

The background of the slide is a 3D simulation of a dam. The dam is a long, brown structure with multiple vertical buttresses, spanning across a wide river. The water is a light blue color. The surrounding landscape is a mix of green and yellow, representing vegetation and terrain. The sky is a pale blue. The overall scene is a perspective view from above and slightly to the side.

Hydrotec – User's Conference

SMS 14 New Release Feature Highlights

Simulation Based Hydro_AS Modeling

Agenda

- Current version of SMS/SRH-2D
- **SMS 14 New Release Feature Highlights**
- **Simulation Based Hydro_AS Interface**

Modeling Resources

<https://aquaveo.com/software/sms/models/hydroas>

<https://aquaveo.com/software/sms/learning>

<https://aquaveo.com/software/sms/learning-tutorials>

The screenshot displays the AQUAVEO SMS Learning Center website. The top navigation bar includes links for Software, Services, Support, Downloads, and About. The main heading is 'SMS Learning Center'. Below this, there are four primary content areas:

- SMS Videos:** Features a 3D visualization of a river or channel with flow lines.
- SMS Tutorials:** Includes a 2D plot of water surface elevation profiles, with a caption 'Figure 8 Observation data' and a sub-section '8.3 Setting Up the Plot Wizard'.
- SMS Wiki:** Contains a 'Welcome to XMS Wiki' message and an 'About XMS Wiki' section. The text states: 'The XMS Wiki is the online user-supported help database for XMS software developed by Aquaveo LLC. This wiki is meant to be the first resource for users of the Groundwater Modeling System (GMS), the Surface-water Modeling System (SMS), and the Watershed Modeling System (WMS). These three packages are collectively referred to as "XMS". This wiki also contains resources for Arc Hydro Groundwater (AHGW) and CityWater (CW).'.
- SMS Training Courses:** Shows a photograph of a training session with a presenter and participants.

At the bottom left, there is a section titled 'SMS Blog' with a post about the effects of changing the time period for a 1D & 2D model run.

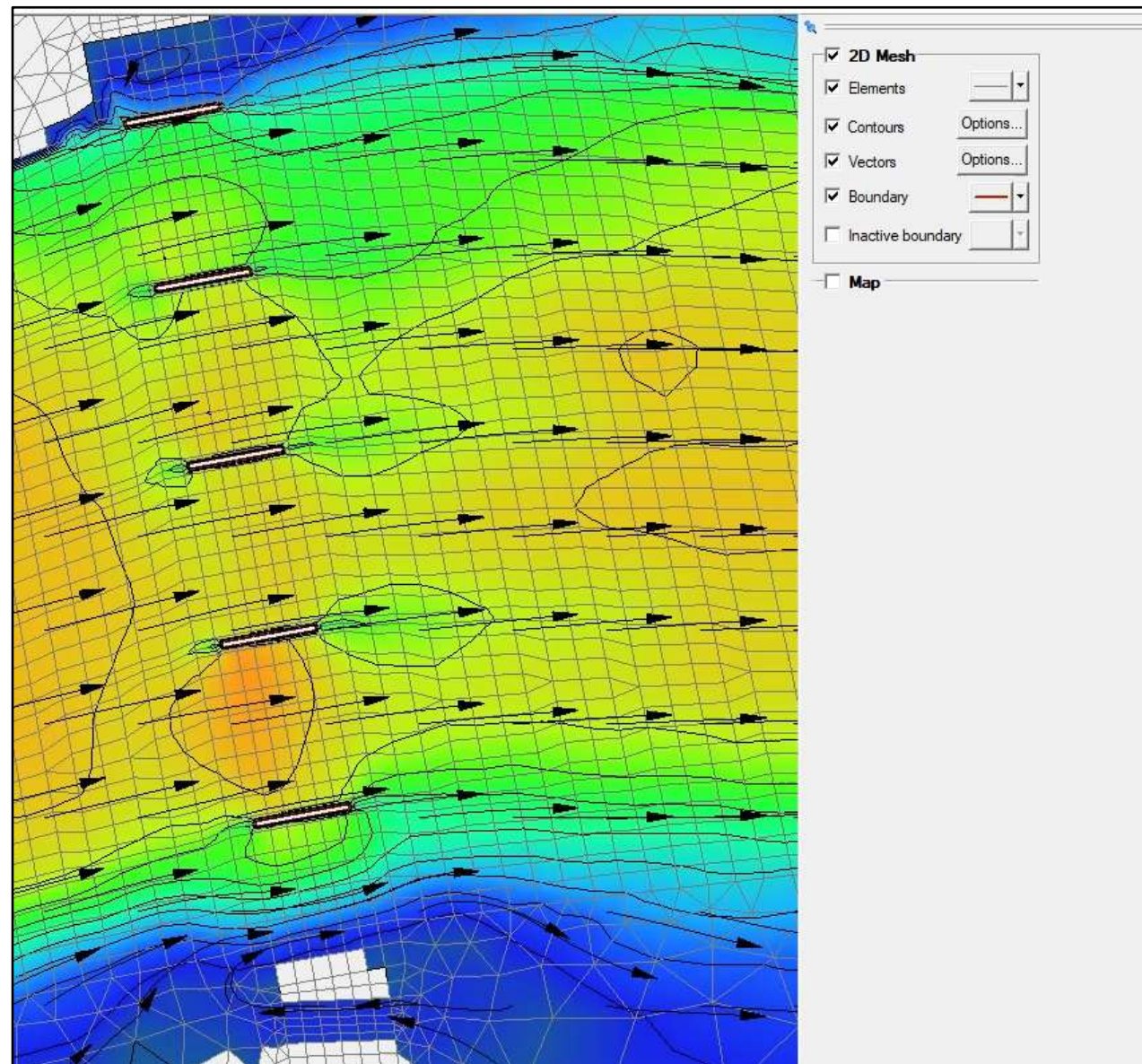
SMS Current Release

- SMS 14.0.4 Build date: September 10, 2026
- New and updated features
 - Quick Display Options
 - Undo /redo support
 - Updates to the Project Explorer folder/tree
 - Variable Contour Range Display
 - Profile plots along any arc
 - Feature extraction improvements
 - Map coverage elevation overrides
 - Select item in project
 - Tool Favorites

SMS 14 Feature Highlights

Quick Display Options

- New feature
- Pinned to upper right corner
- Readily turn mesh and map features on and off
- Buttons to quickly access settings



SMS 14 Feature Highlights

Undo To the Rescue

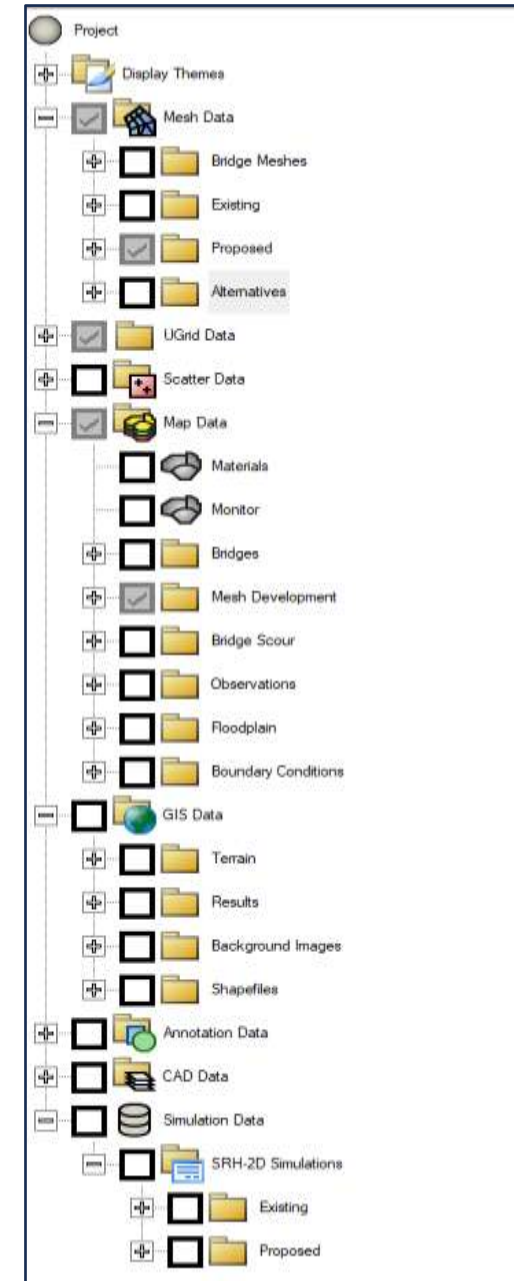
- Undo – Ctrl + z
- Redo – Ctrl + y
- Currently works on Map Coverage data
- Applies to both geometry and attributes



SMS 14 Feature Highlights

Updates to the Project Explorer folder tree

- Additional folder options are available in multiple locations
 - Simulations



SMS 14 Feature Highlights

Variable Contour Range Display

- Open Display Options
 - Select the View-based Range
 - Update Theme if using Themes

SMS 14.0 Sample Theme
file [download](#)

2D Mesh | Contours | Vectors

Contour method
 Color Fill
 Use color ramp
 Color Ramp...

Data range
 Dataset: Vel_Mag_ft_p_s
 Min: 0.0
 Max: 8.4
 View-based range
 Auto range
 Specified range
 View-based range
 Max: 8.4
☒ Fill below
☒ Fill above

Contour interval
 Specified Interval
 1.0
 Populate Values...
 Populate Colors...

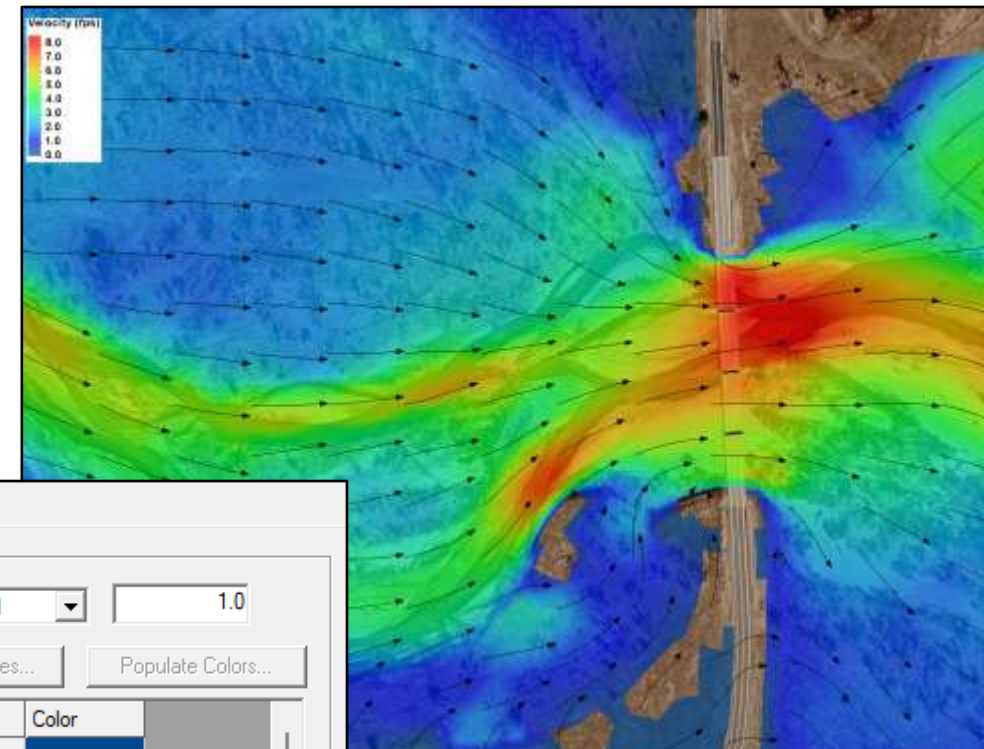
	Value	Color
1	0.0	Dark Blue
2	1.0	Blue
3	2.0	Cyan
4	3.0	Light Blue
5	4.0	Green
6	5.0	Yellow-Green
7	6.0	Yellow

☒ Fill continuous color range
☐ Fill inactive cells

☒ Specify precision: 1
☒ Legend: Options...

Transparency: 30 %

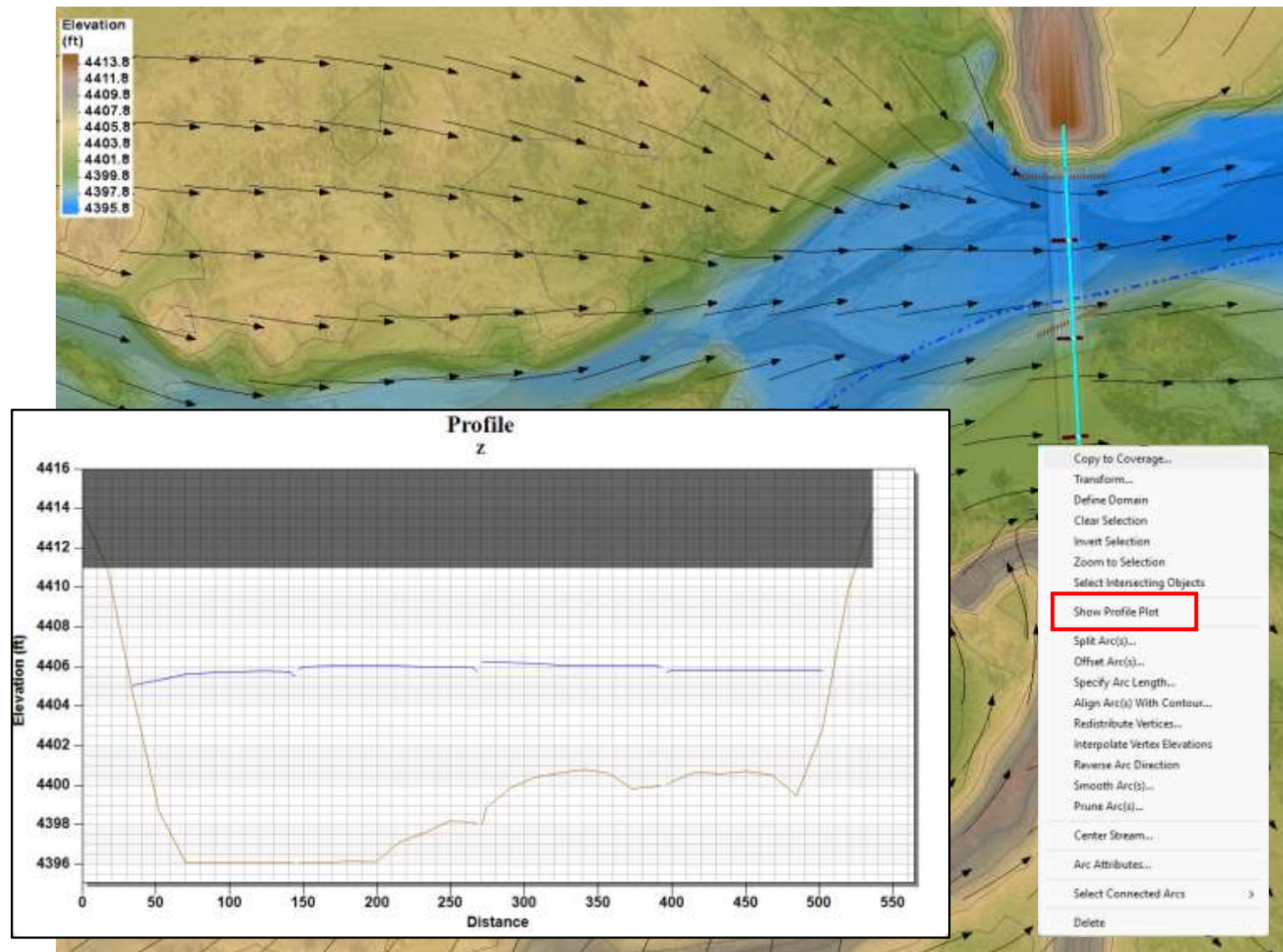
Bold Options... Label Options... Import... Export...



SMS 14 Feature Highlights

Profile plots along any arc

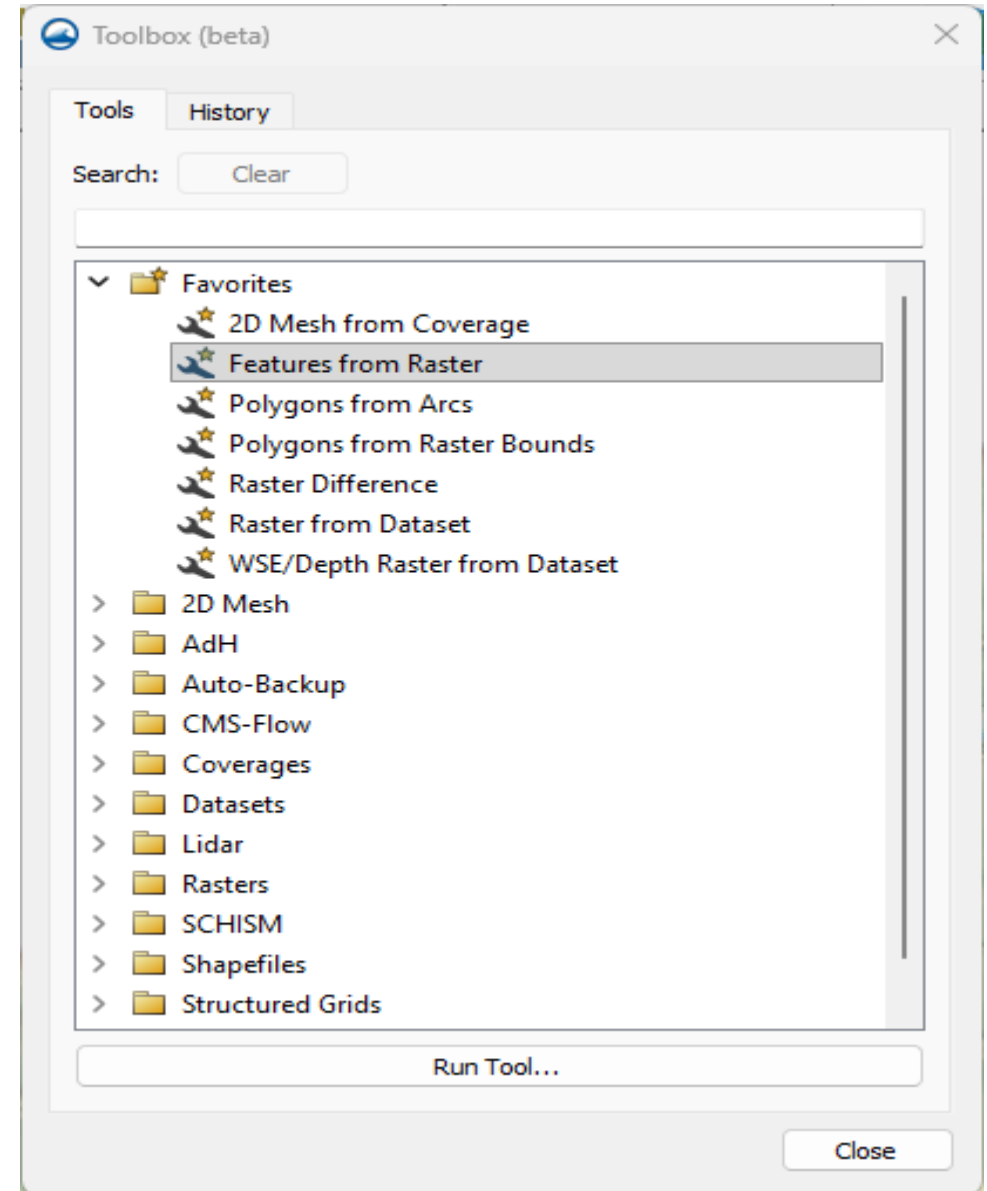
- Right Click on any arc
- Select *Show Profile Plot*
- The active dataset is the default
- Other data sets may be added (right click – plot data)



SMS 14 Feature Highlights

Toolbox Favorites

- Right click on Tool → Add to favorites
- Click on History tab to rerun any previous tools (settings are preserved and can be modified)
- History includes output variable names

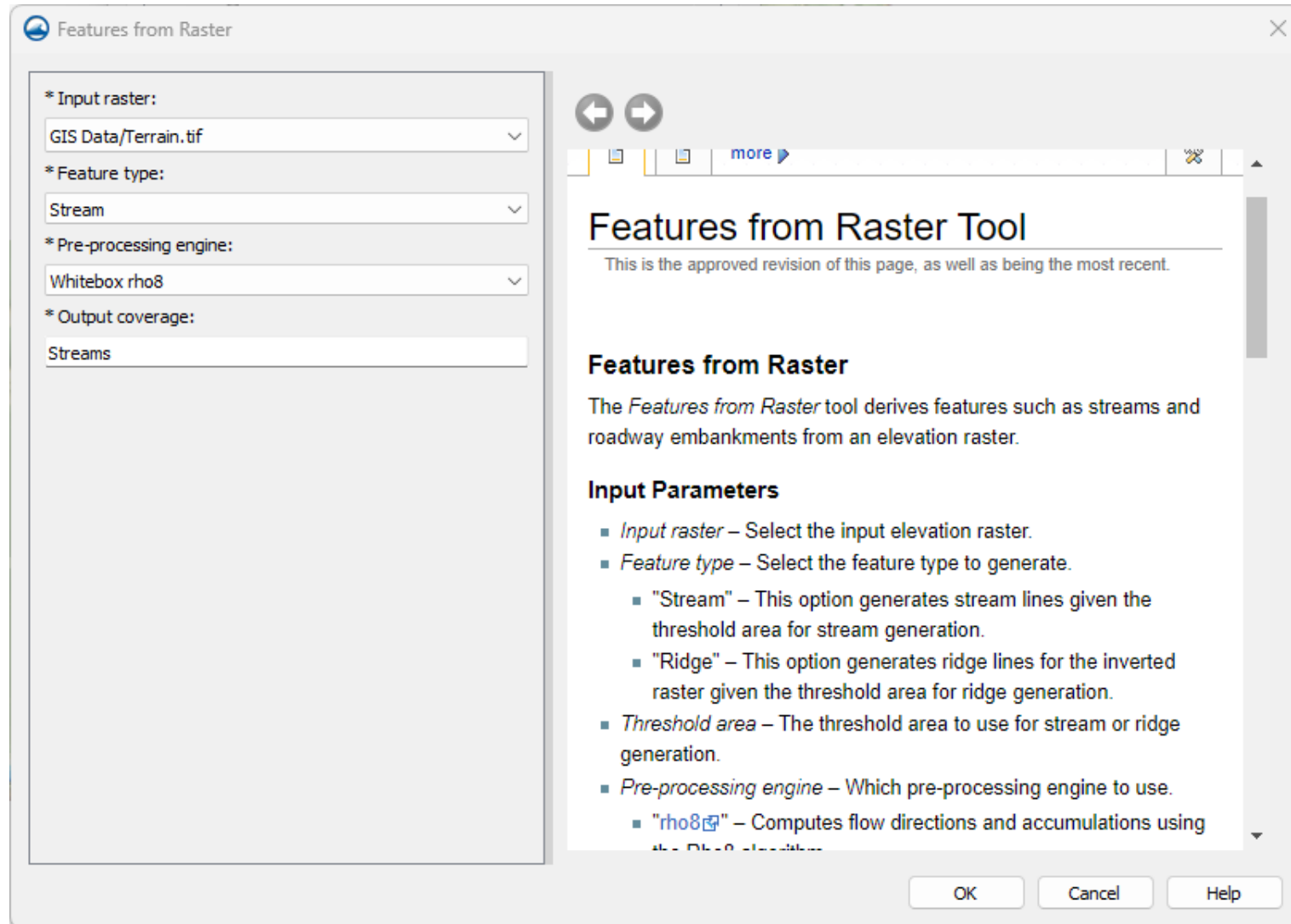


SMS 14 Feature Highlights

Feature Extraction Improvements

Auto-generate breaklines for streams and ridges

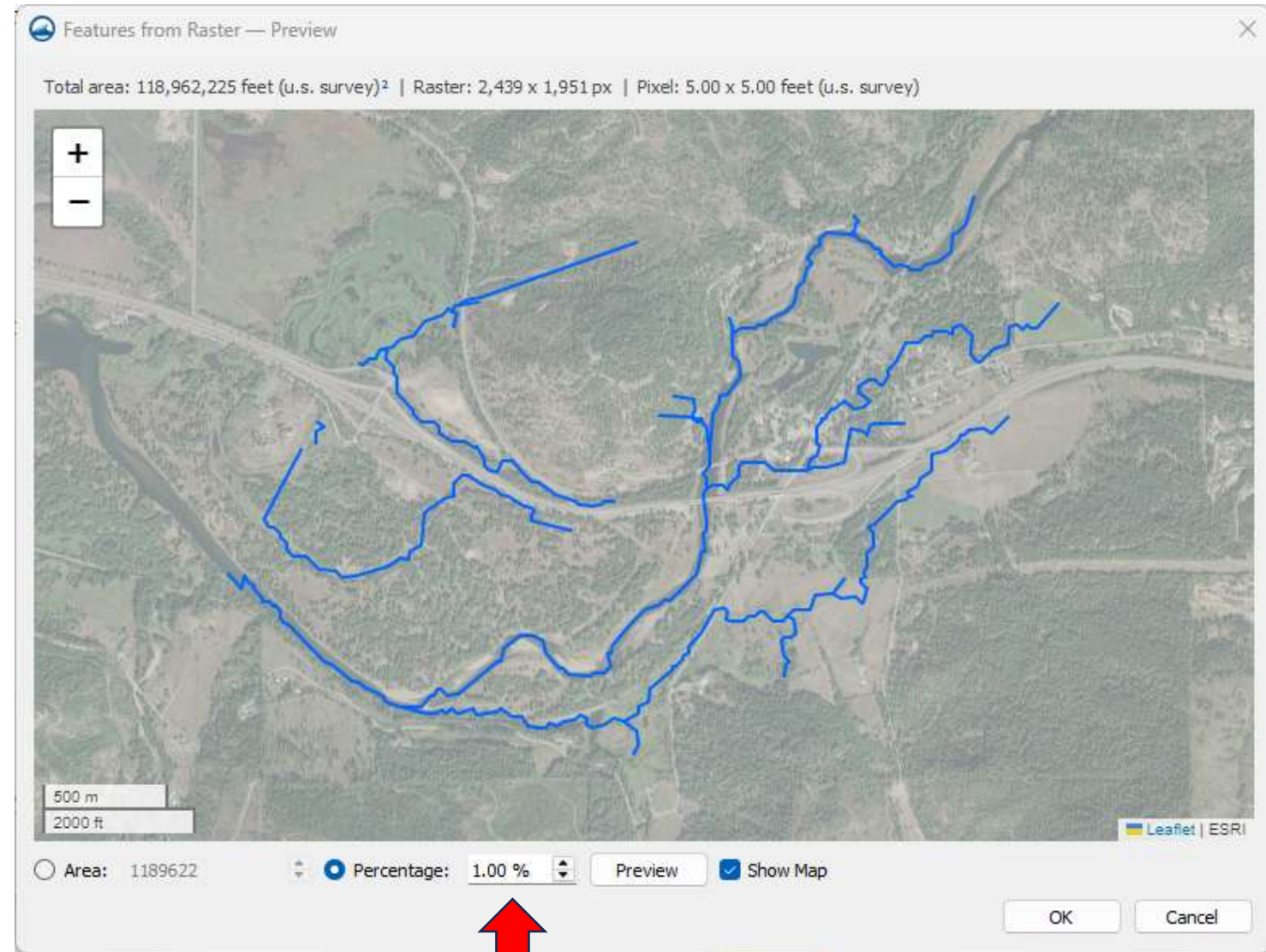
- From Toolbox, run Features from Raster
- Select Input Raster
- Set Feature Type (Stream or Ridge)
- Name output coverage
- Run (OK)



SMS 14 Feature Highlights

Feature Extraction Improvements

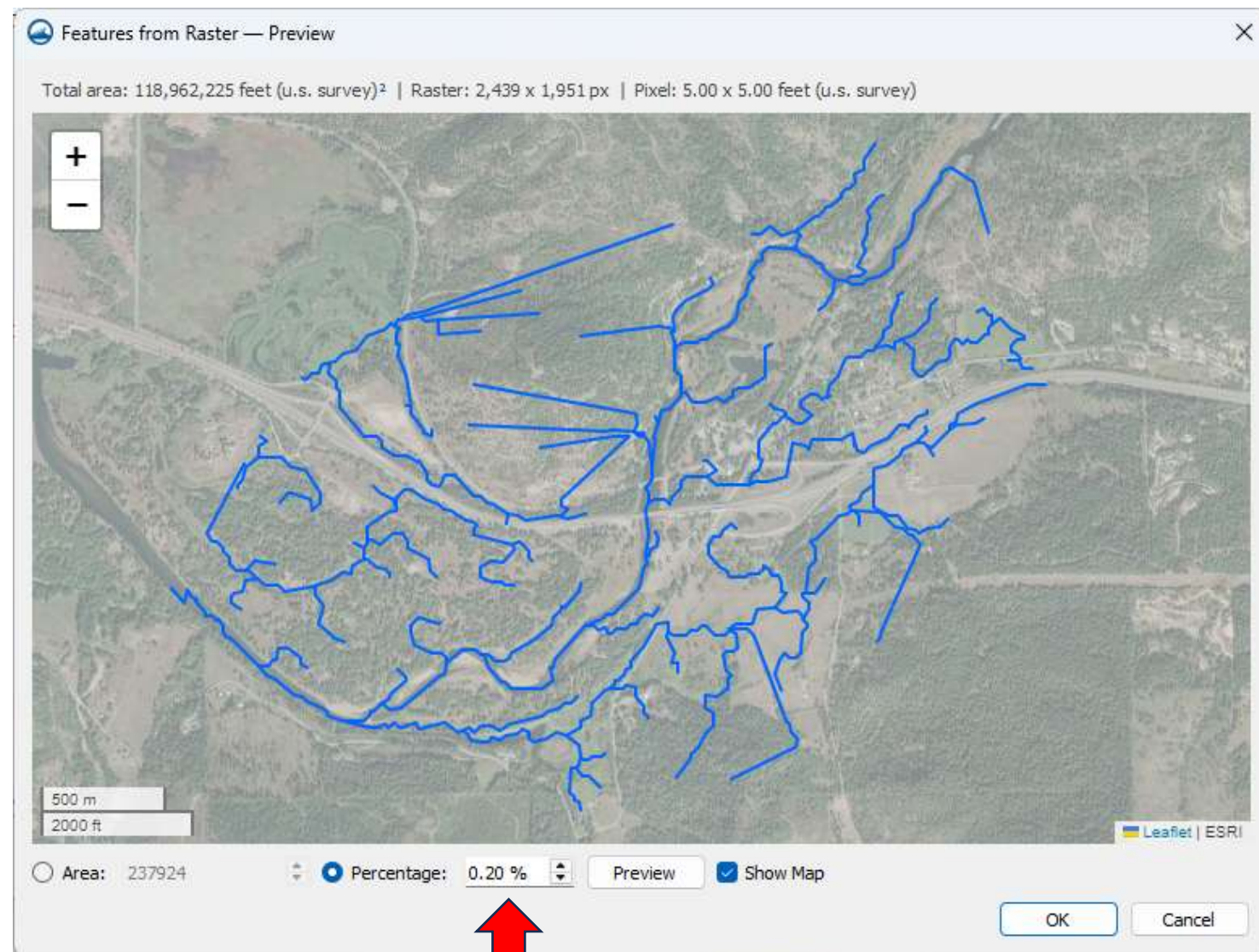
- In the Preview window change the % or area or area and Preview
- Select OK when the desired density of breaklines is shown
- Repeat for Ridges (Use run tool from History option)



SMS 14 Feature Highlights

Feature Extraction Improvements

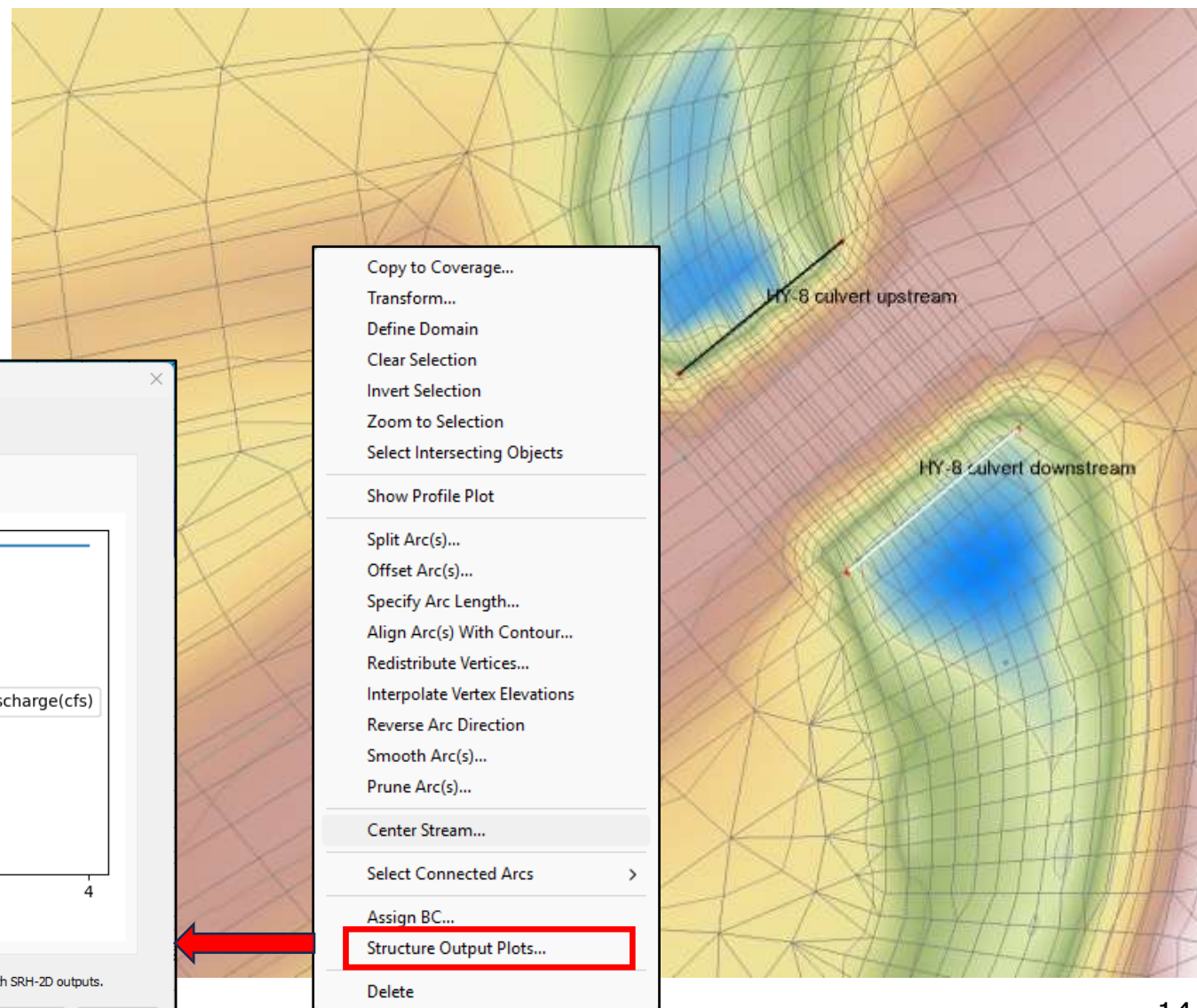
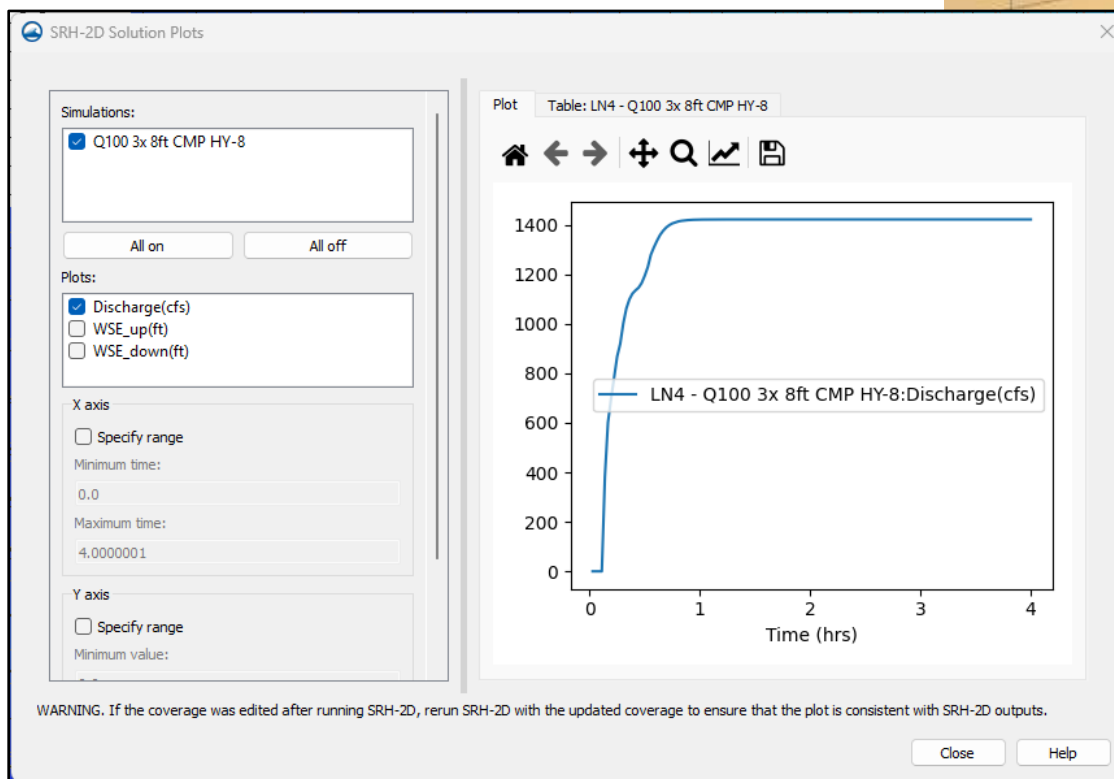
- In the Preview window change the % or area or area and Preview
- Select OK when the desired density of breaklines is shown
- Repeat for Ridges (Use run tool from History option)



SMS 14 Feature Highlights

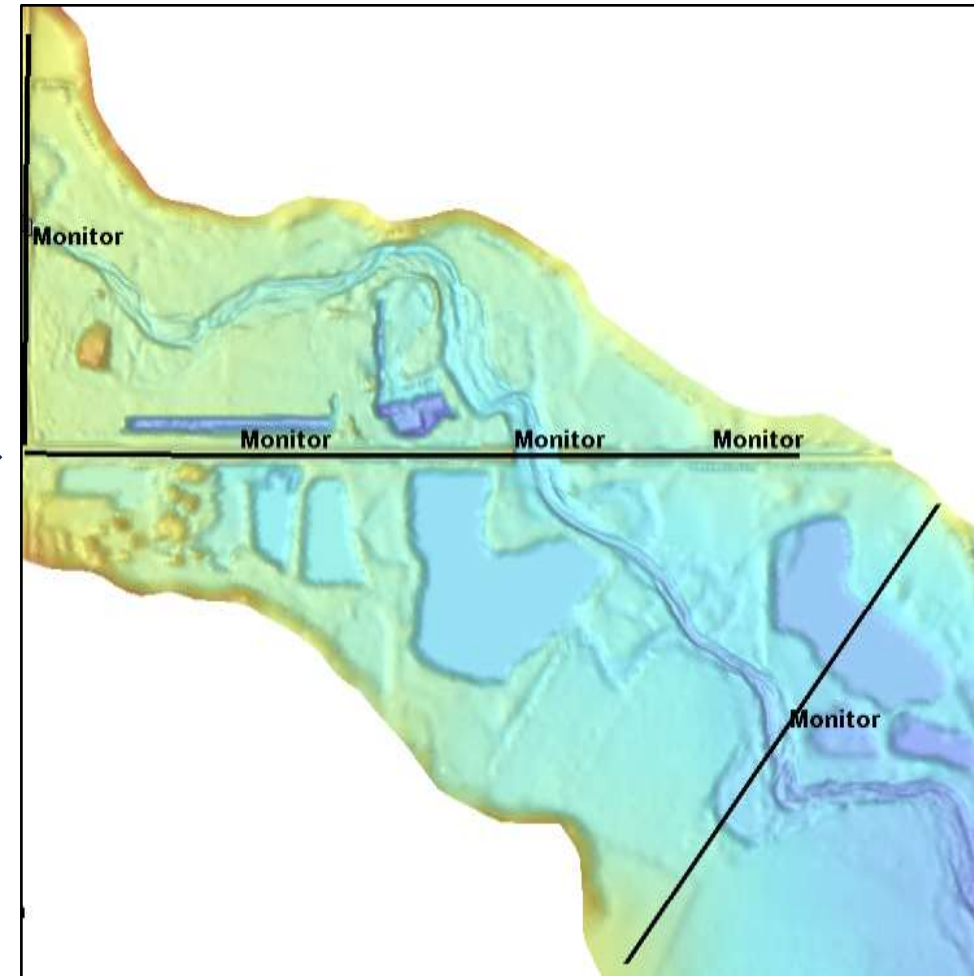
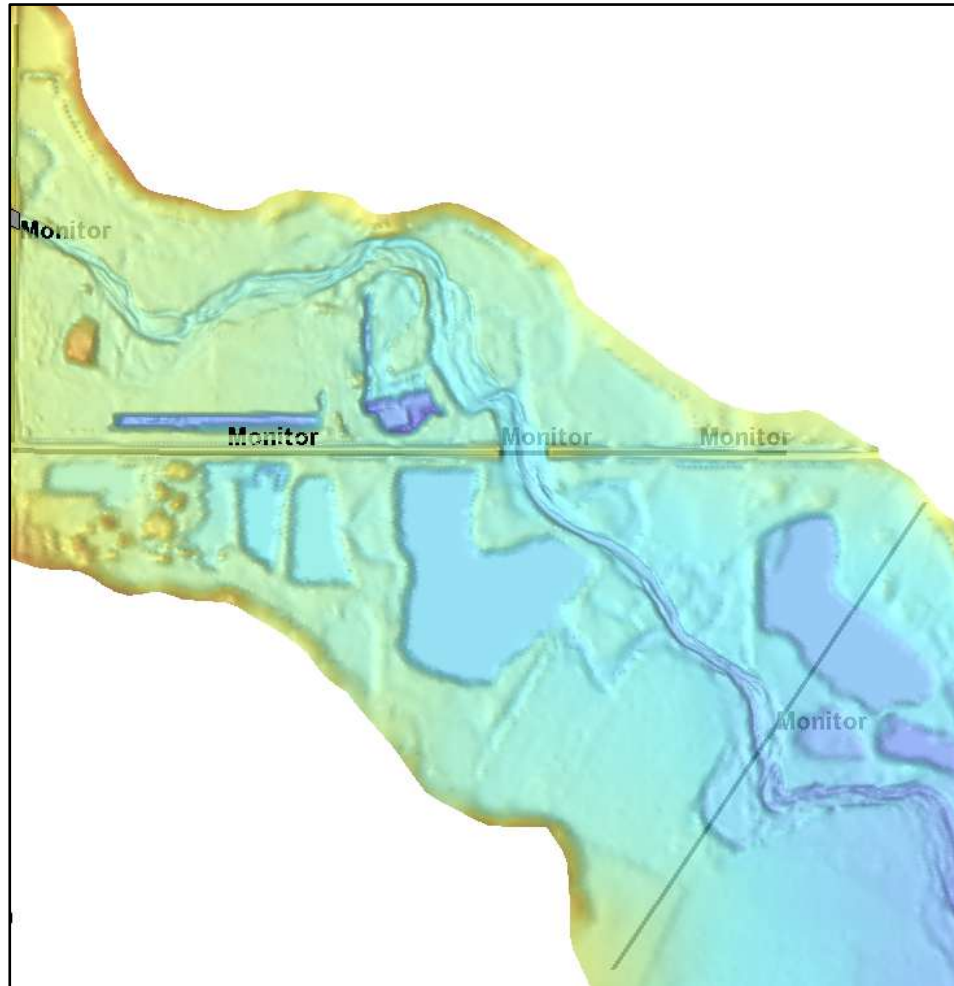
Hydraulic Structure Summaries – 1D Structures

- Select one of the structure arcs
- Rt Click → Structure Output Plots



SMS 14 Feature Highlights

Map Coverage Elevation Overrides

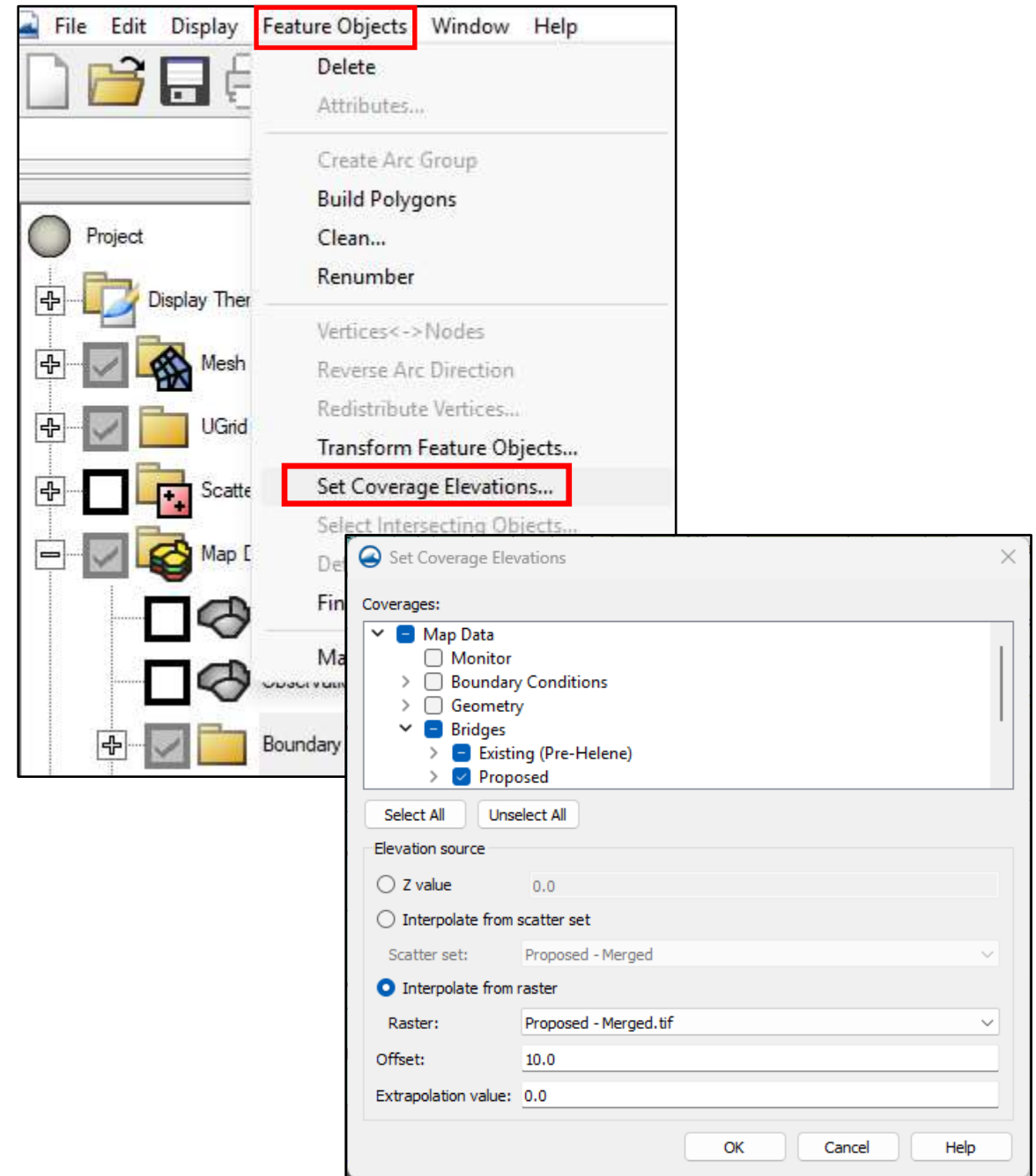


SMS 14 Feature Highlights

Map Coverage Elevation Overrides

With a map coverage active

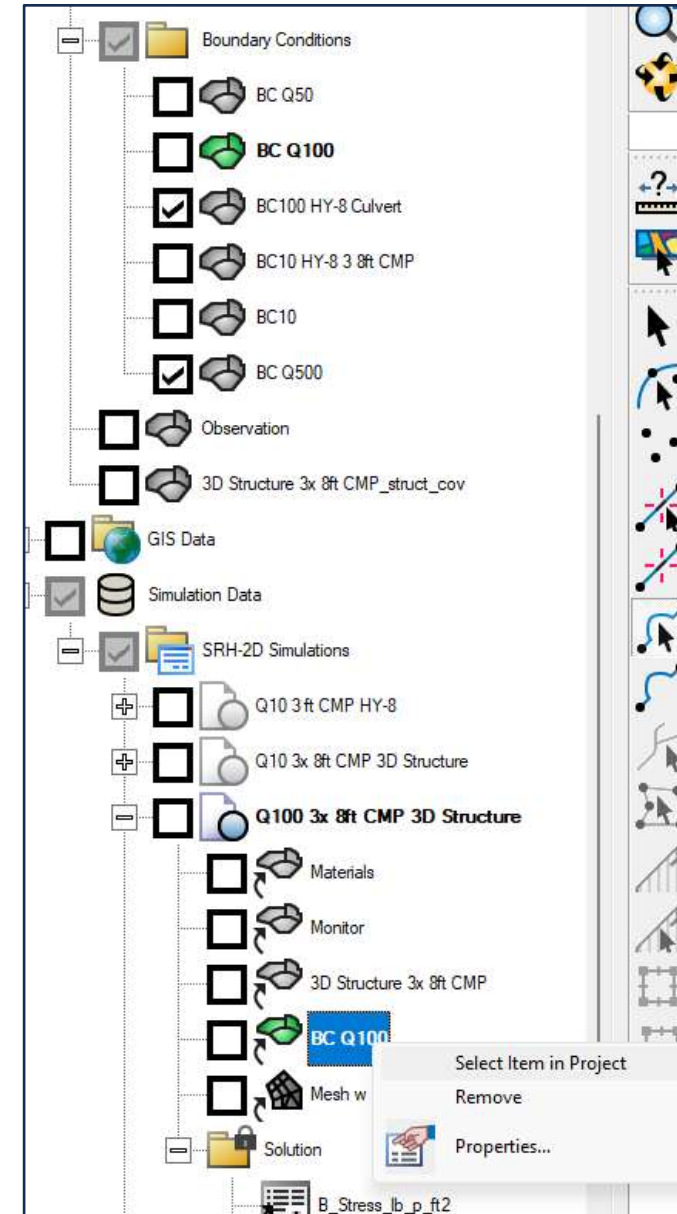
- Feature Objects → Set Coverage Elevations
- *Or* Rt Click on a coverage → Set Coverage Elevations
- Set Coverage Properties
 - Select coverages
 - Select elevation source



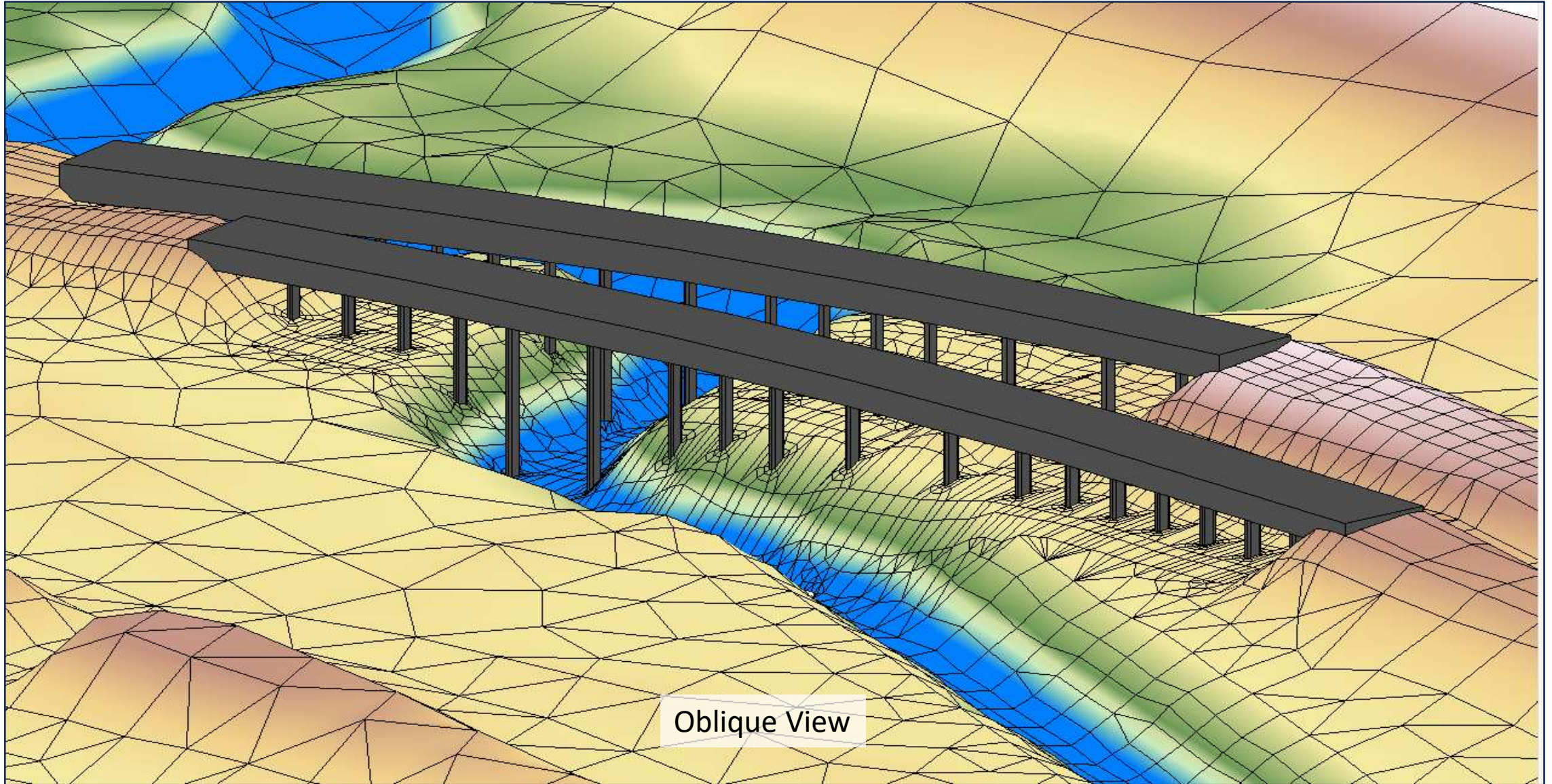
SMS 14 Feature Highlights

Select Item in Project Explorer

- Rt click on item in a simulation
- → Select Item in Project
- SMS jumps to that item and makes it active



3D Structures – Bridges and Culverts



Define 3D Structure – Center Line and Profile Curves

Edit 3D Structure

Profiles

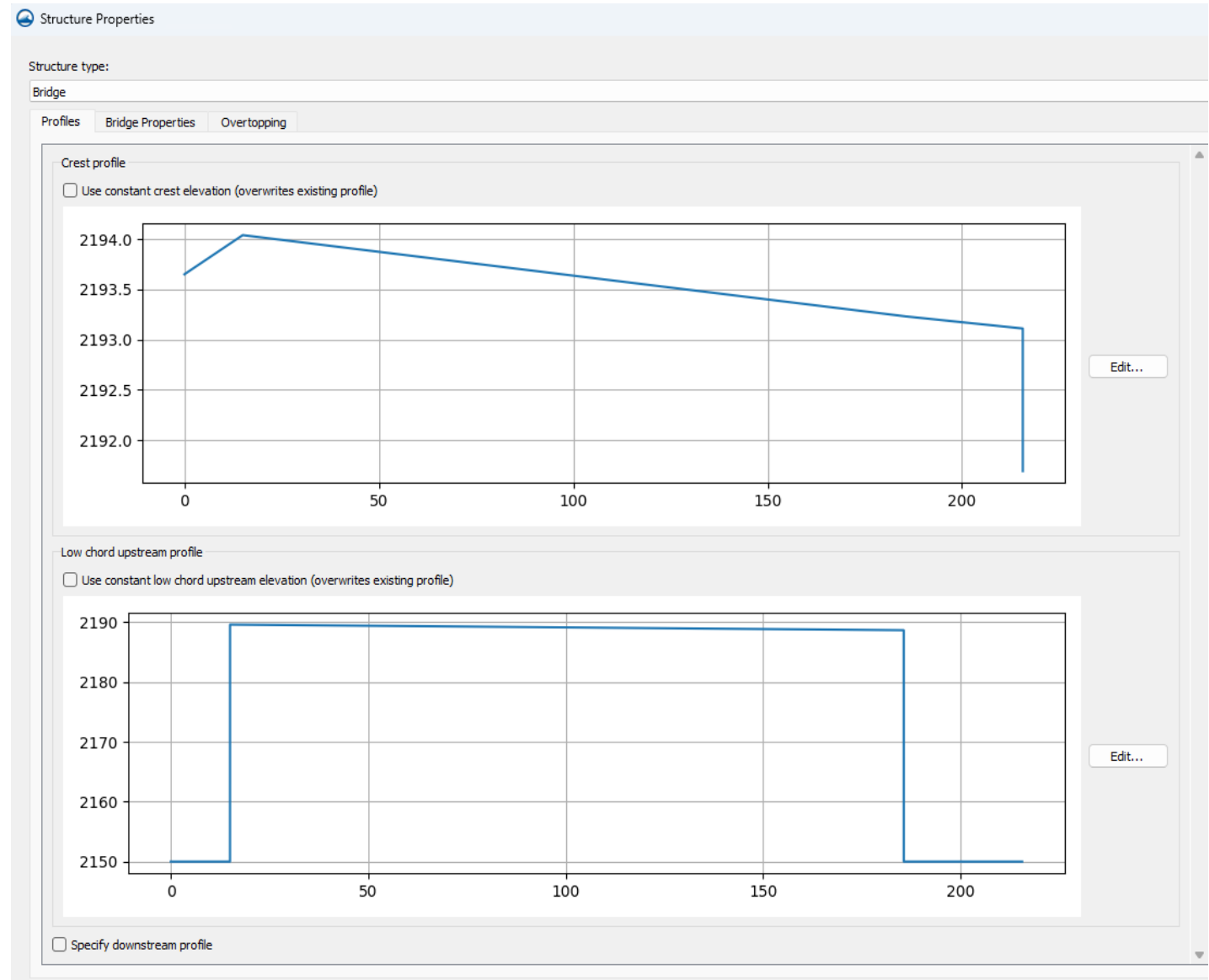
- Vertical walls may be used in low chord profile

IF

- At least 3 elements are used through the bridge

THEN

- Voids in the mesh are not needed to represent vertical abutments



3D Structure – Bridge Properties

- Use 0.05 for default Manning's ceiling roughness for girder bridges (SMS 13.4 and up)
- Element width around piers – 1 pier width recommended
- Number of side elements
 - Minimum of 3
 - 5 or more recommended for scour analysis

Structure Properties

Structure type: Bridge

Profiles Bridge Properties Overtopping

☐ Assign properties to individual arcs Use for cylindrical piers and multiple piers with variable geometry

Bridge width (upstream to downstream): 30.0

Bridge ceiling manning roughness coefficient: 0.05

Arc properties

Pier type: Wall

Wall width: 3.0

Wall pier length: 25.0

Pier end type: Round

☐ Specify number of segments on bridge center line

☐ Specify number of segments on bridge faces

☐ Has abutments

Element width around piers: 3.0

Wall pier number of side elements: 5

Bridge 2D mesh generation

Bridge wrapping width: 20.0

☒ Wrap upstream

☒ Wrap downstream

Select elevation raster: Pre-Helene_Merged_exported.tif

Preview bridge mesh: Preview bridge mesh (compatibility mode):

Add data to SMS on OK:

☐ Add 3D Bridge UGrid

☐ Add "structure mesh" coverage

☐ Add "structure mesh" 2D mesh

Mesh Generated in the “Footprint” of the Bridge

- Assign properties to individual arcs
 - Best for pier groups
 - Piers with differing sizes and characteristics
 - Allows number of elements through bridge to be specified
- Preview bridge mesh
 - Some iterations may be needed with mesh / pier / bridge geometry
 - Mesh quality improvements still in progress

Structure Properties

Structure type: Bridge

Profiles Bridge Properties Overtopping

☒ Assign properties to individual arcs

Arc properties

Arc ID	Type	Element width around piers	PG Diameter	PG # piers	PG spacing	WP width	WP length	WP end type
2 2	Pier group (PG) ▾	1.0	3.0	2	20.0	0.0	0.0	Square ▾
3 3	Pier group (PG) ▾	1.0	3.0	2	20.0	0.0	0.0	Square ▾
4 4	Pier group (PG) ▾	1.0	3.0	2	20.0	0.0	0.0	Square ▾
5 5	Abutment ▾	0.0	0.0	1	0.0	0.0	0.0	Sharp ▾
6 6	Bridge ▾	0.0	0.0	1	0.0	0.0	0.0	Sharp ▾

Preview coverage arcs... Preview coverage arcs (compatibility mode)...

Bridge width (upstream to downstream): 30.0

Bridge ceiling manning roughness coefficient: 0.05

Bridge 2D mesh generation

Bridge wrapping width: 20.0

☒ Wrap upstream

☒ Wrap downstream

Number of elements through bridge width (minimum recommended width is 2): 5

Select elevation raster... Pre-Helene_Merged_exported.tif

Preview bridge mesh... Preview bridge mesh (compatibility mode)...

Add data to SMS on OK

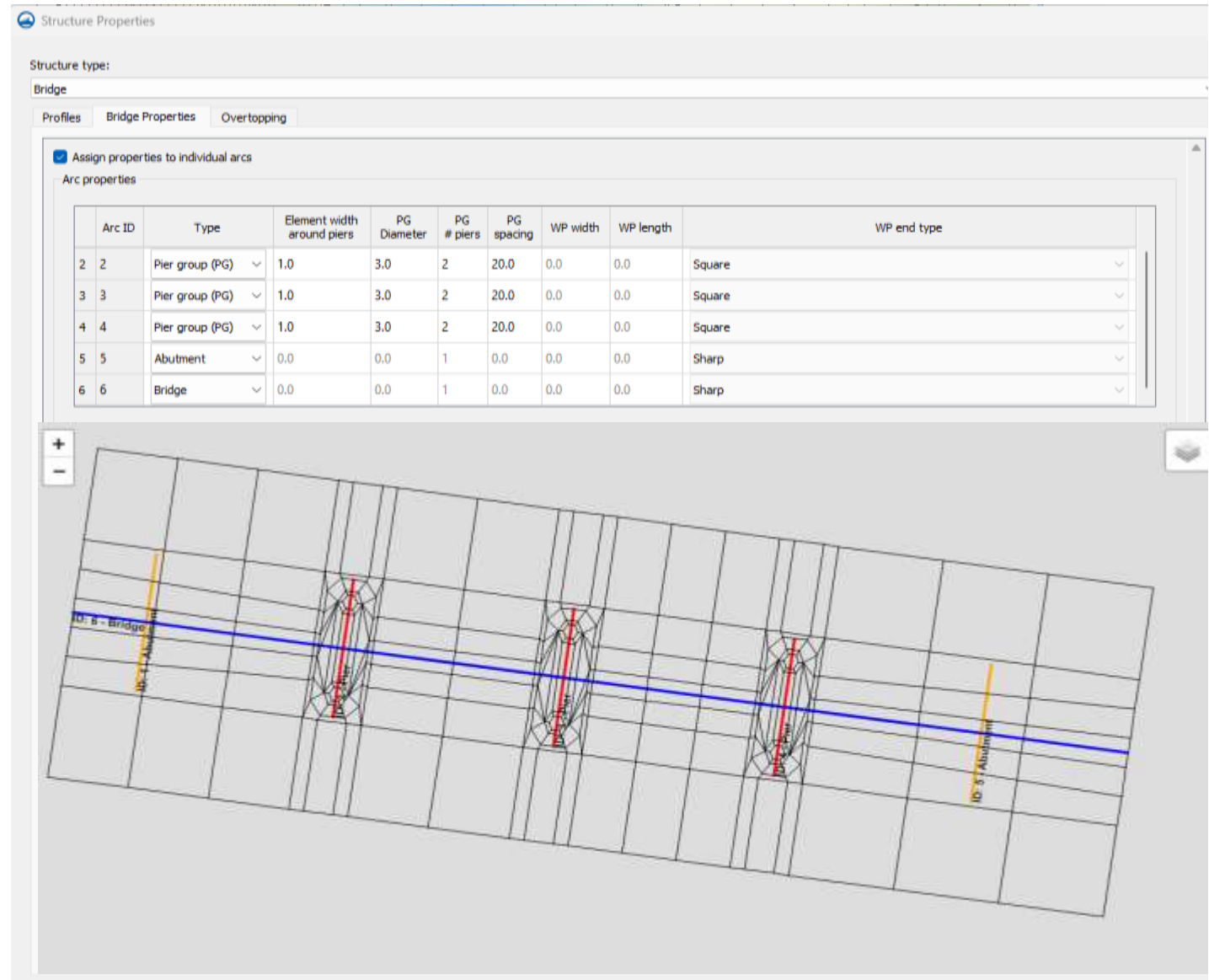
☐ Add 3D Bridge UGrid

☐ Add "structure mesh" coverage

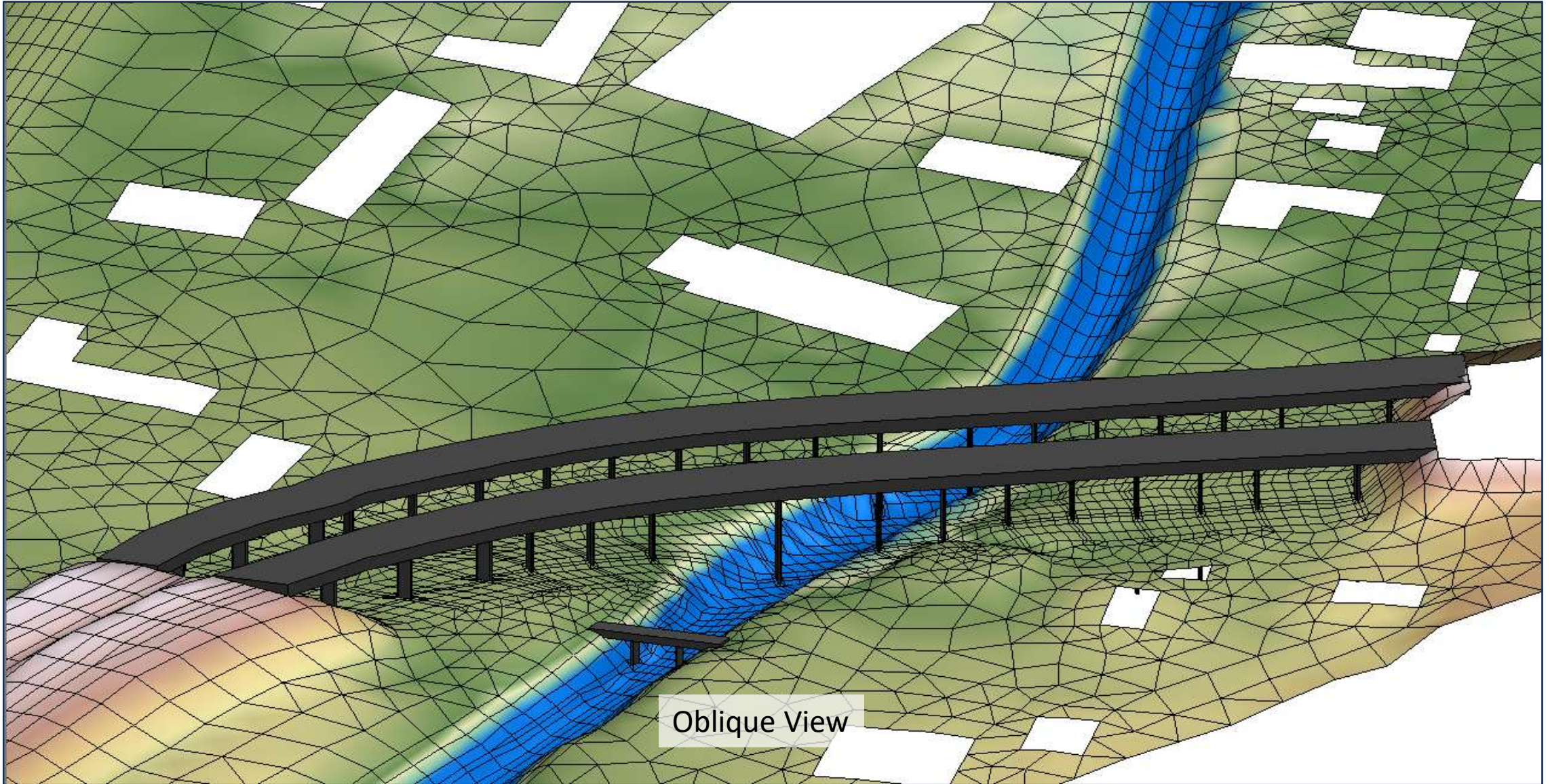
☐ Add "structure mesh" 2D mesh

Mesh Generated in the “Footprint” of the Bridge

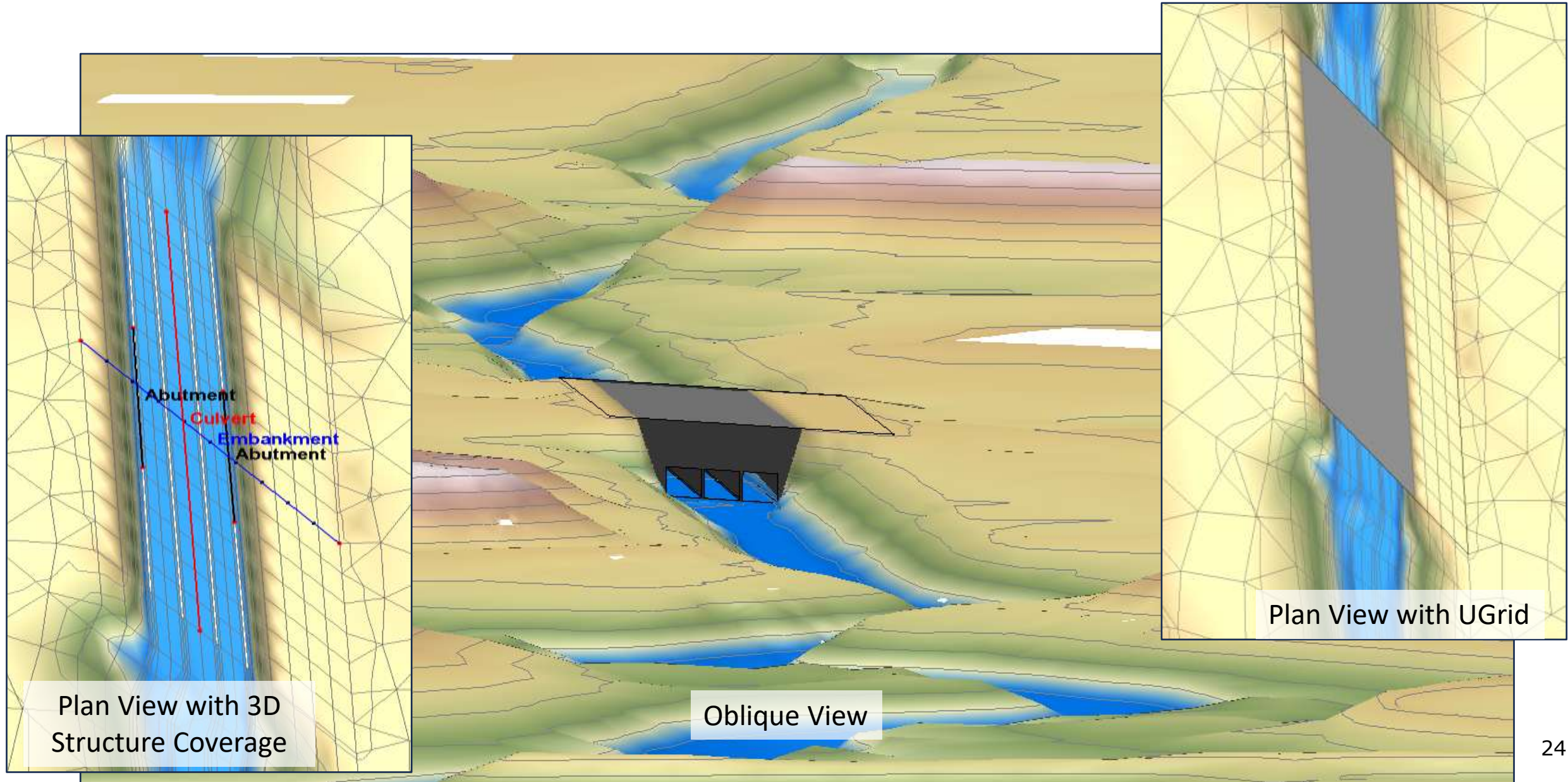
- Assign properties to individual arcs
 - Best for pier groups
 - Piers with differing sizes and characteristics
 - Allows number of elements through bridge to be specified
- Preview bridge mesh
 - Some iterations may be needed with mesh / pier / bridge geometry
 - Mesh quality improvements still in progress



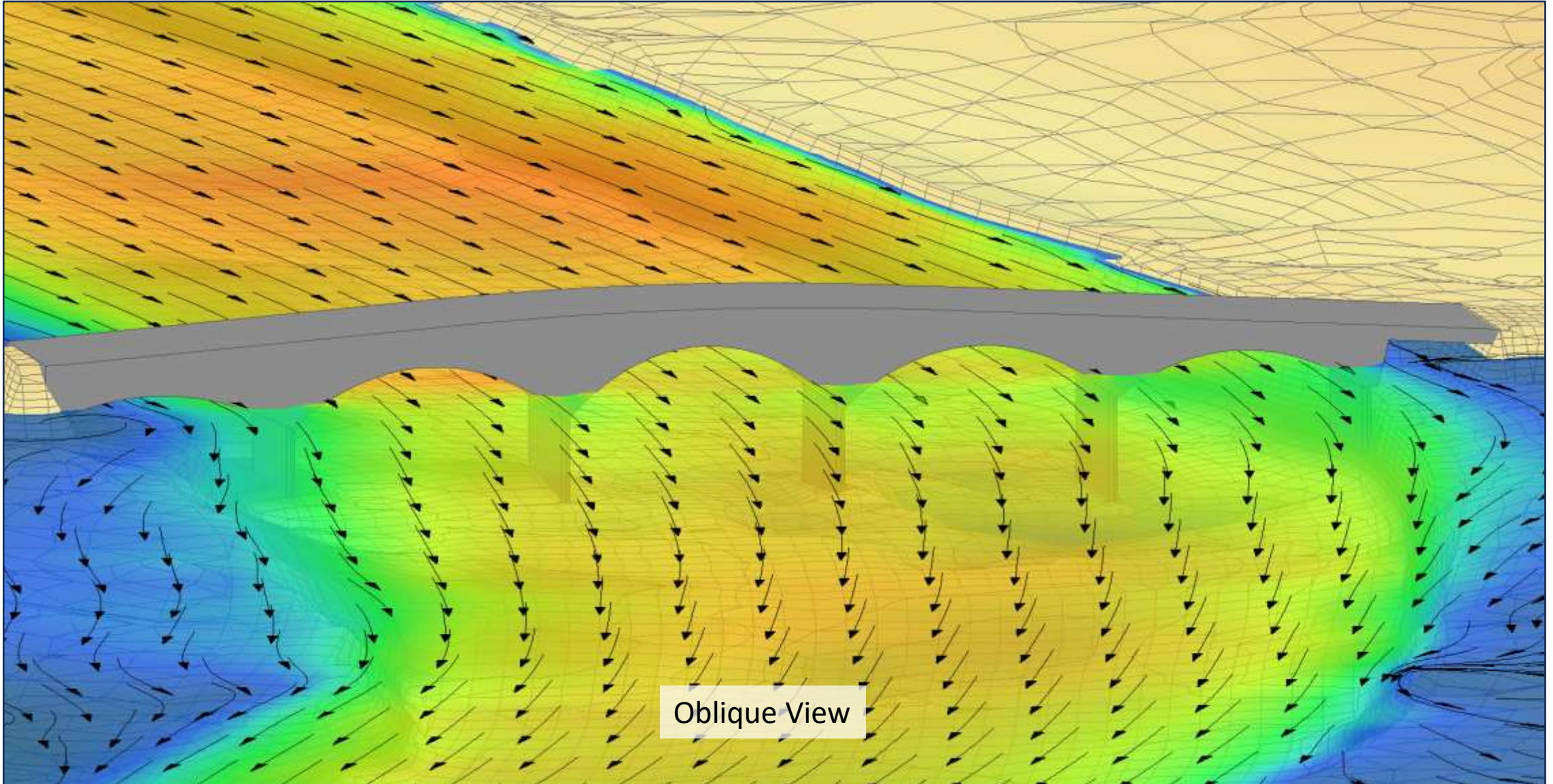
3D Structure Example: Curved Bridge



3D Stucture Example: Skewed, Multiple Barrel Culvert

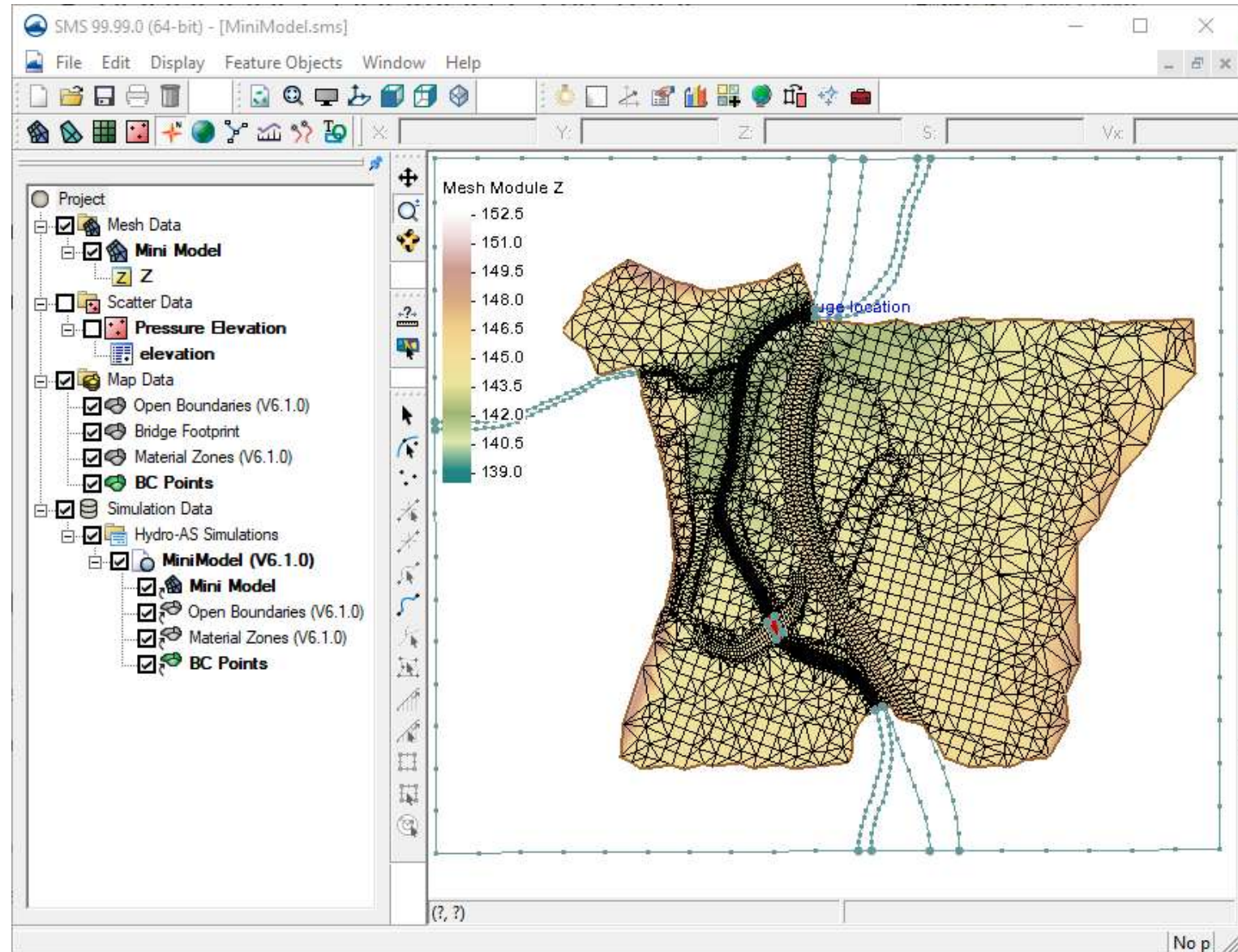


3D Structure Example: Multiple Arched Bridge



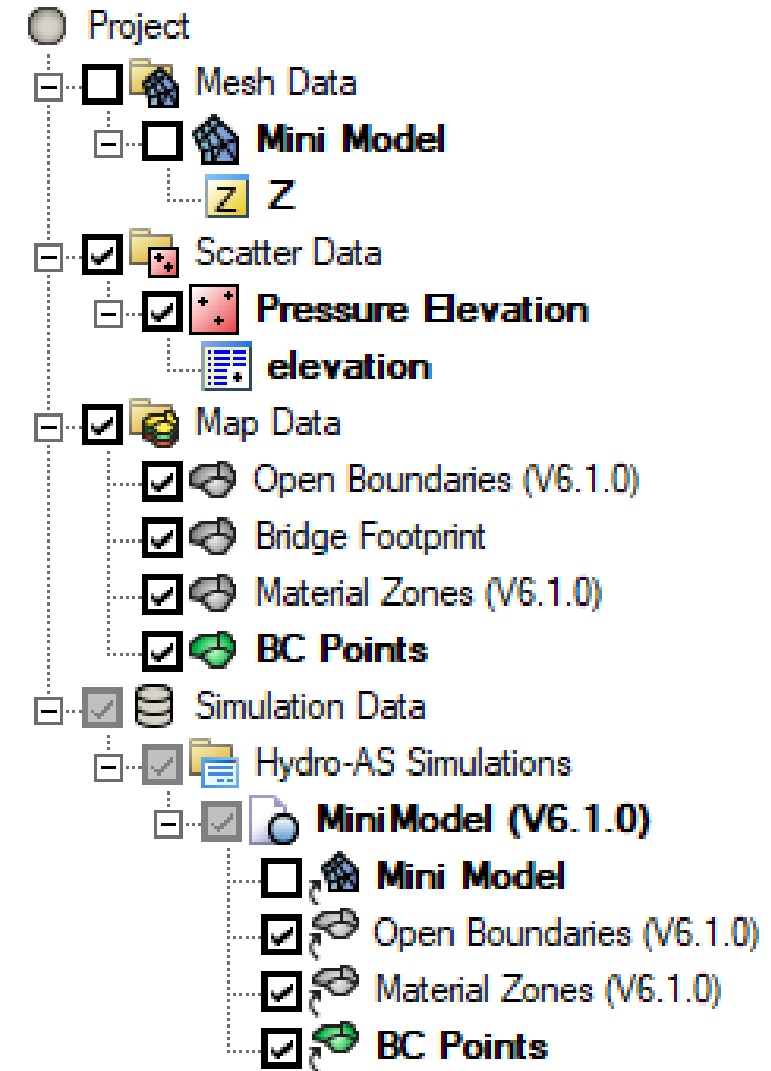
Simulation based modeling with Hydro_AS

- Native File Support
- Simulation Management
- Custom Tools
- Updates on Mesh Generation



Simulation Based Modeling

- Component Based
 - Mesh
 - Boundary Condition Coverage
 - Materials Coverage
 - Simulation Entity
 - Model Parameters
- Reusable
- Flexibility



Native File Support

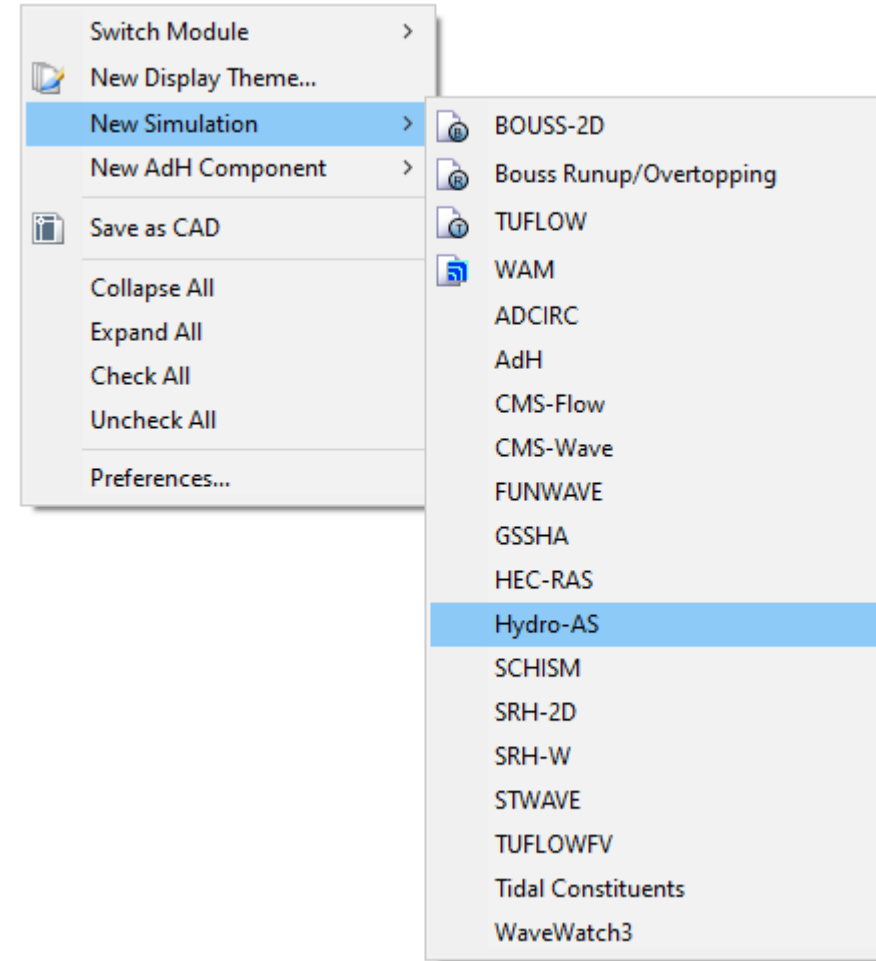
- .2dm File
 - Geometry
 - HydroAS Version
- Reading / Import
 - Simulation
 - Mesh
 - Line Boundaries
 - Point Boundaries
 - Material Polygons / List
- Writing / Export

```
BEGPARAMDEF
GM  "HydroAS V6.1.0"
SI  1
DY  0
TU  "sec"
TD  0  0
GP  1 "HydroAS" 1
.
.
.
ENDPARAMDEF
```

```
MESH2D
MESHNAME "Mini Model"
NUM_MATERIALS_PER_ELEM 1
E3T 1 20 21 1 4
E4Q 2 1 2 22 20 1
E4Q 3 3 23 22 2 1
E4Q 4 3 4 24 23 1
E4Q 5 5 25 24 4 1
.
.
.
.
ND 1 4298771.59 5506787.54 143.073
ND 2 4298772.08 5506787.75 142.97701
ND 3 4298772.57 5506787.97 142.75101
ND 4 4298773.02 5506788.25 142.701
ND 5 4298773.47 5506788.54 142.651
ND 6 4298773.92 5506788.83 142.629
.
.
.
NS 5351 5249 5142 5035 4924 4810 4676 4539 4411 -4288 1
NS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 -19 2
```

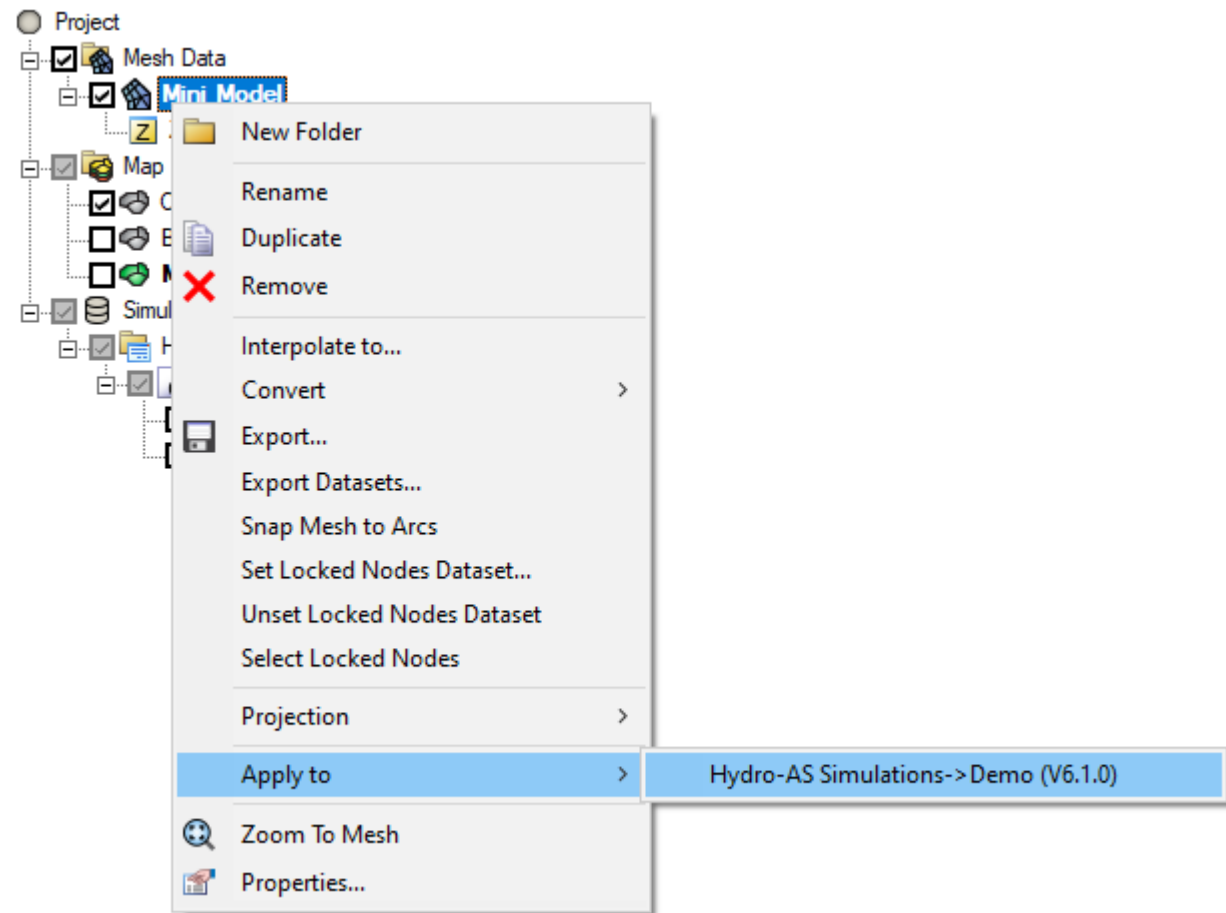
Simulation Creation

- Right click in Project Explorer
- Select “Template”
 - Determines HydroAS version
- Set simulation name



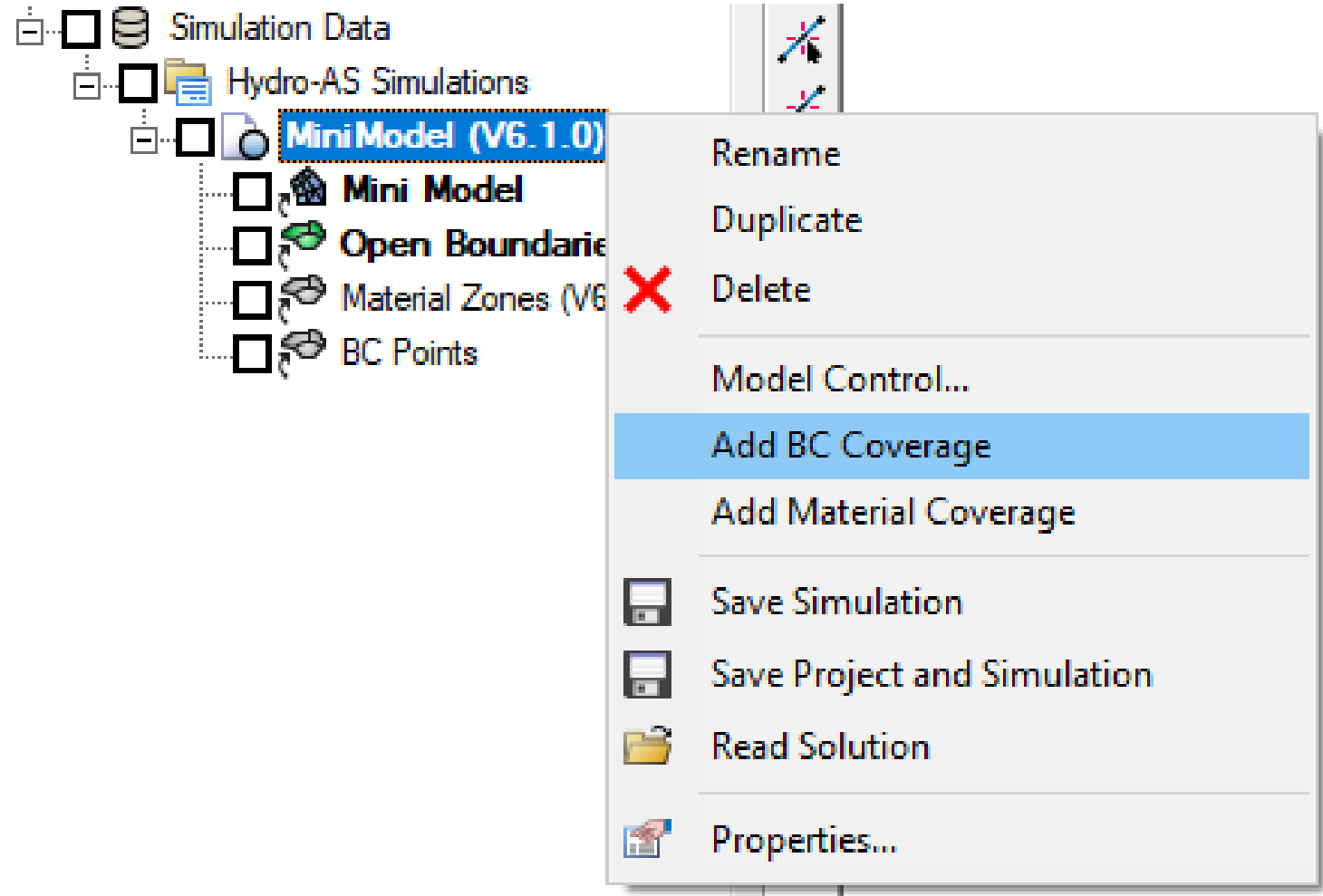
Simulation Management

- Apply Components
 - Drag / Drop
 - Right click - Apply
- Includes
 - Mesh
 - BC Coverage
 - Material Coverage



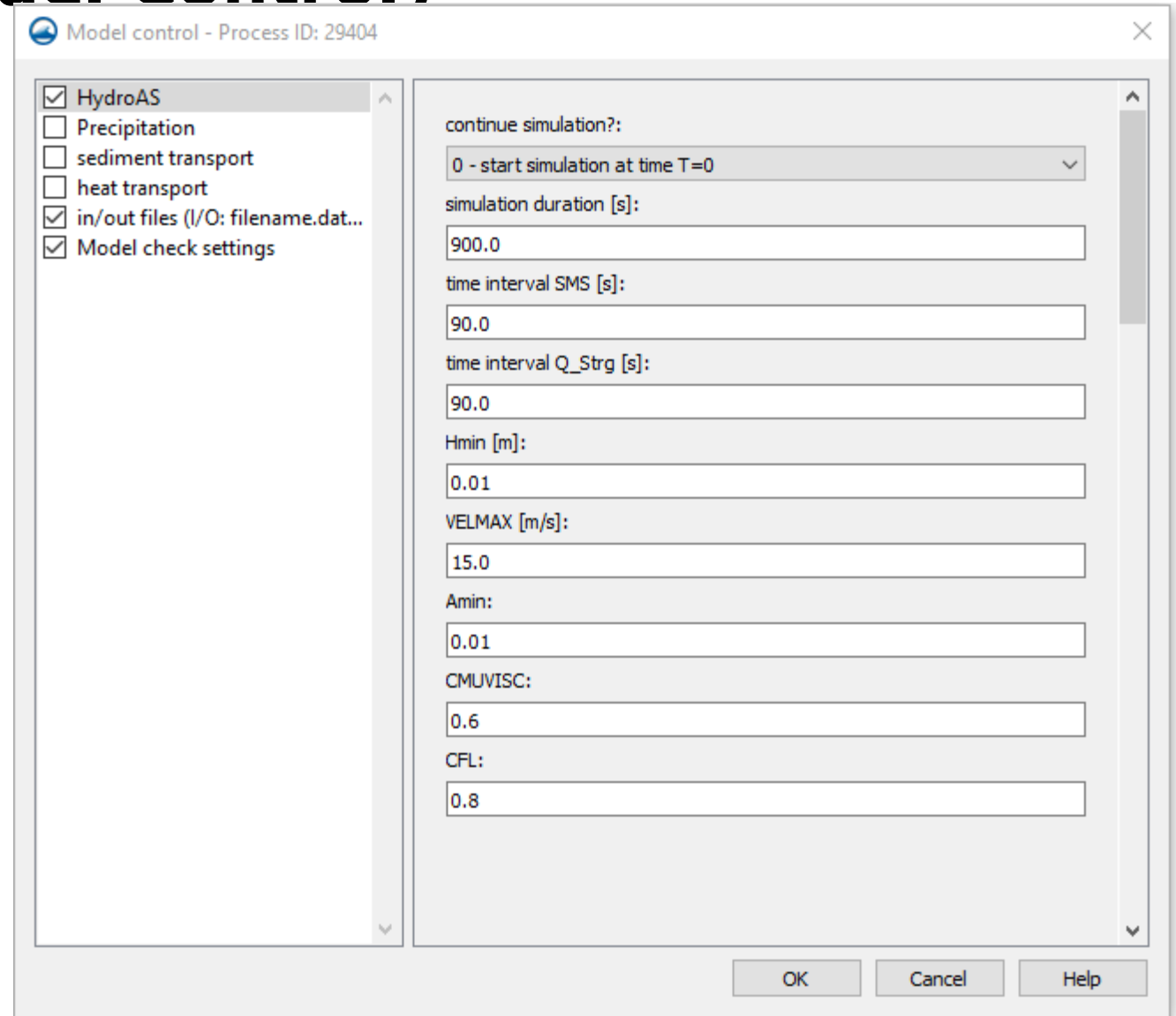
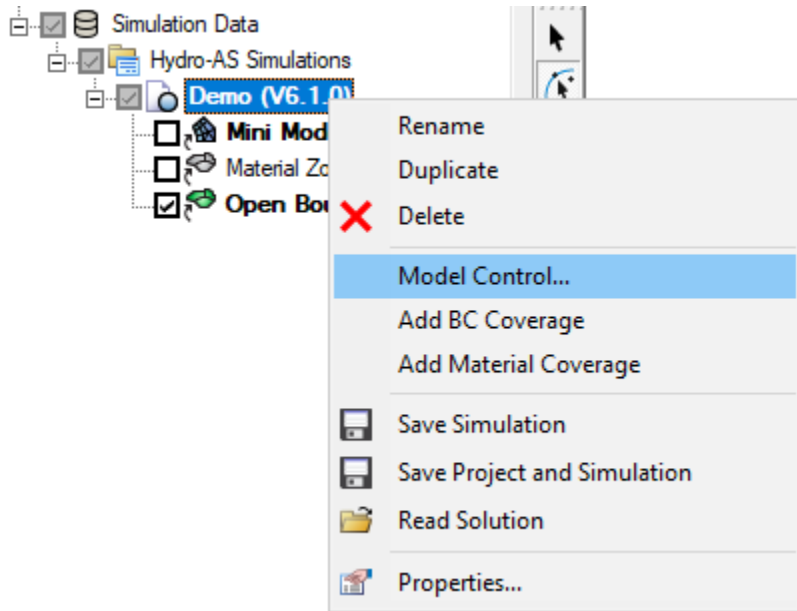
HydroAS Version Specification

- Specified when:
 - Creating simulation
 - Creating coverage
 - Setting coverage type
- Copied when:
 - Copying simulation
 - Copying coverage
- Simulation Commands



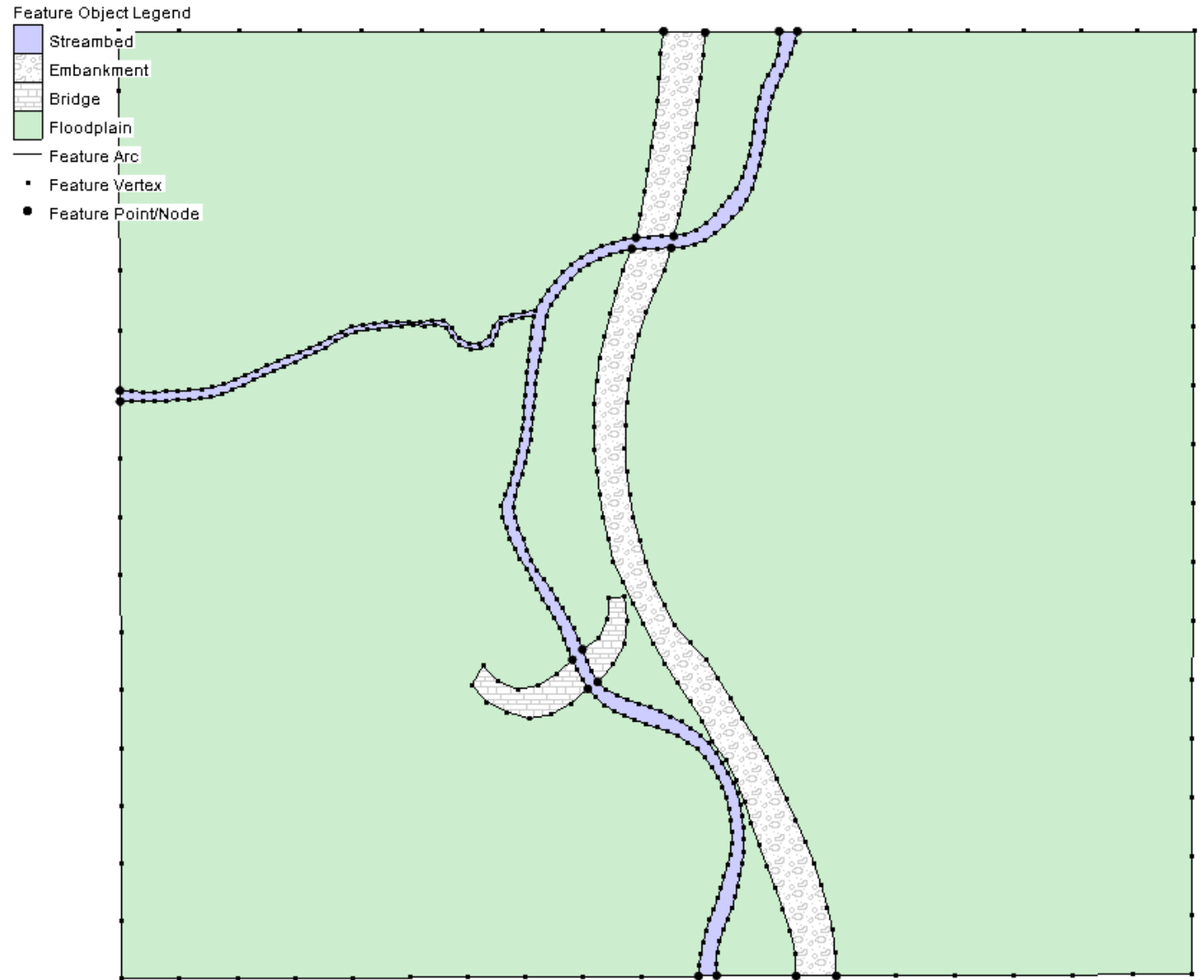
Simulation Attributes (Model Control)

- Access with right click



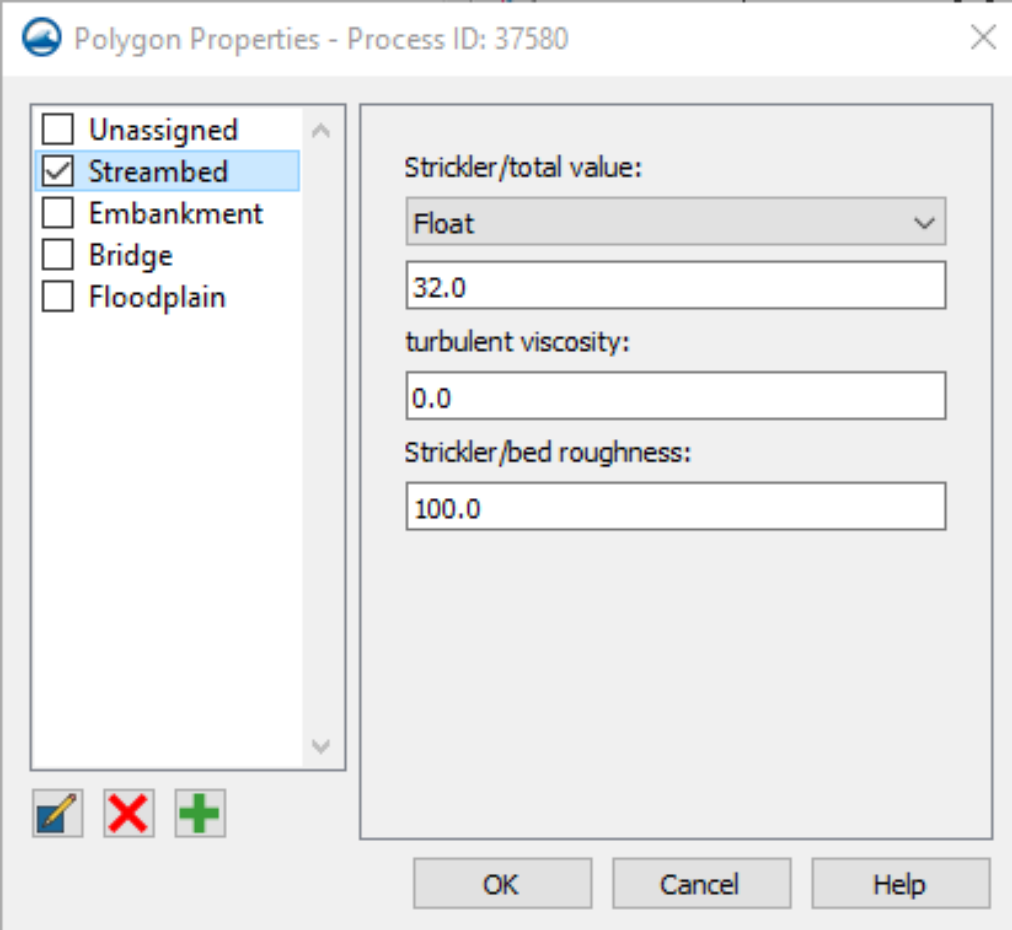
HydroAS Material Coverage

- Version Specific
- Material List / Attributes
- Display Options
- Applied to Simulation
 - Assigned to elements



HydroAS Material List

- Add / Delete materials
- Specify names
- Attributes
 - Strickler /total value
 - Constant
 - Depth Varied
 - Viscosity
 - Strickler /bed roughness
- Assign material type to polygon(s)



The screenshot shows the 'Polygon Properties' dialog box with the title 'Polygon Properties - Process ID: 37580'. On the left, a list of material types includes 'Unassigned', 'Streambed' (checked), 'Embankment', 'Bridge', and 'Floodplain'. Below this list are three icons: a pencil, a red 'X', and a green plus sign. On the right, three input fields are shown: 'Strickler/total value' with a dropdown set to 'Float' and a text box containing '32.0'; 'turbulent viscosity' with a text box containing '0.0'; and 'Strickler/bed roughness' with a text box containing '100.0'. At the bottom right are 'OK', 'Cancel', and 'Help' buttons.

Polygon Properties - Process ID: 37580

☐ Unassigned
☒ Streambed
☐ Embankment
☐ Bridge
☐ Floodplain

Strickler/total value:
Float
32.0

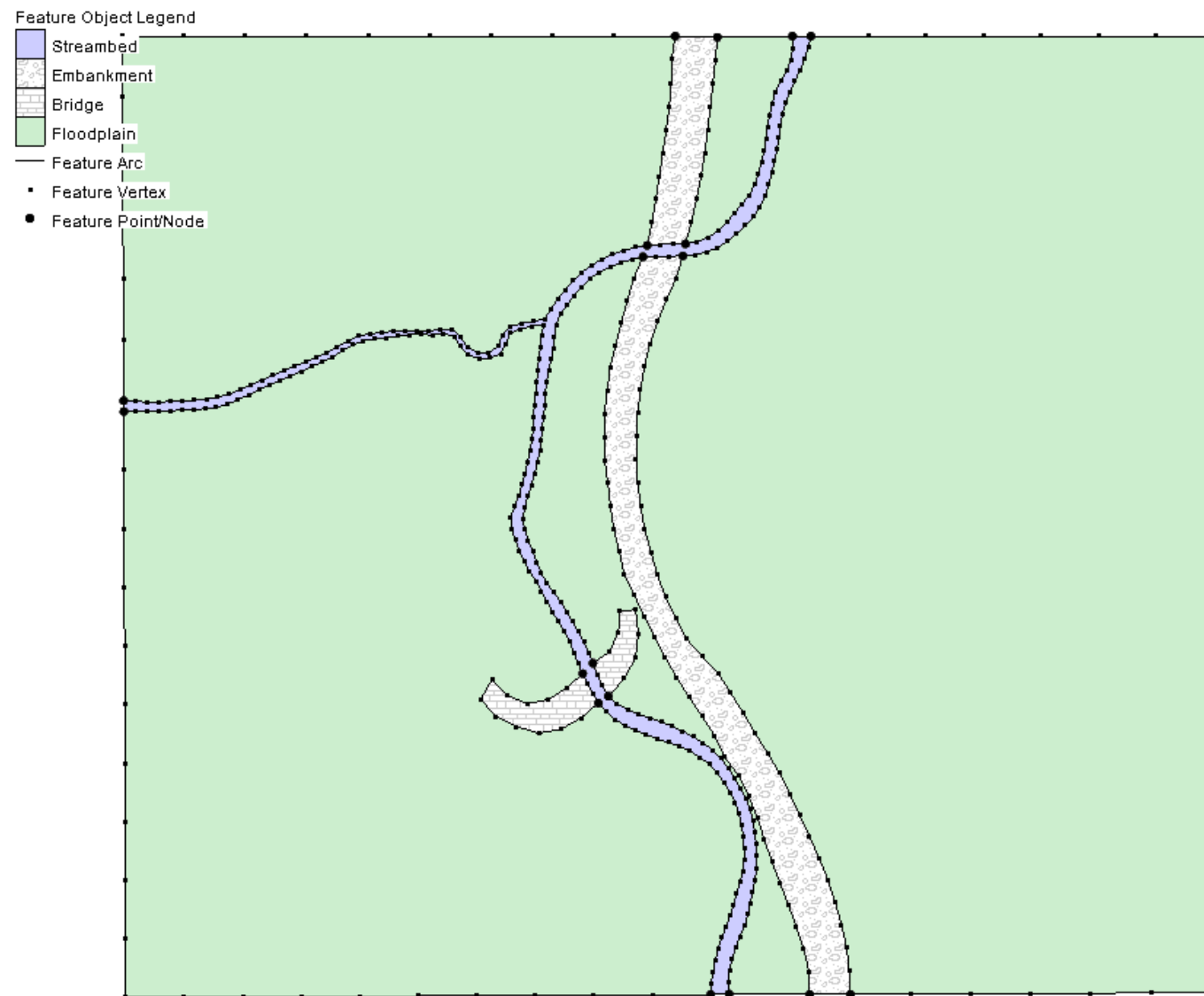
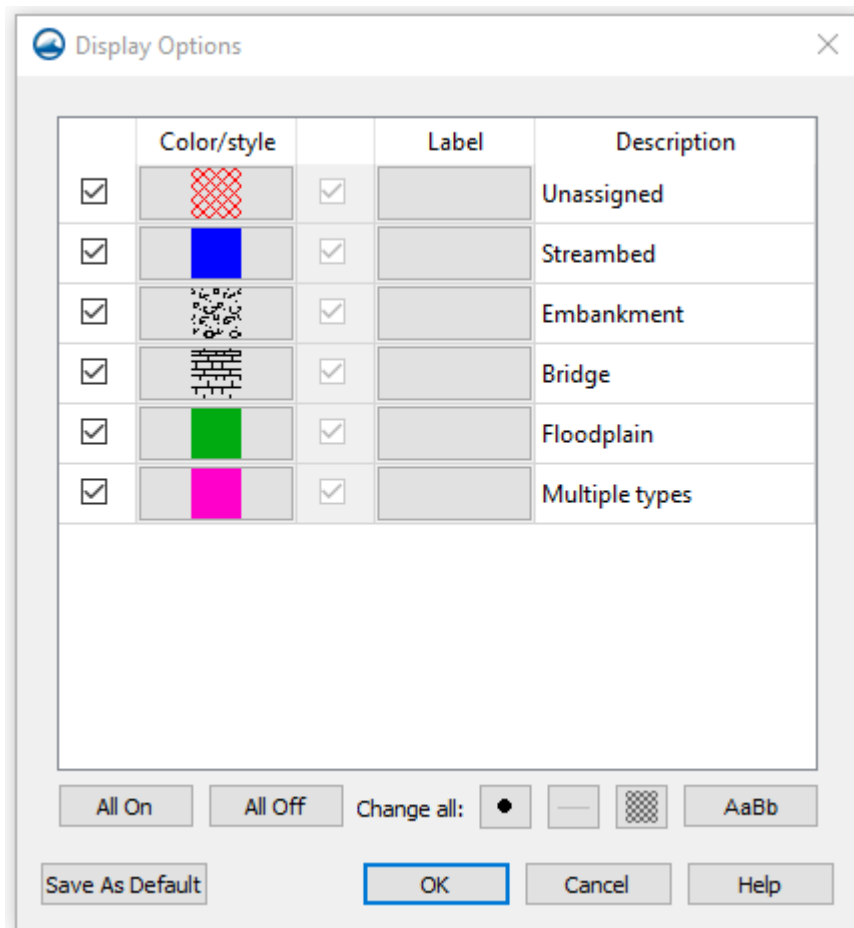
turbulent viscosity:
0.0

Strickler/bed roughness:
100.0

OK Cancel Help

HydroAS Material Display Attributes

- Color / Style / Label for each material in the list



HydroAS Boundary Condition Coverage

- Arc attributes
 - Type - values
 - Name
- Node attributes

Arc Properties - Process ID: 22796

☒ inflow
☐ inflow linked to outflow
☐ outflow/energy grade line
☐ outflow waterlevel/discharge...
☐ outflow waterlevel/discharge...
☐ outflow H-weir (time)
☐ outflow H-weir (control)
☐ outlet discharge time series
☐ outlet free outflow (super crit...
☐ H-boundary condition
☐ 1D-culvert/rectangular
☐ 1D-culvert/circular
☐ 1D-weir overflow

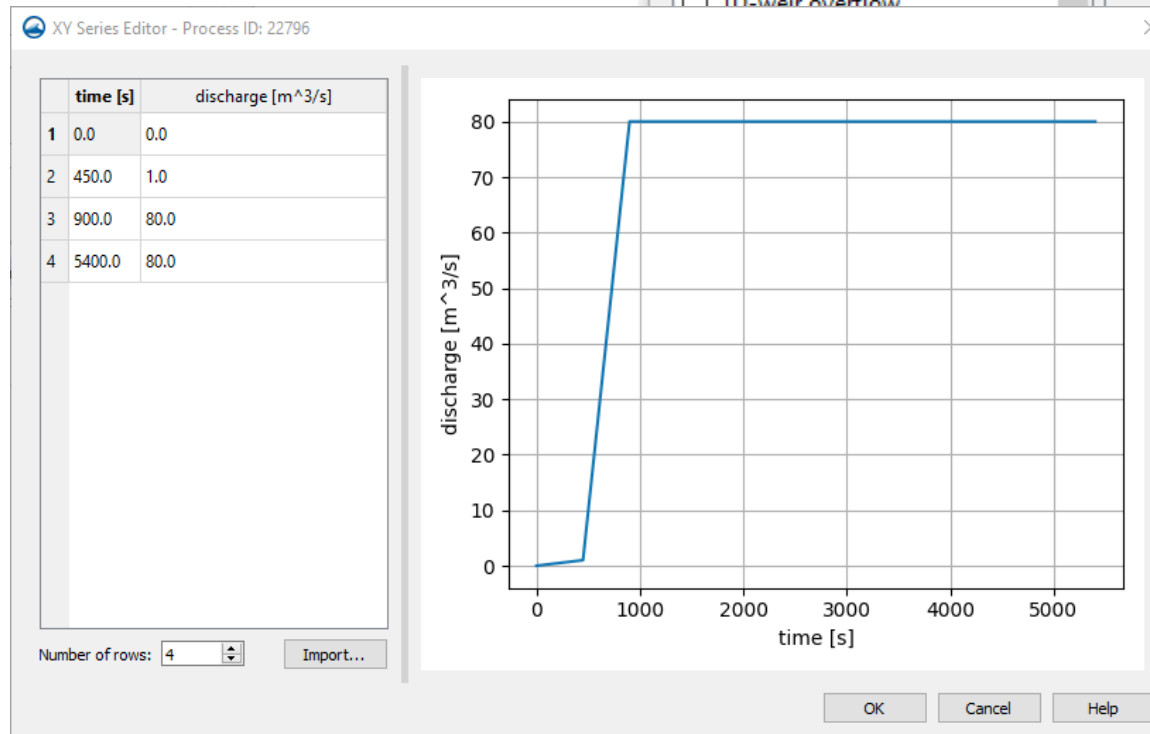
name:
Inflow 80 cms

discharge [m^3/s]:
Edit XY Series...

use angle?:
1 - Yes

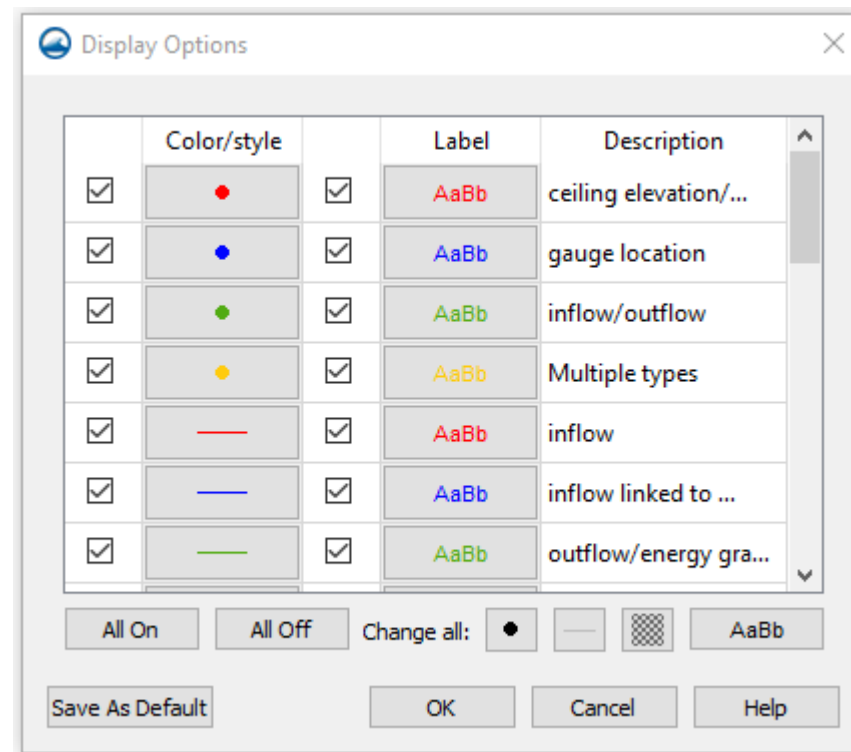
orientation CCW °:
121.3

OK Cancel Help



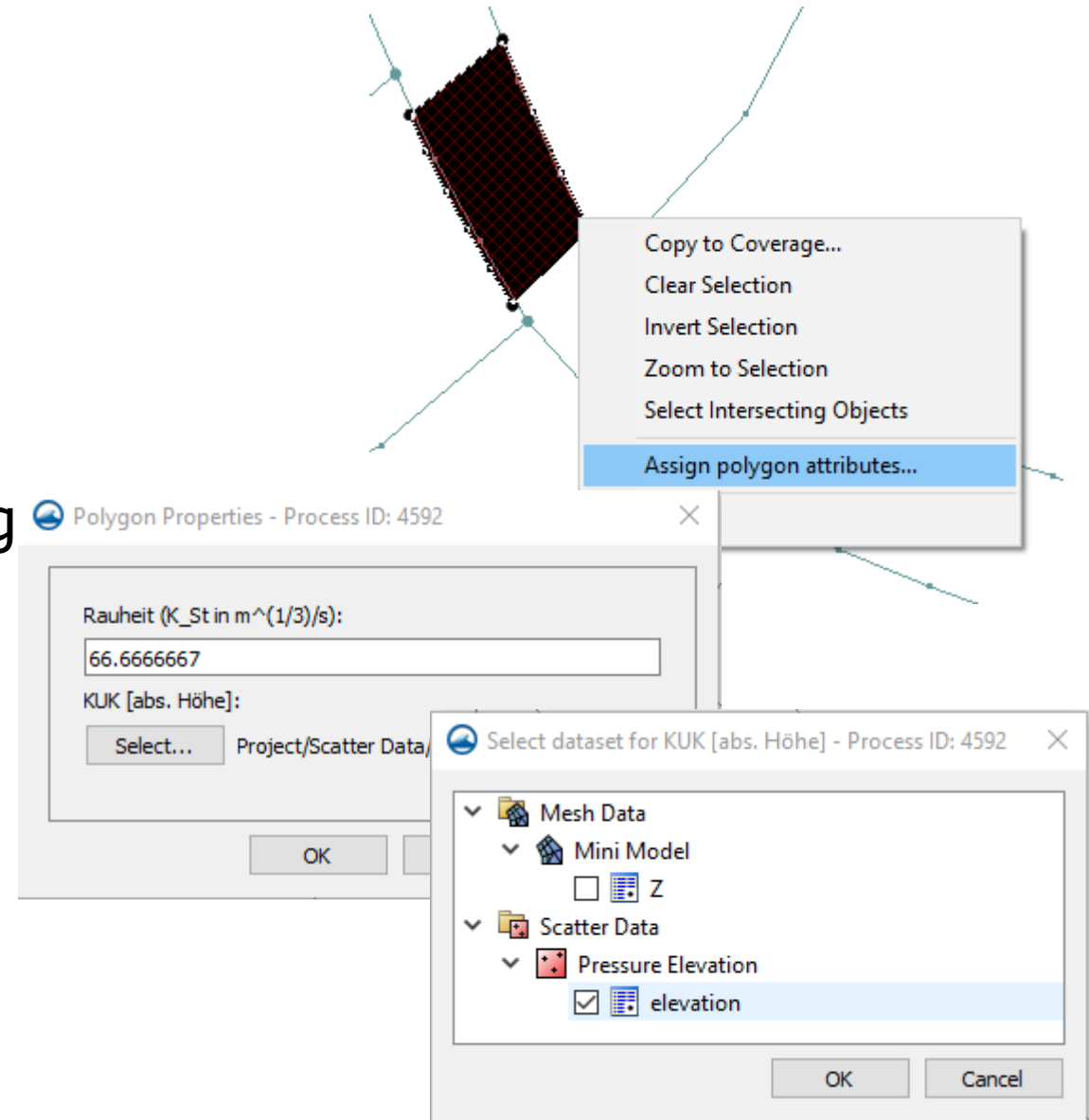
HydroAS Boundary Condition Display Attributes

- Color / Style / Font for each boundary condition type (nodes and lines).



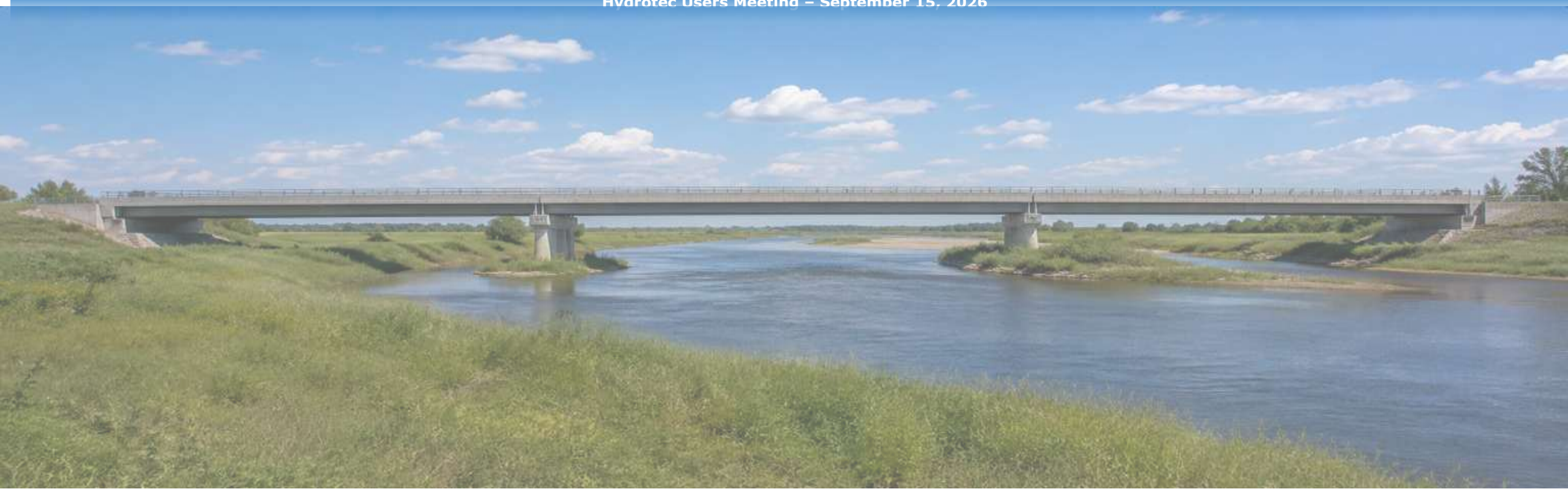
Custom Tool – Pressure (KUK, Druckabfluss)

- Custom options
 - Coverage with Attributes
 - Tools in the Toolbox
- Pressure Zone Points
- Not version specific
- Stand alone python library
- Creates Boundary Condition coverage when “applied”
- Modular
 - Example of user specific tools



Questions





THANK YOU for participating!
Please contact us with any questions

Aquaveo Technical Support
support@aquaveo.com