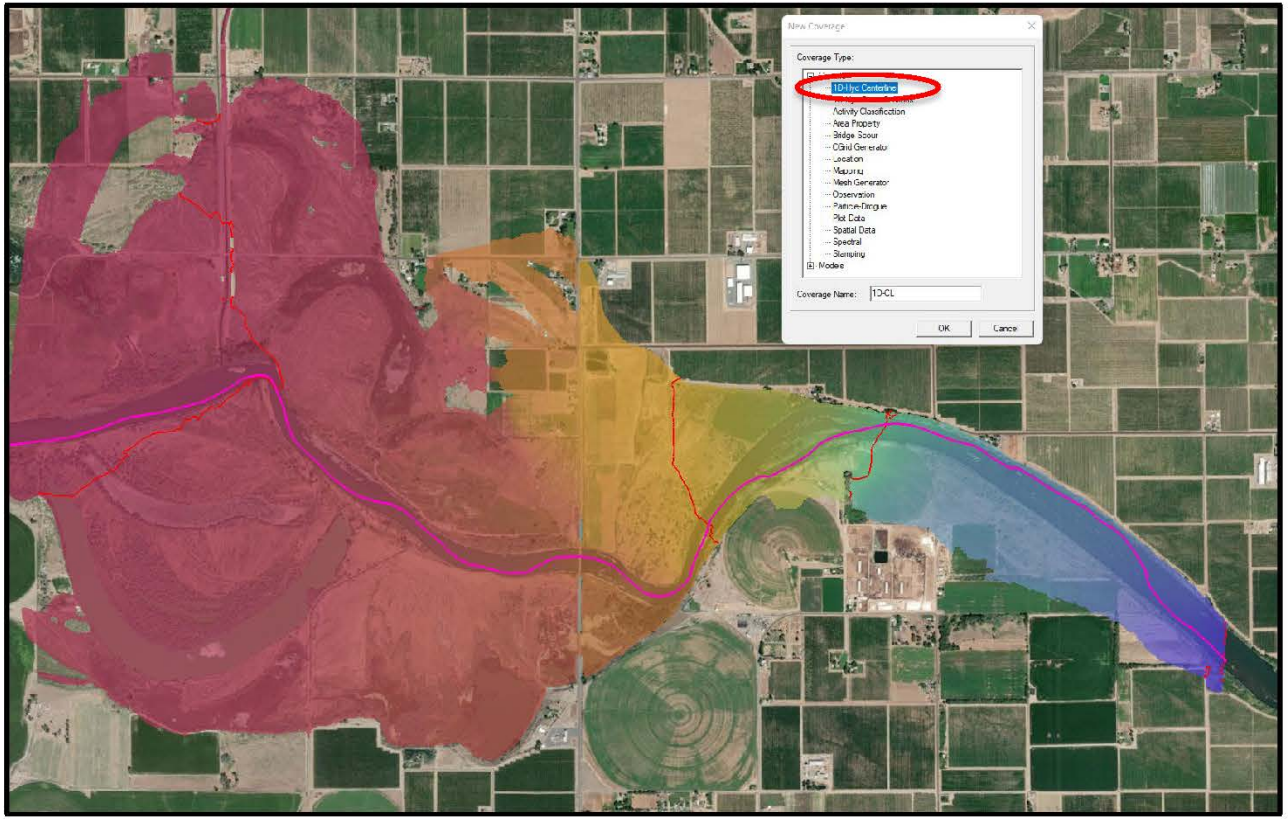
4. Summary

Summarize:

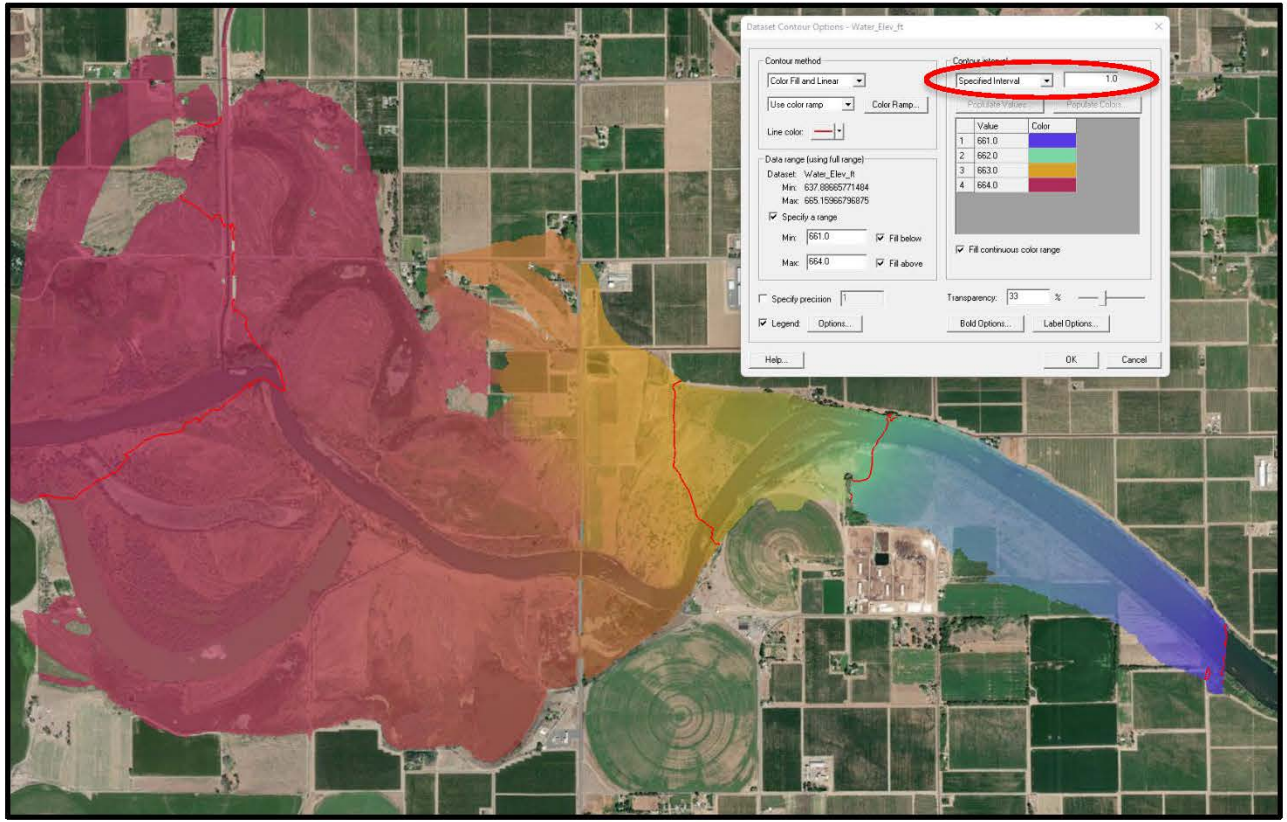
- Potential impacts (if any) to adjacent property and structures
- **Potential changes that could be made to the preliminary design that may allow the final design to meet FEMA, local jurisdiction and health and safety requirements**
- Required subsequent assessment (e.g., no-rise / zero-rise / floodplain analysis / CLOMR / specify any other analyses or requirements) that is anticipated to be required for the project based on the preliminary design.

Q&A

2D Model Example



2D Model Example



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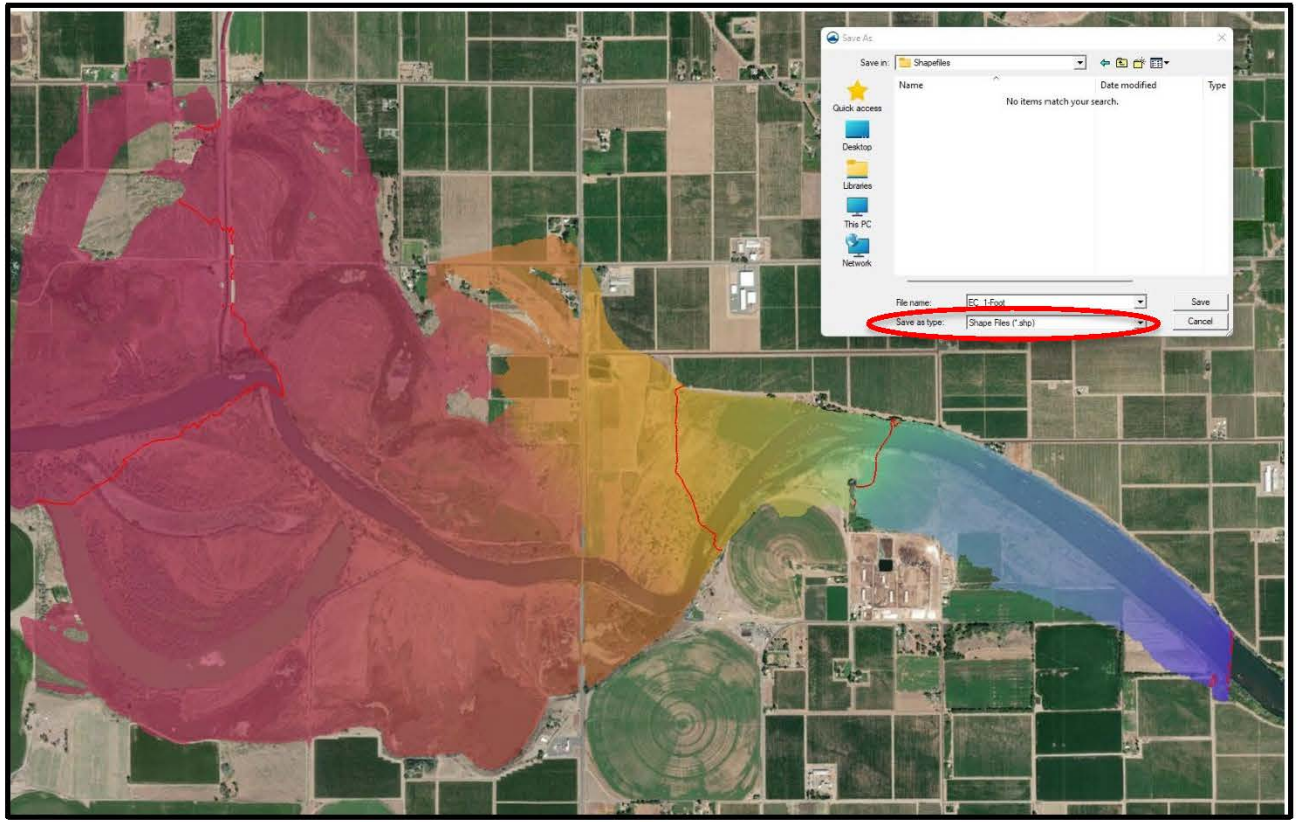

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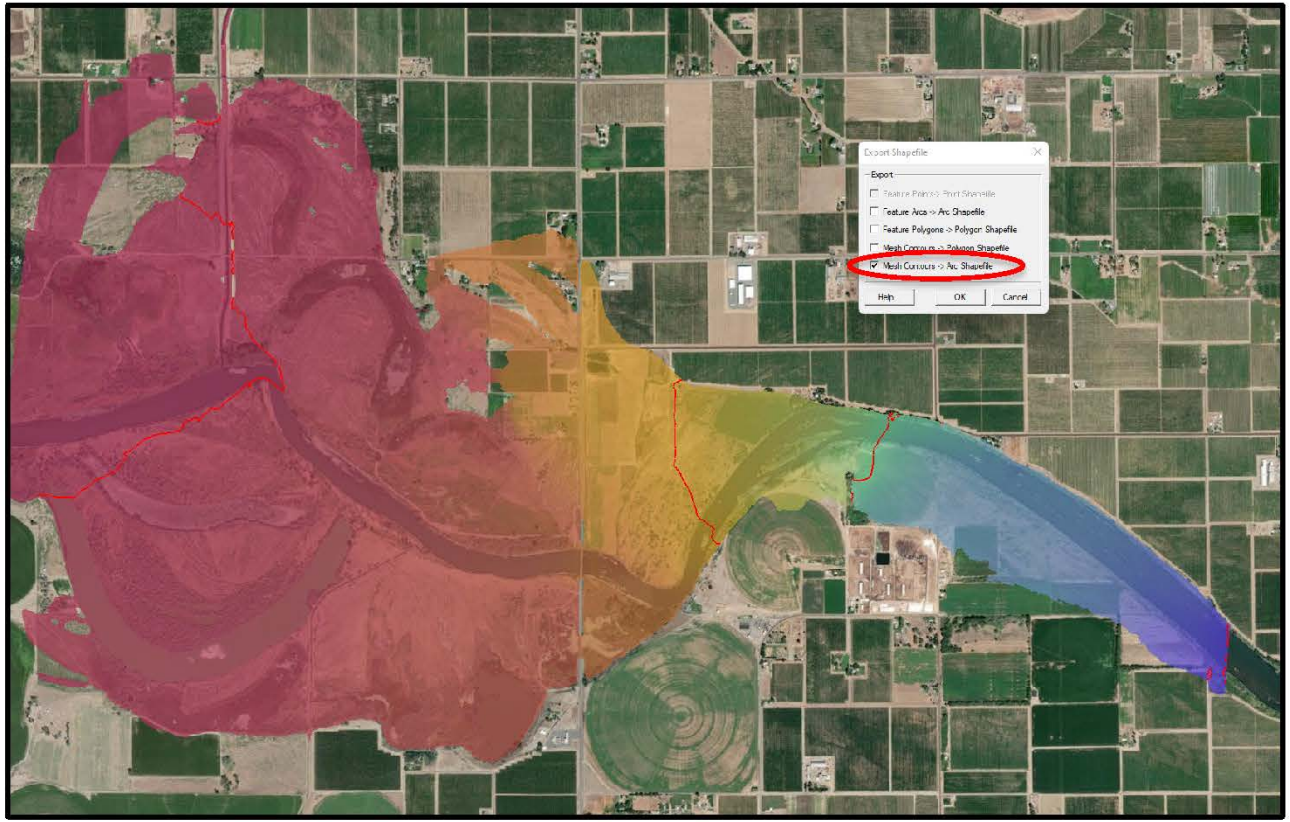

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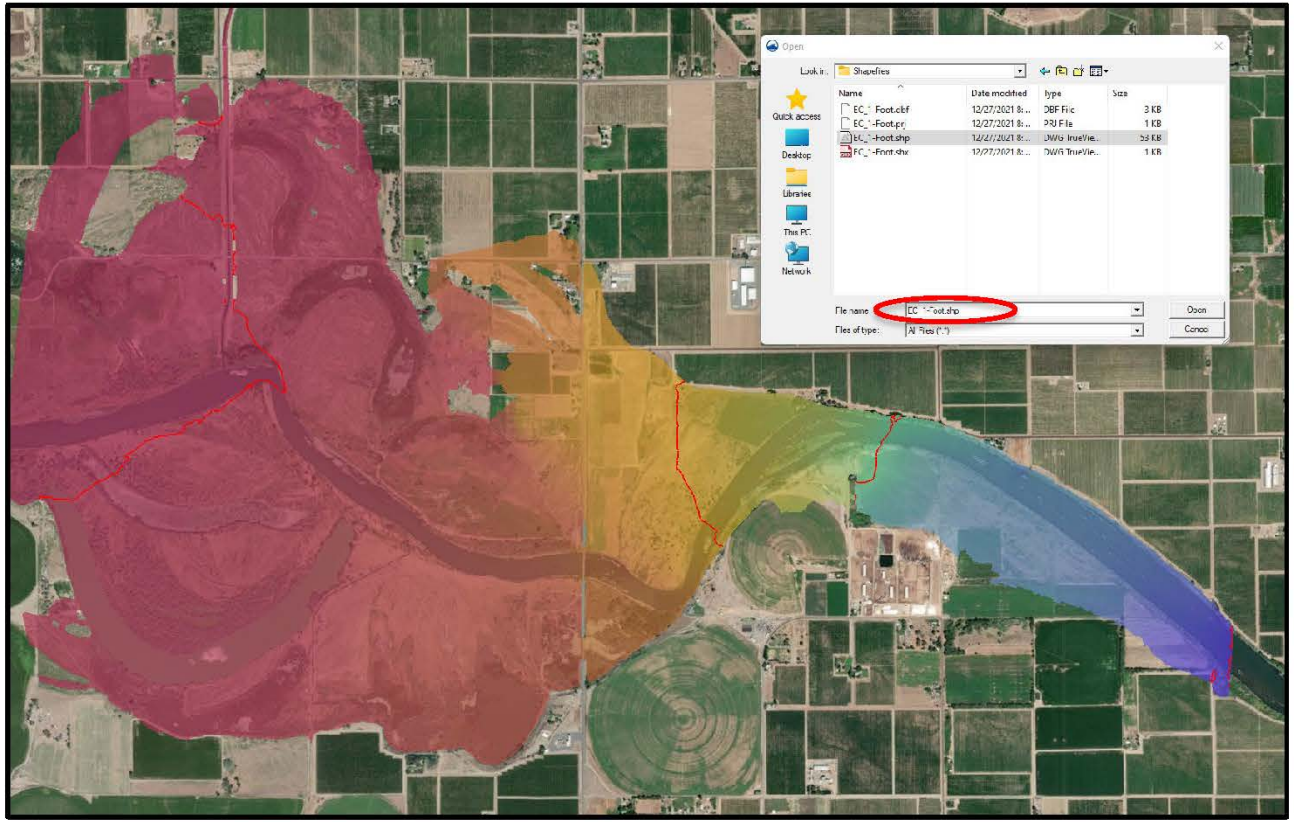

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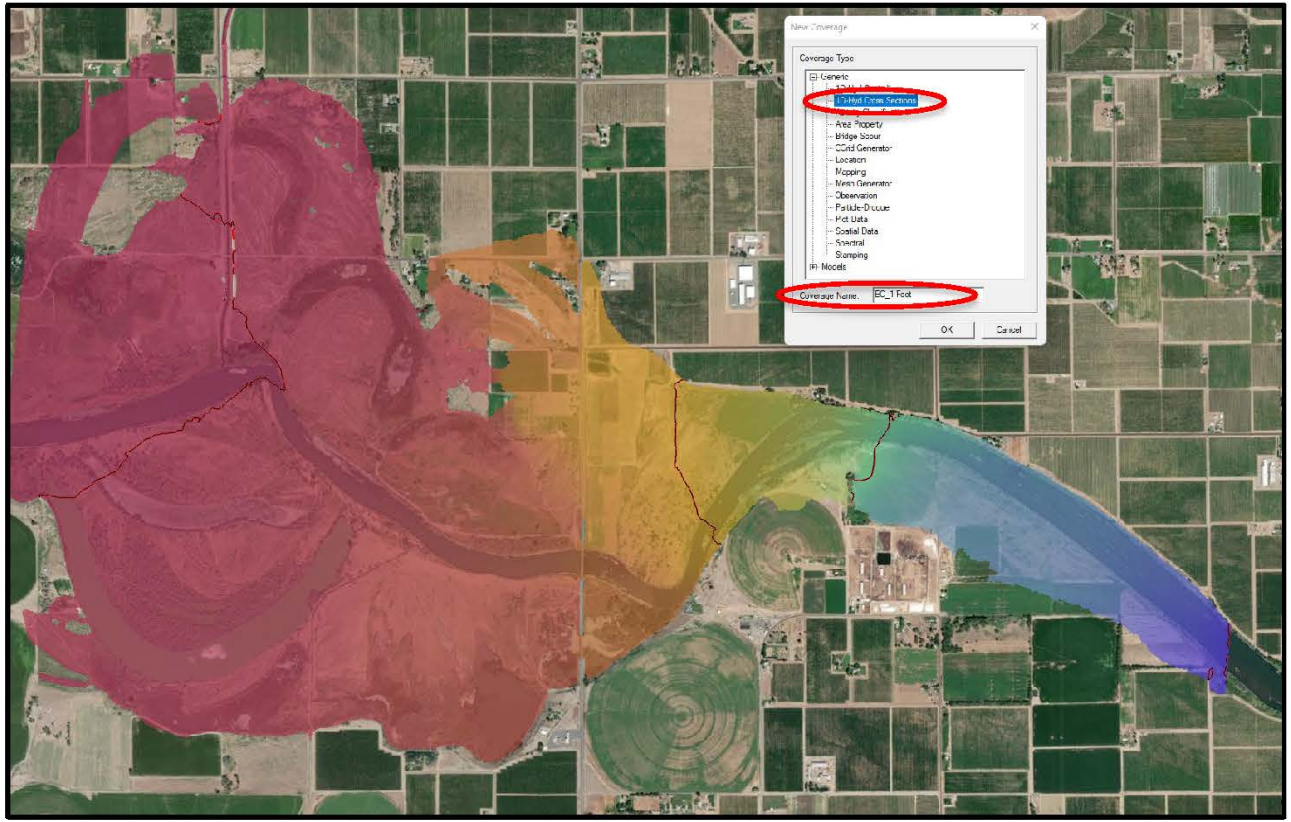

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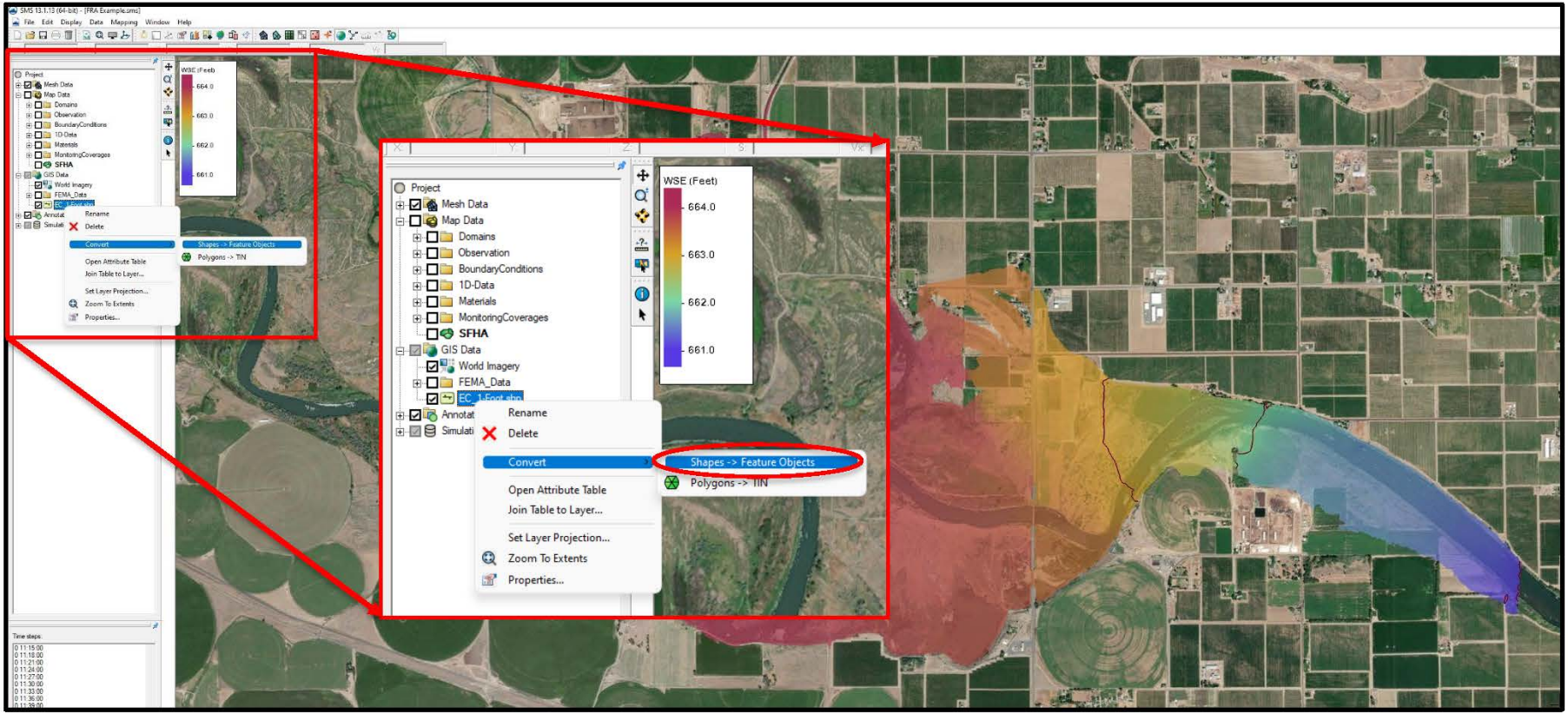

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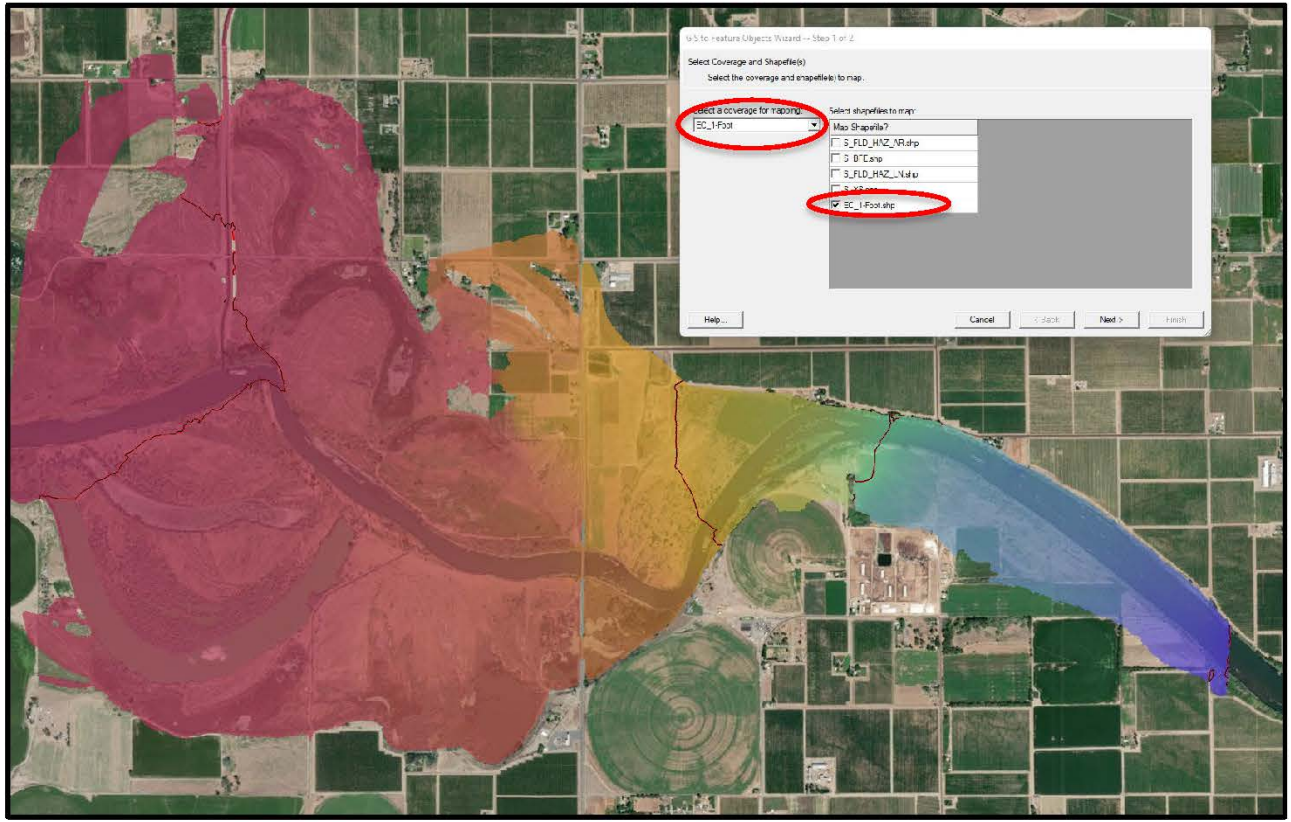

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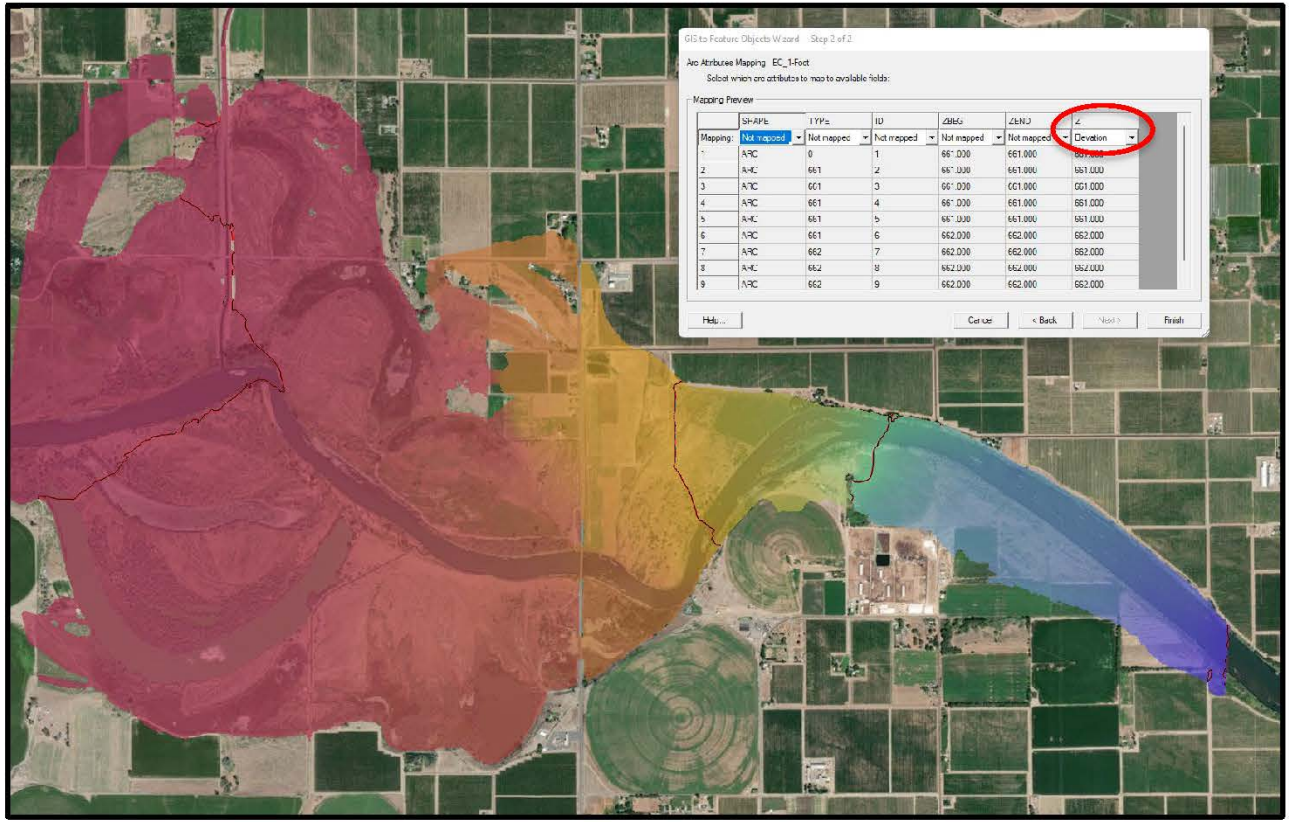

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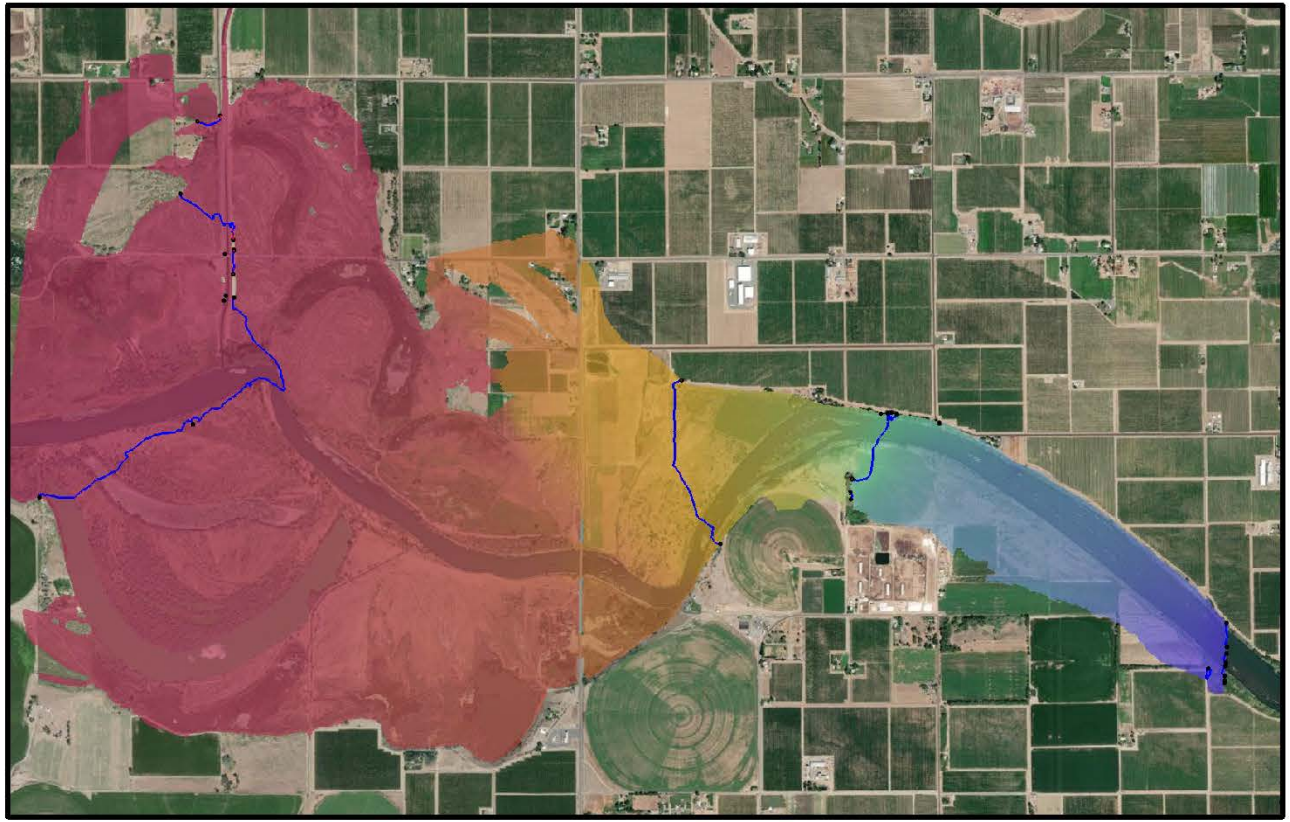

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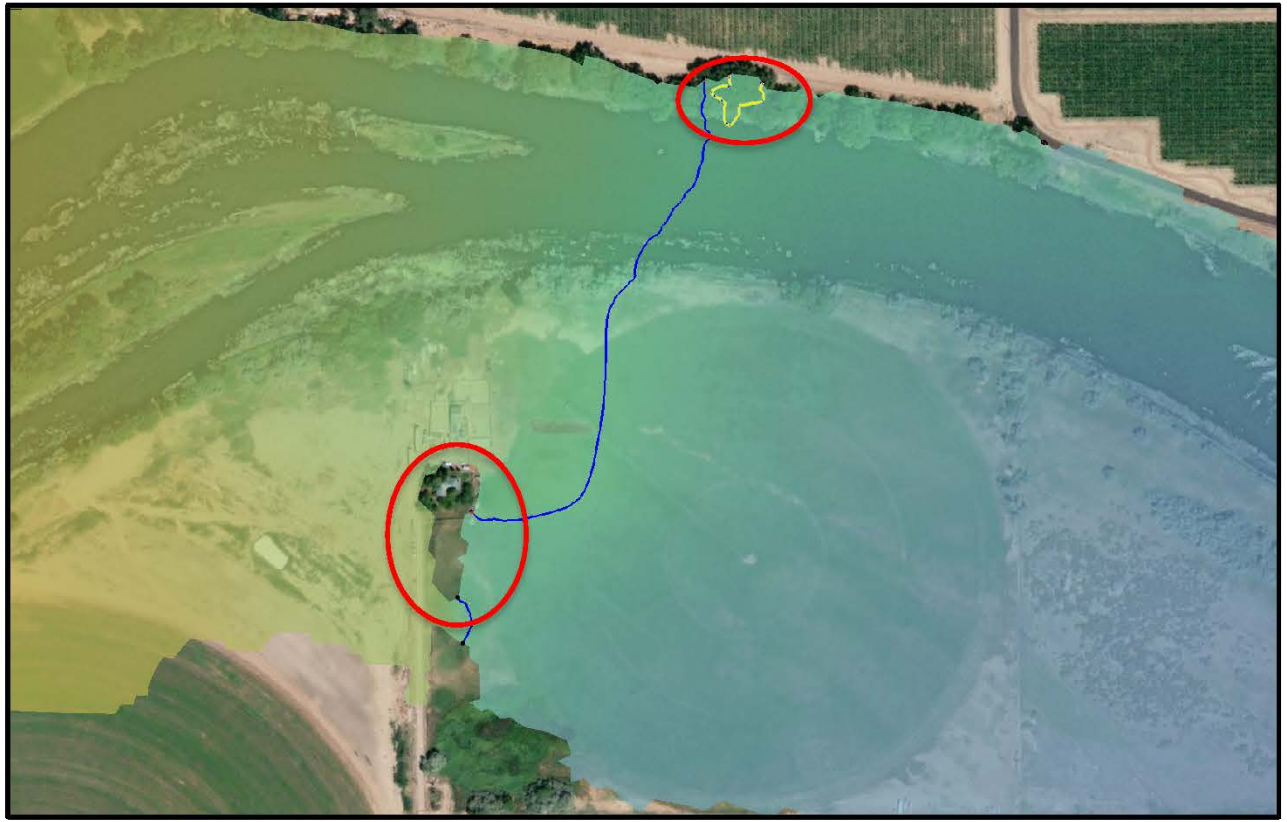

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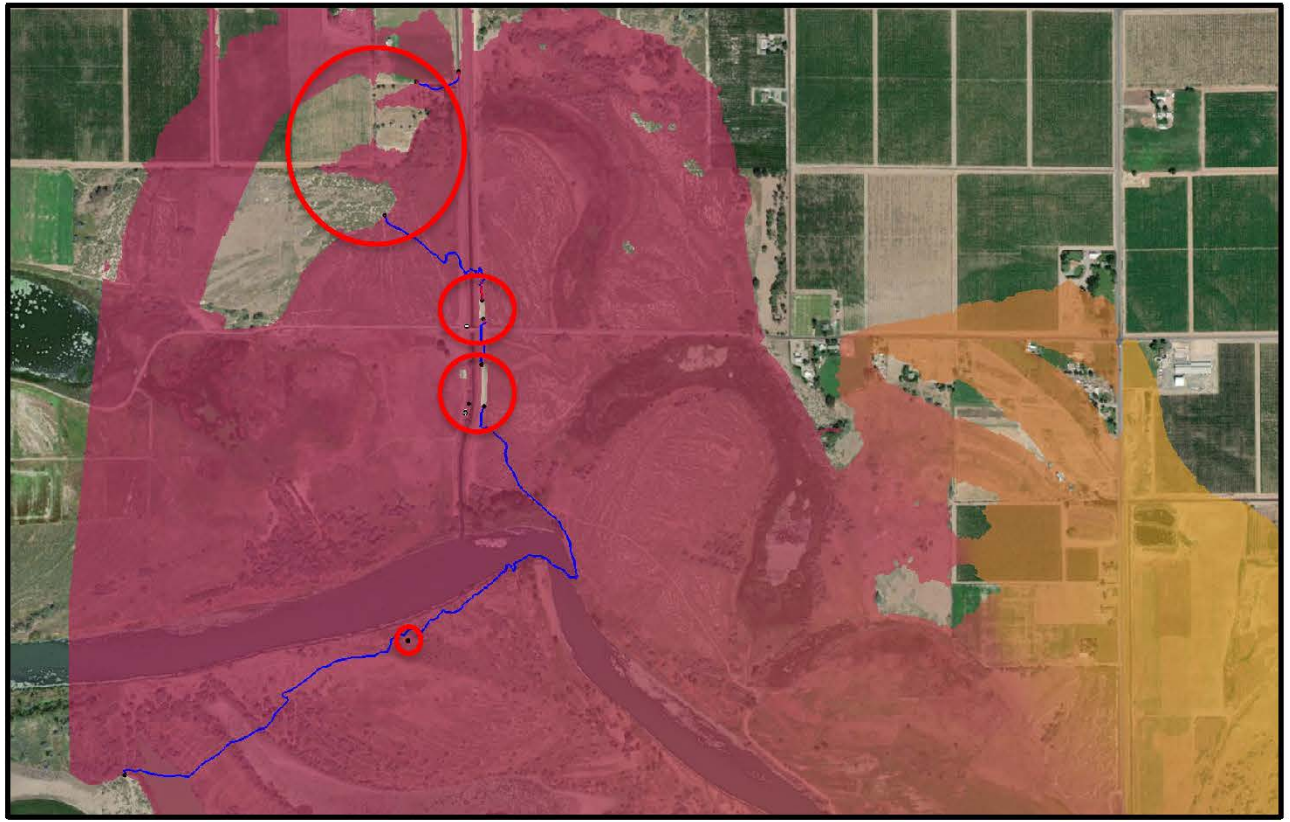

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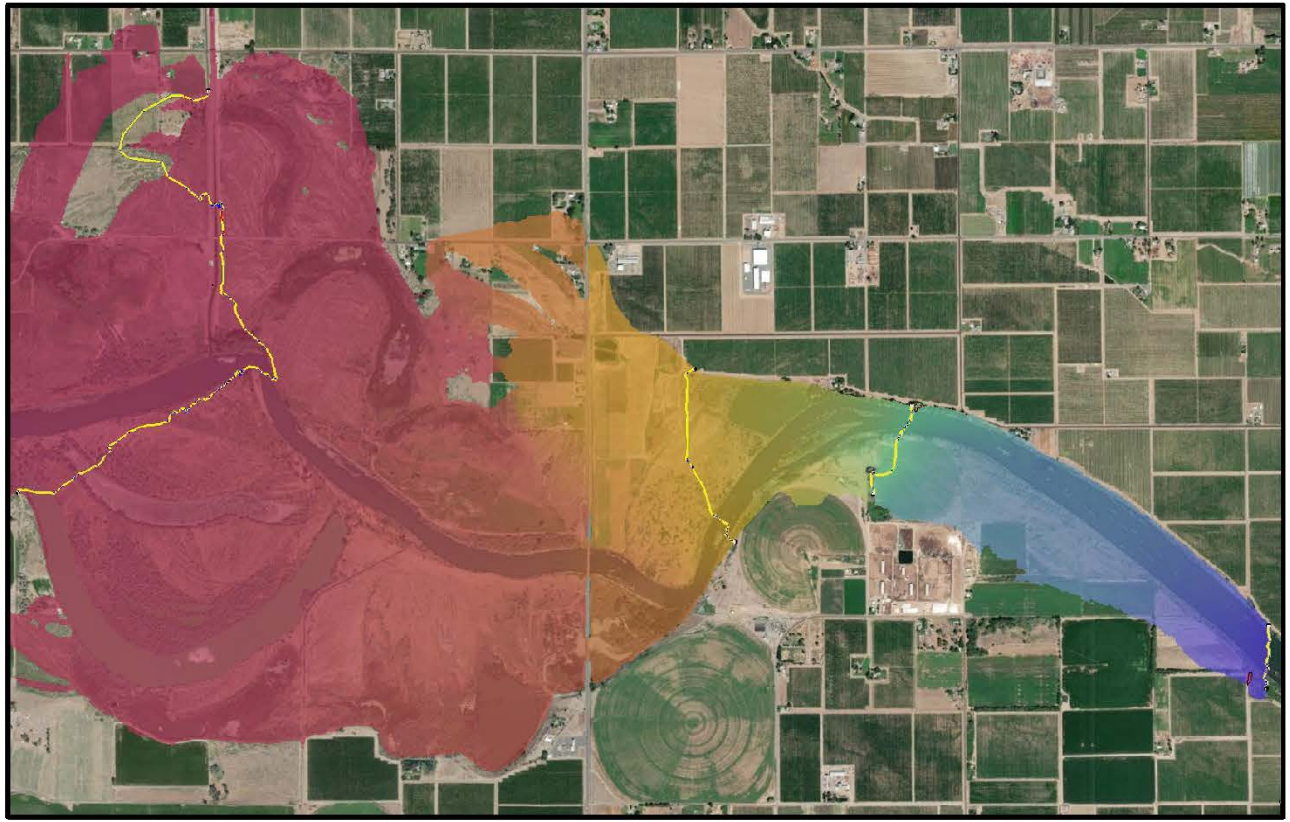

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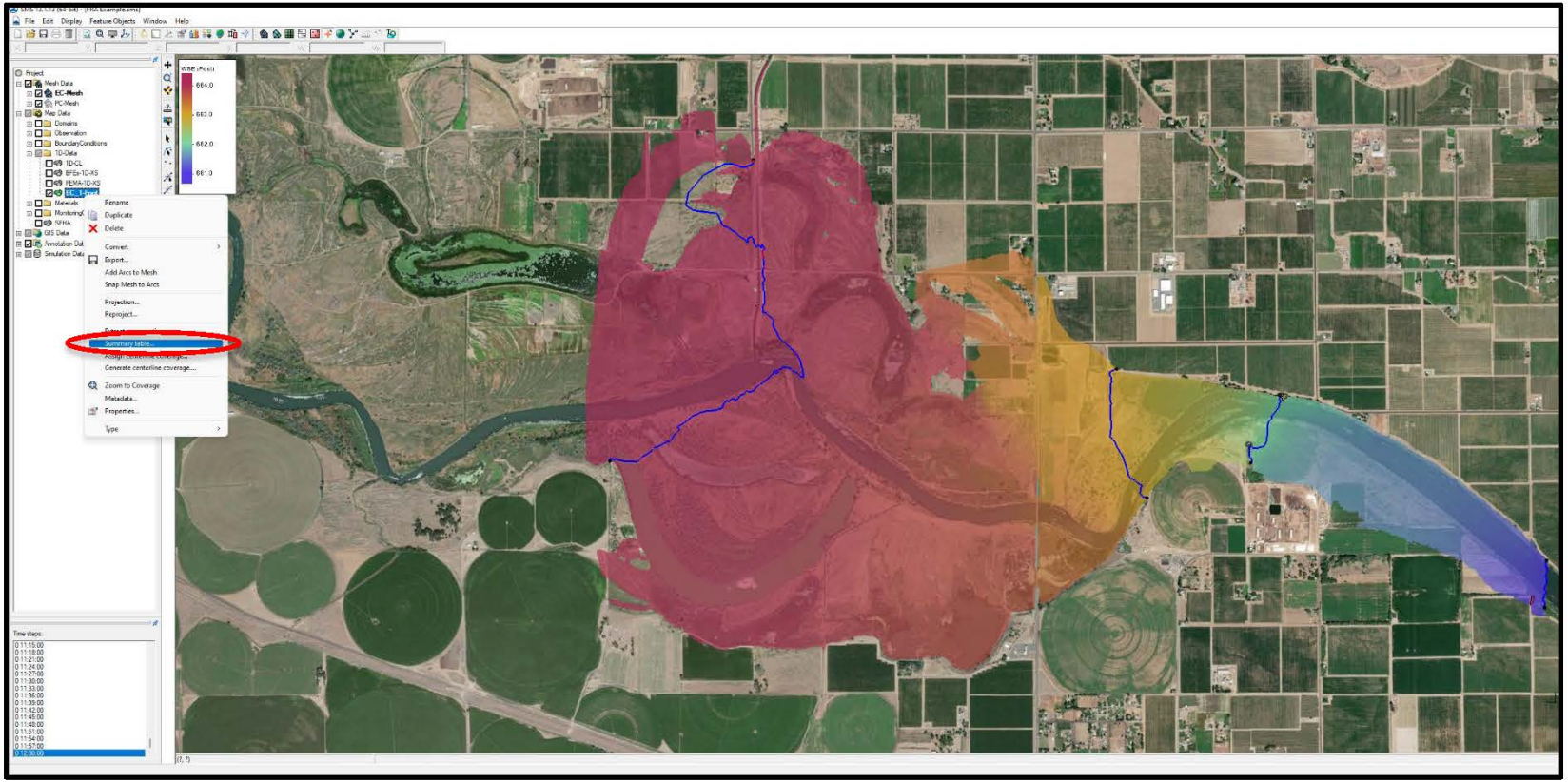

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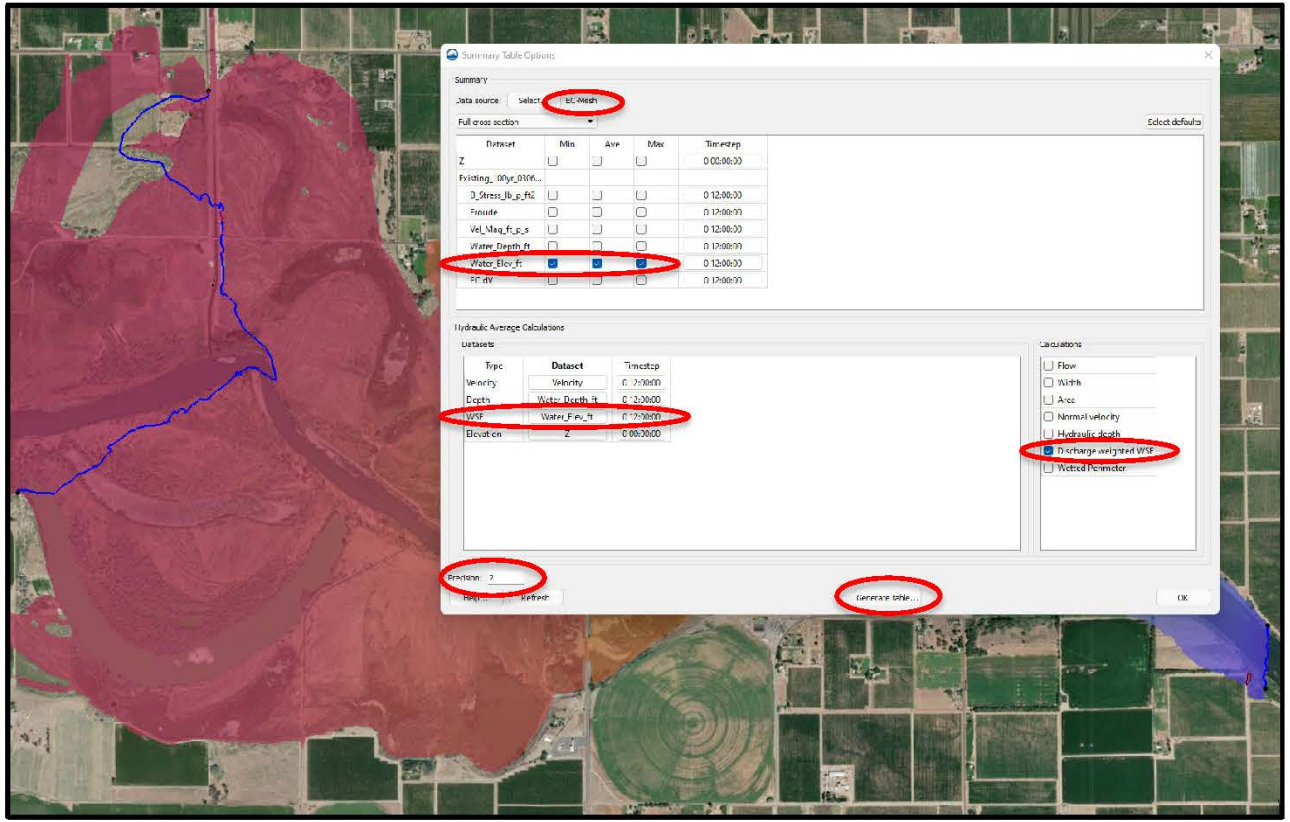

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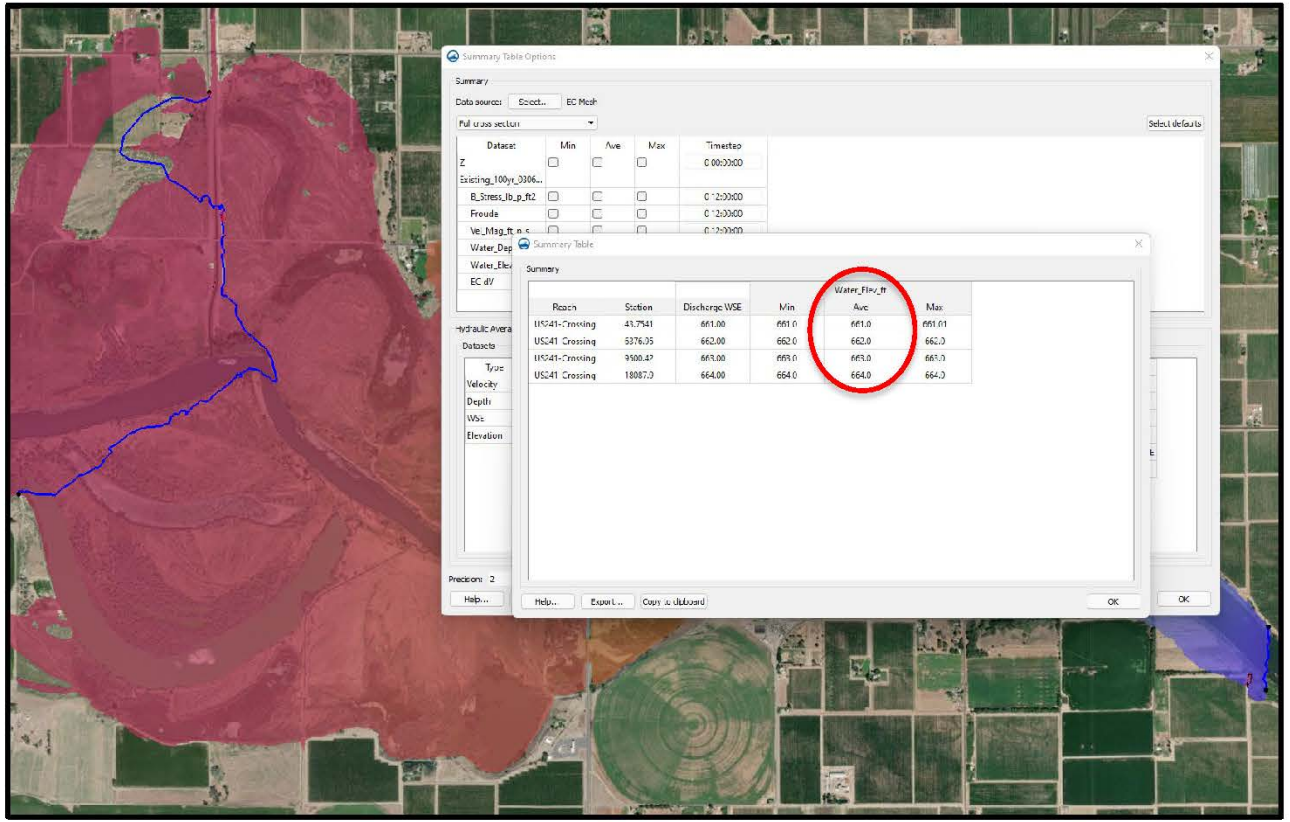
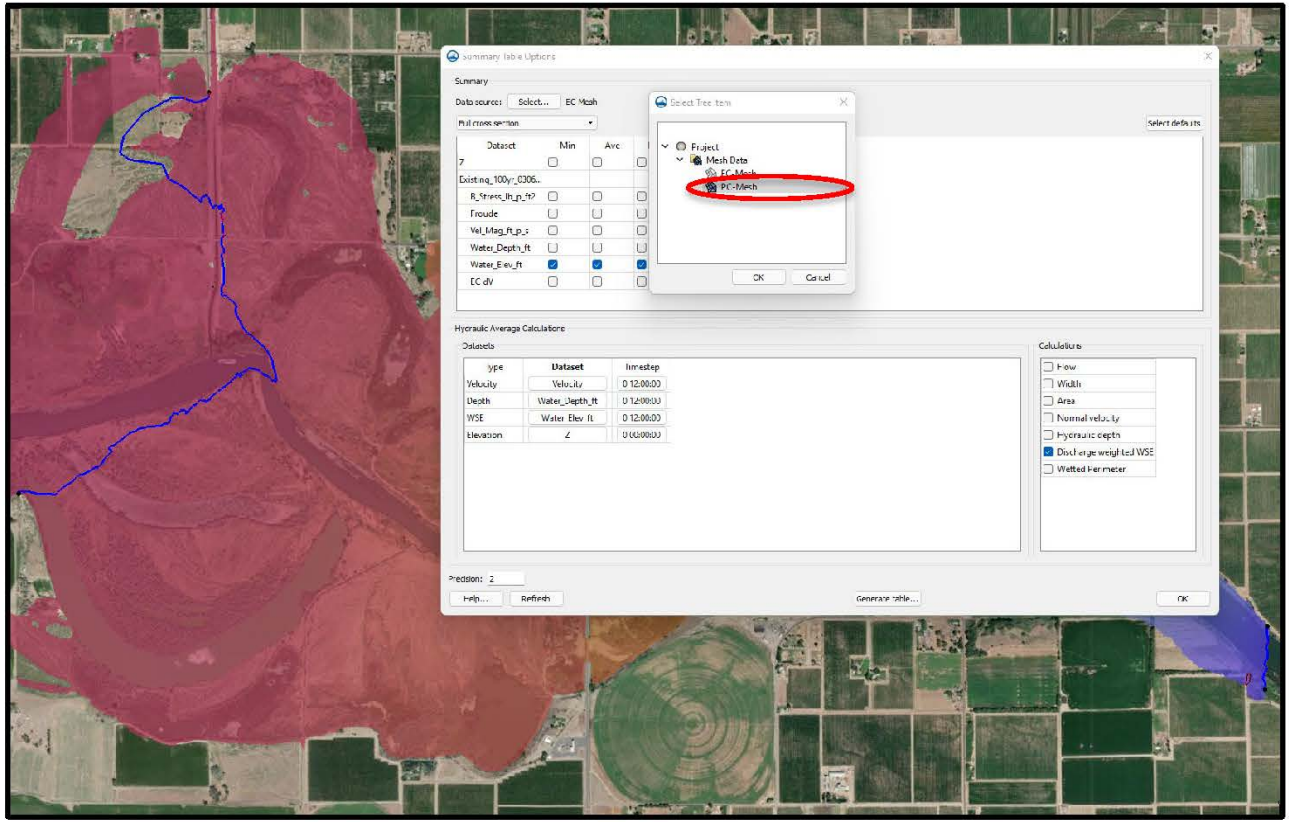


2D Model Example

Existing Conditions					
		Water_Elev_ft			
Reach	Station	Discharge WSE	Min	Ave	Max
US241-Crossing	43.7541	661	661	661	661.01
US241-Crossing	6376.95	662	662	662	662
US241-Crossing	9500.42	663	663	663	663
US241-Crossing	18087.9	664	664	664	664

2D Model Example



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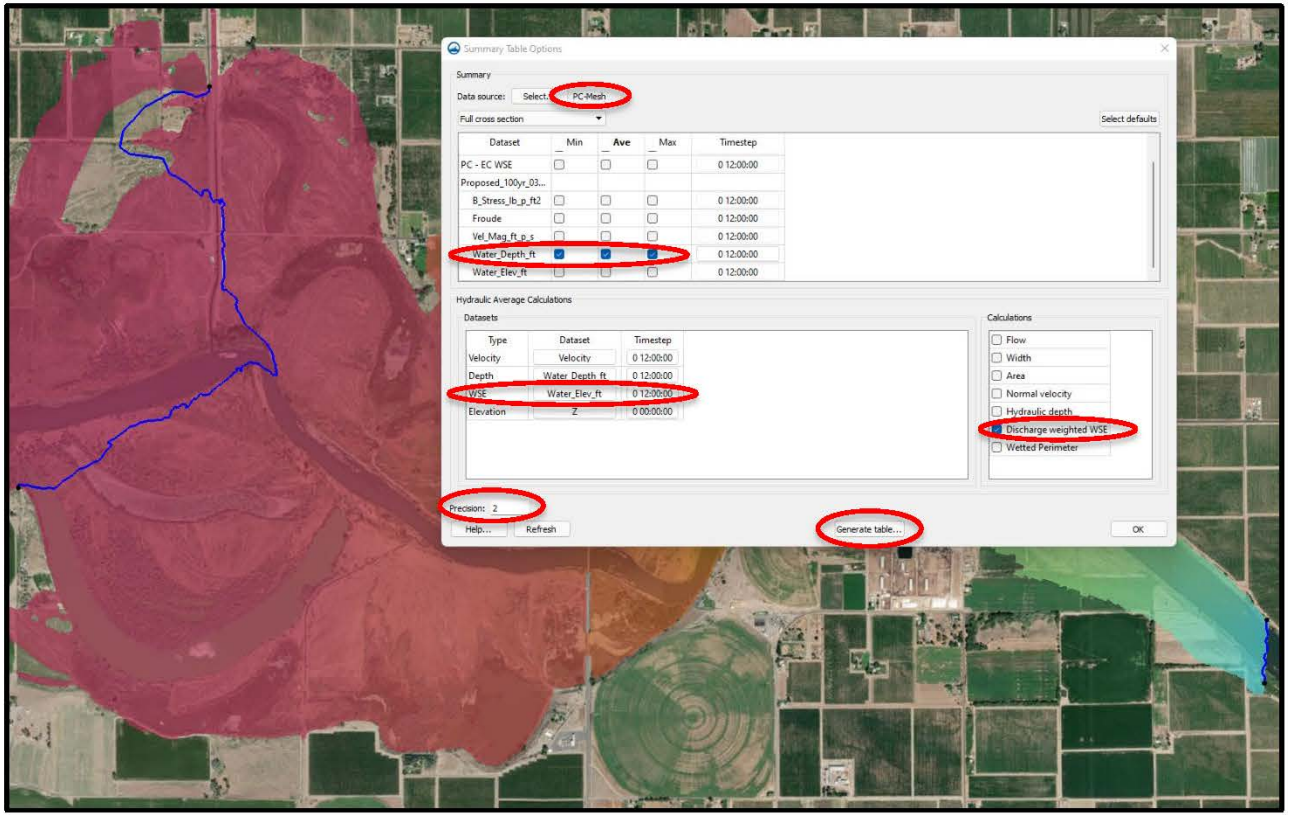

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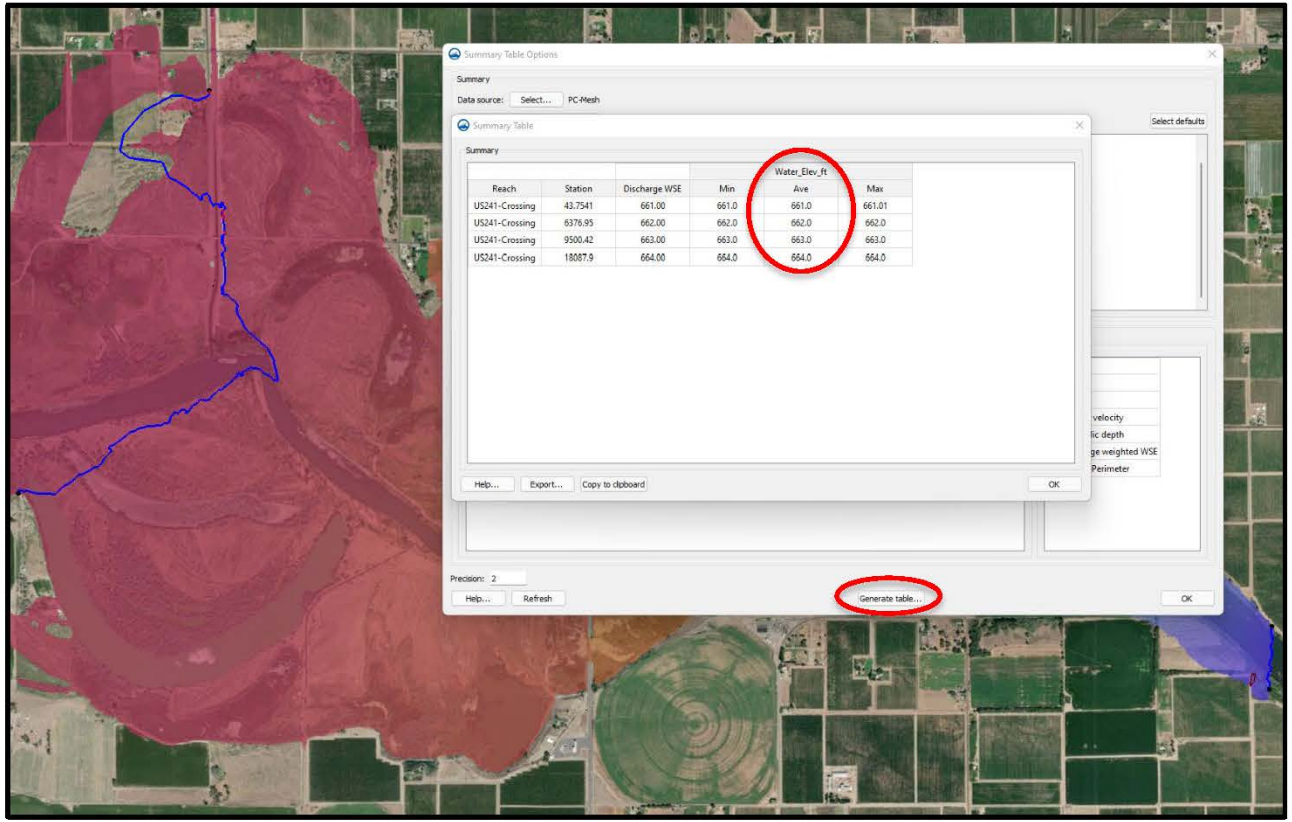

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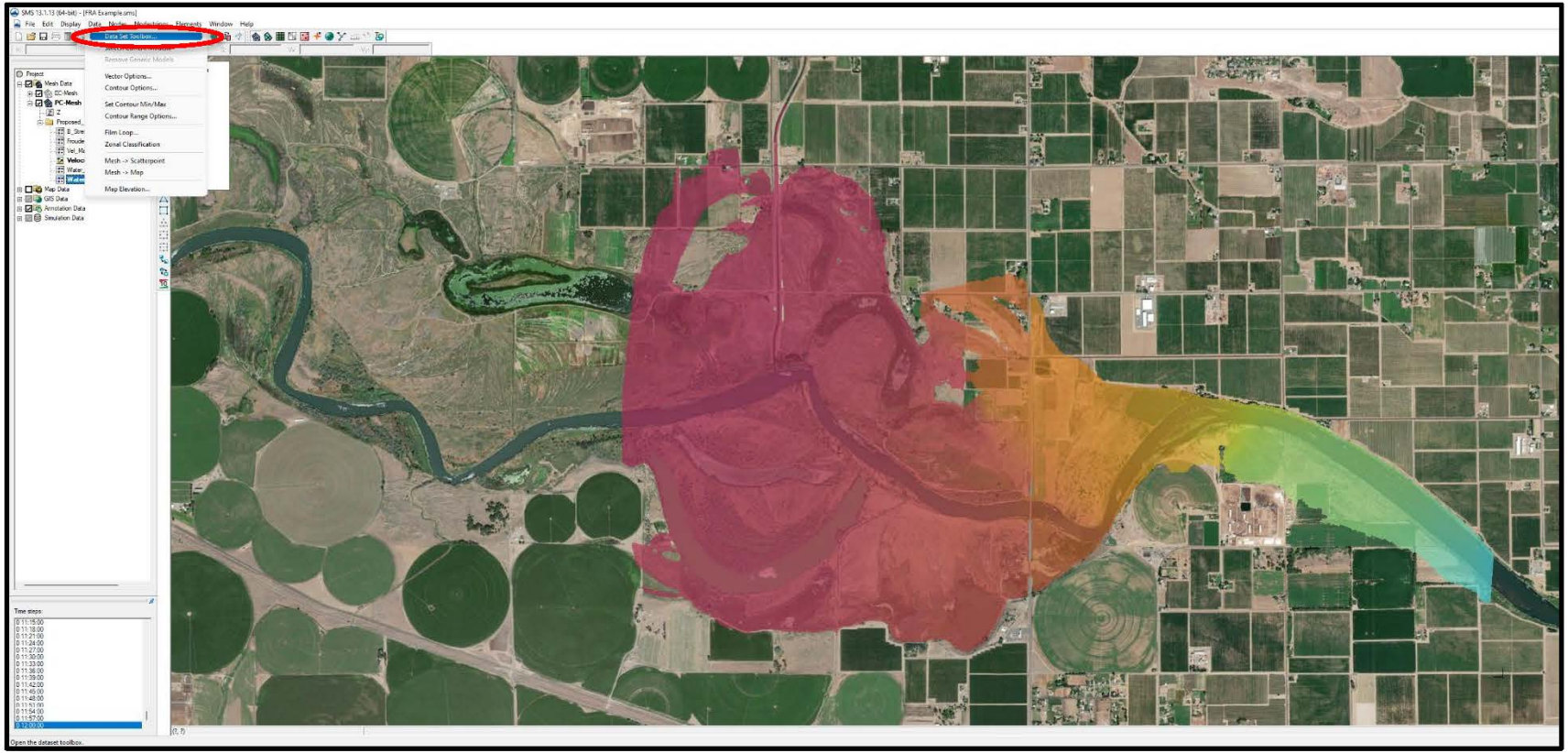
US241-Crossing	43.7541	661	661	661	661.01
US241-Crossing	6376.95	662	662	662	662
US241-Crossing	9500.42	663	663	663	663
US241-Crossing	18087.9	664	664	664	664

Proposed Conditions					
		Water_Elev_ft			
Reach	Station	Discharge WSE	Min	Ave	Max
US241-Crossing	43.7541	661	661	661	661.01
US241-Crossing	6376.95	662	662	662	662
US241-Crossing	9500.42	663	663	663	663
US241-Crossing	18087.9	664	664	664	664

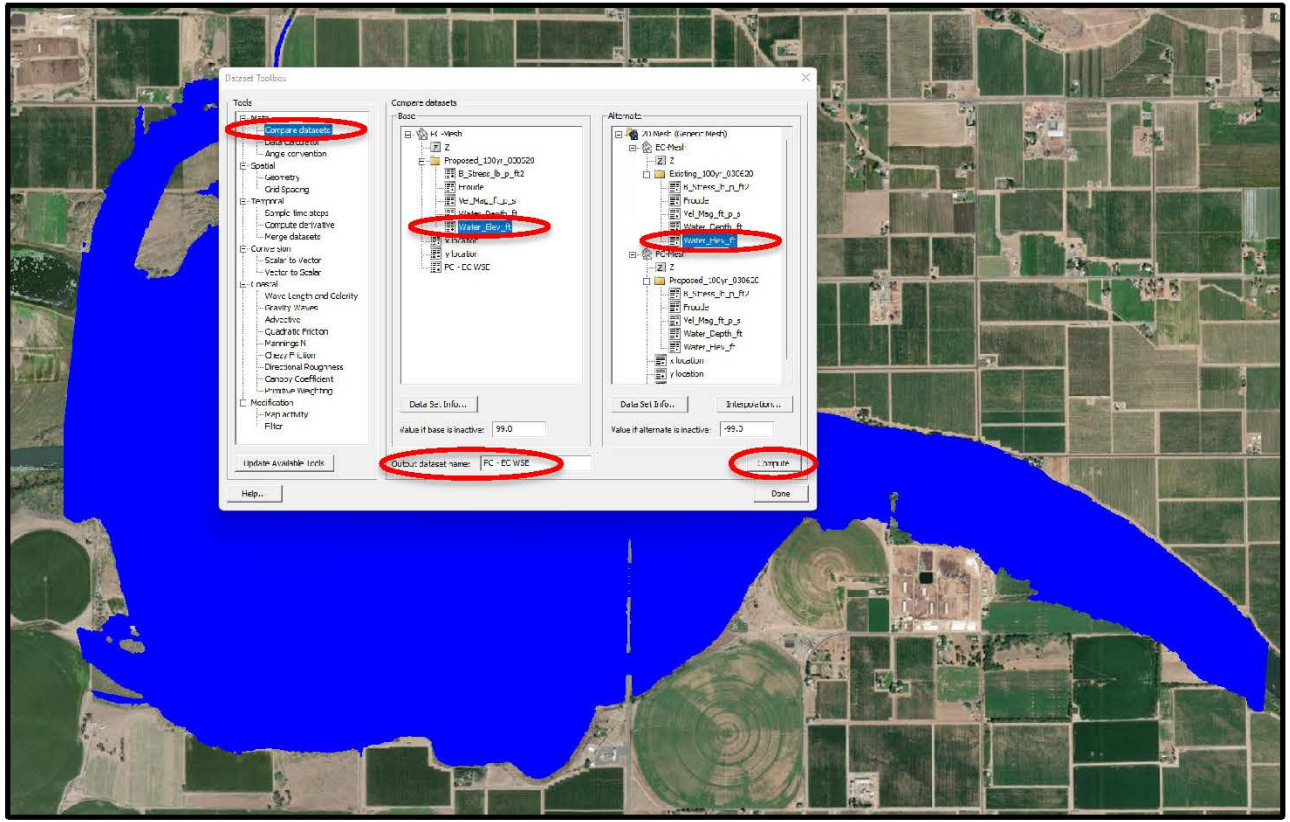
Difference		
	Water_Elev_ft	
Station	Discharge WSE	Ave
43.7541	0.000	0.000
6376.95	0.000	0.000
9500.42	0.000	0.000
18087.9	0.000	0.000

2D Model Example

2D Model Example



2D Model Example



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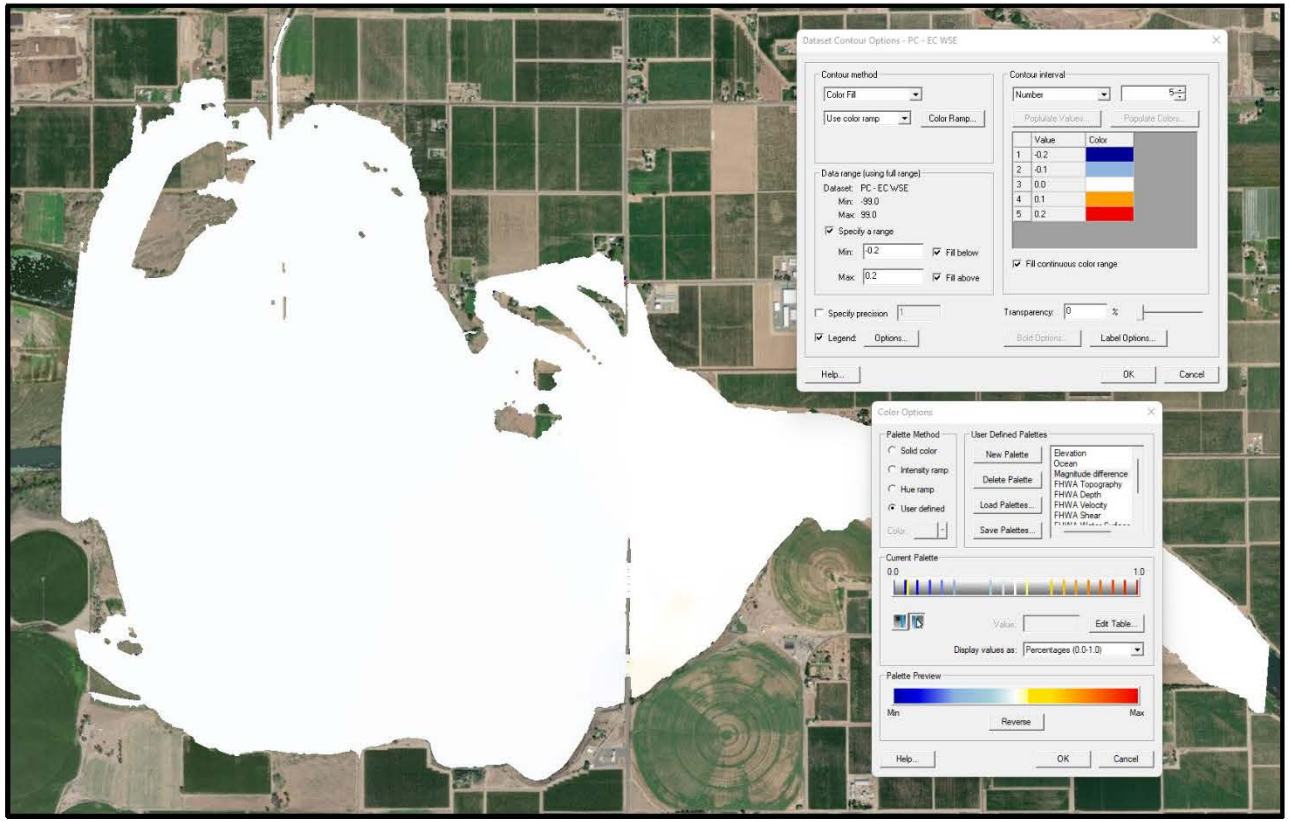

2D Model Example

Q&A

SRH-2D User's Meeting

- Forum to discuss SRH-2D and modeling topics
- Agendas and other SRH-2D material ftp://ftp.wsdot.wa.gov/public/SRH2DMtg/
- If interested and not already on mailing list, please contact:

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morschh@wsdot.wa.gov
WSDOT Hydraulics
(360) 705-7261

THANK YOU!

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