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InfoWorks ICM and Civil3D

A Flood Modelers guide to Project Impacts

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Product Manager

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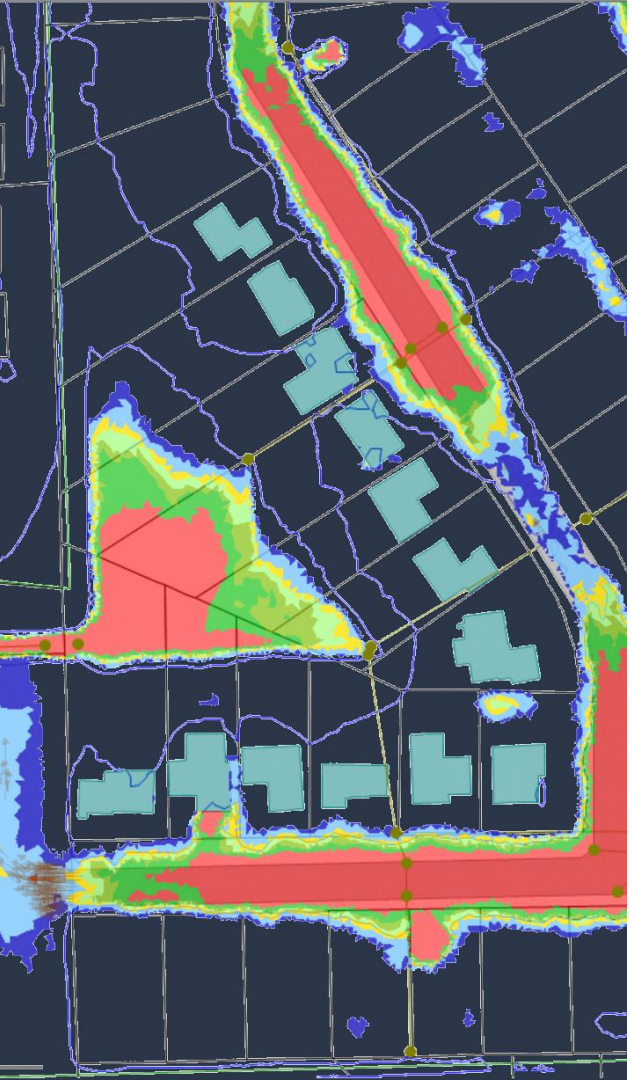
Course Content

A Flood Modelers guide to Project Impacts

InfoWorks ICM *assists engineers and designers in understanding projects impacts on the environment. Extreme events continue to stress local and regional civil infrastructure, and our tools and techniques must change as we design projects in our communities.* ***InfoWorks ICM*** *enables team collaboration and empowers engineers to reach beyond single purpose tools to evaluate various options against a multitude of rainfall events within the context of the entire watershed. This technical instruction class will provide users through a number of considerations to preserve* ***AutoCAD© Civil 3D*** *designs in evaluation of possible flood damages across the wide range of flood scenarios.*



Learning Objectives

1. **Data Exchange**
   AutoCAD© Civil 3D between InfoWorks© ICM models
2. **Scenarios**
   Single network – Many simulations
3. **Preserve Design Data**
   Document overall flood impacts
4. **Collaboration**
   Collaborate with Workgroup Data Server

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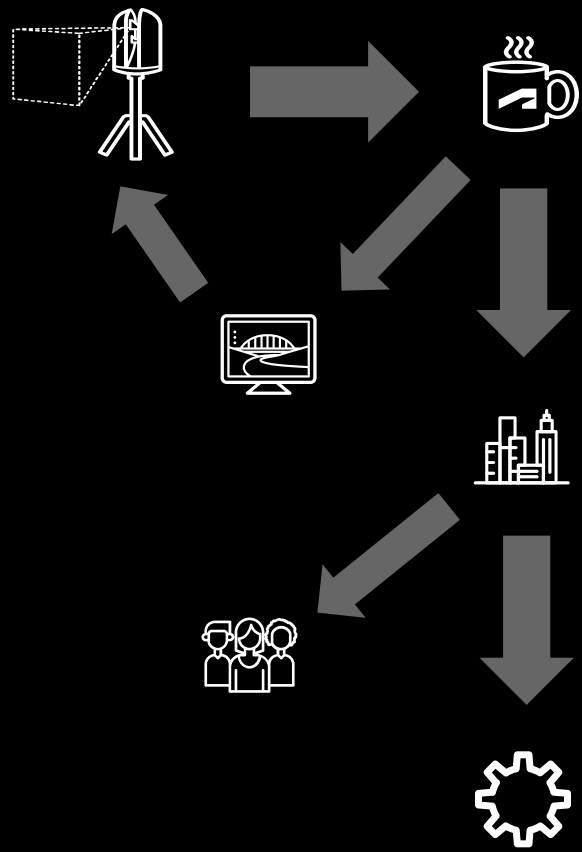
com·mu·ni·ca·tion

/kəˌmyo͞onəˈkāSH(ə)n/

process by which information is exchanged
(Merriam-Webster)



AutoCAD© Civil 3D

data

InfoWorks © ICM models

Data Exchange

Design

Civil 3D

- Terrain Surfaces
- Pipe Networks
- Lines/Points/Polylines
- Rivers/Sections

Outcome

InfoWorks ICM

- **Model Inputs**
  - Ground Models
  - 1D Pipe Networks
  - River 1D Networks
  - 2D Mesh Models
- **Model Results**

Civil 3D

Design & Documentation

Civil 3D

Key Questions to ask

Source of Surface Data

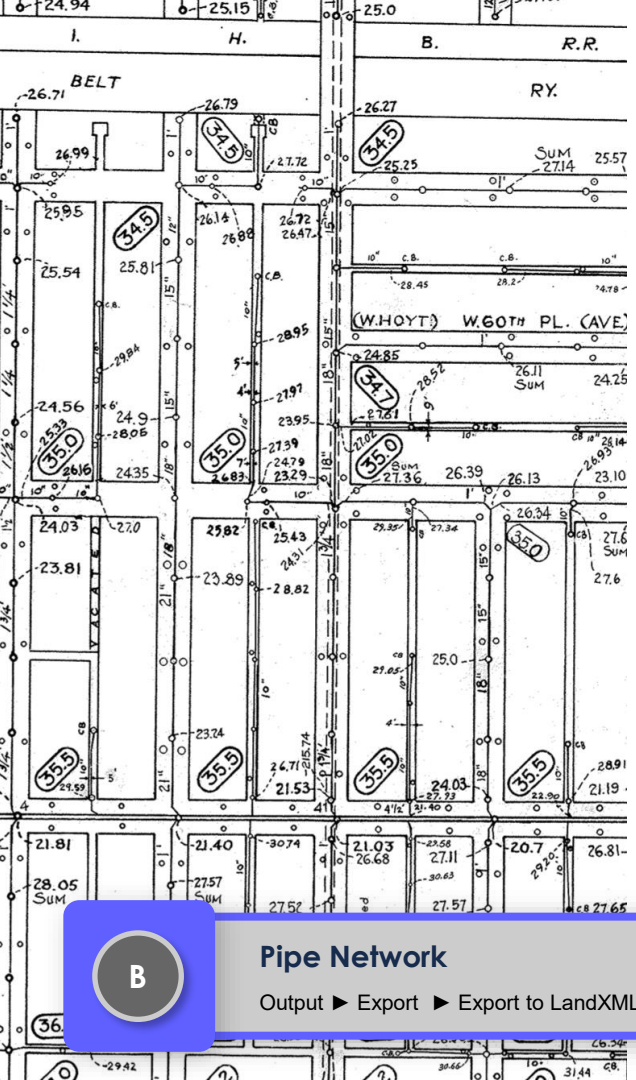
- Terrestrial
- LiDAR or GIS

Scope of surface changes

- ❑ Single
- ❑ Multiple

TIN Surface

Avoid Grid..



Pipe Networks

A model or reference?

- **Existing Pipe Networks**
  - Are they flat, CAD-entities – lines and labels?
  - Are they attributed Asset Inventory from GIS?
- **Civil 3D- Pipe Network**
- Challenges – **Be On the Lookout**!
  - *Multiple Barrel Pipes*
  - *Unique Geometric Shapes Pipe & Structures*
  - *Inlet Configurations*

B

Pipe Network

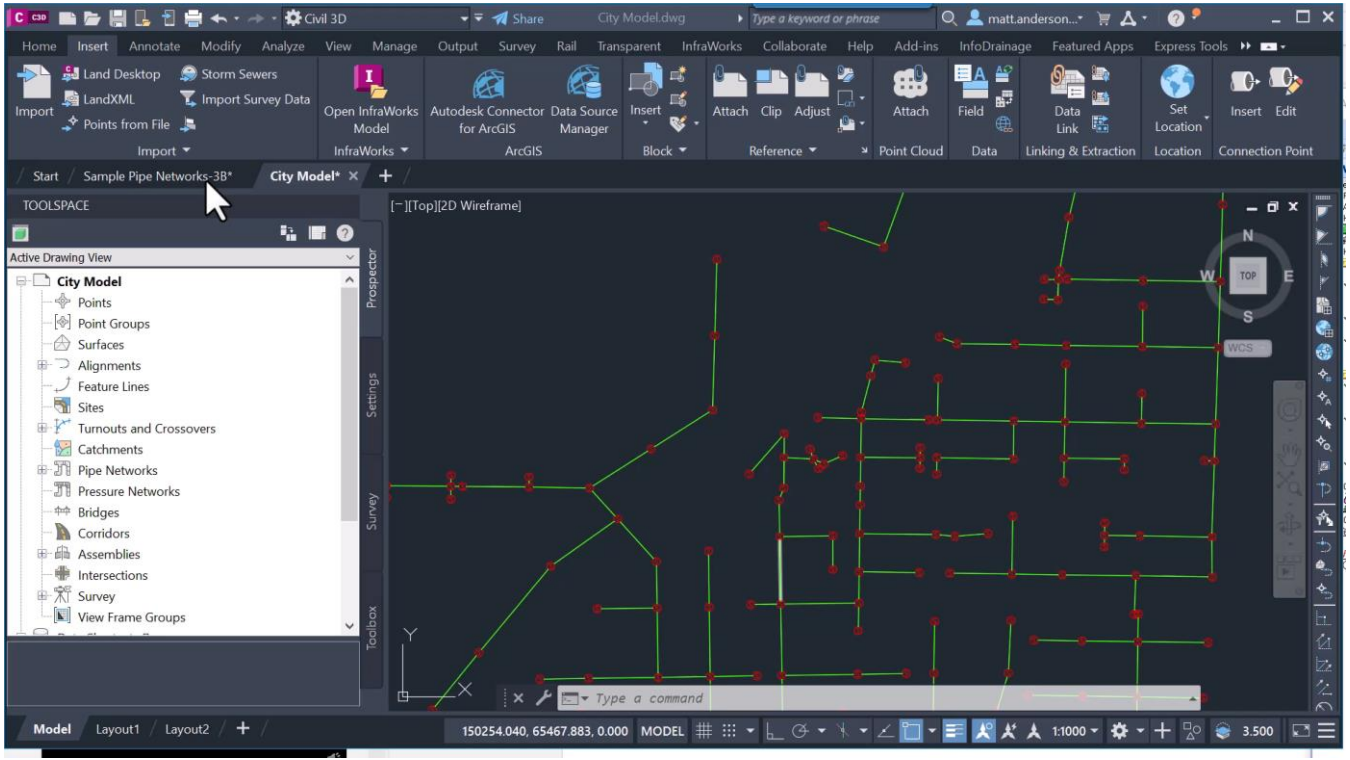
Output ► Export ► Export to LandXML

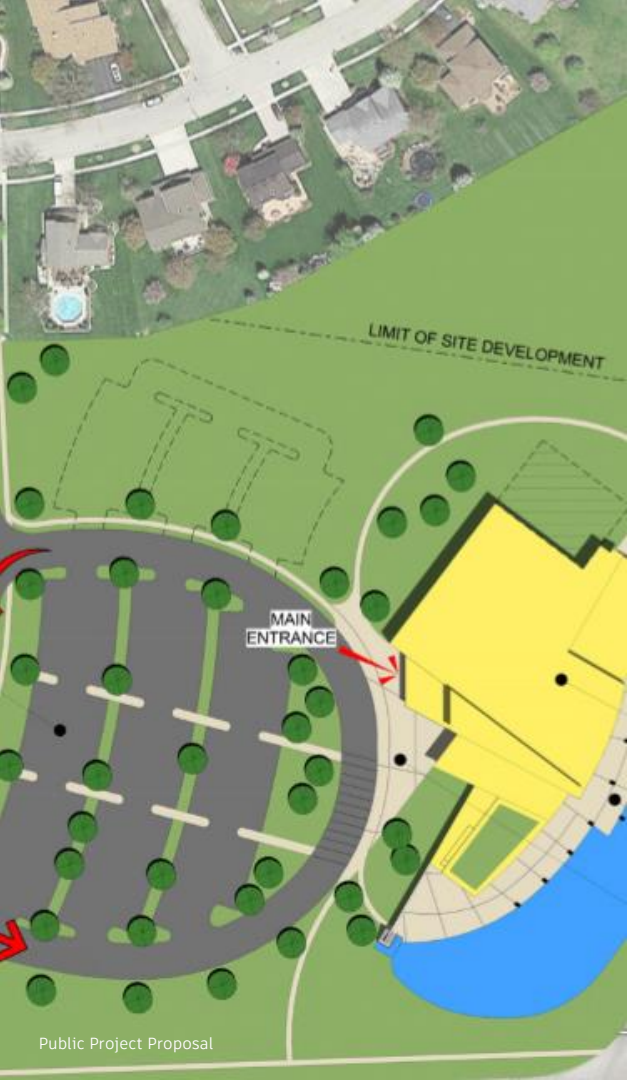
B

Pipe Network

Prospector ► Copy to Clipboard

Pipe Networks



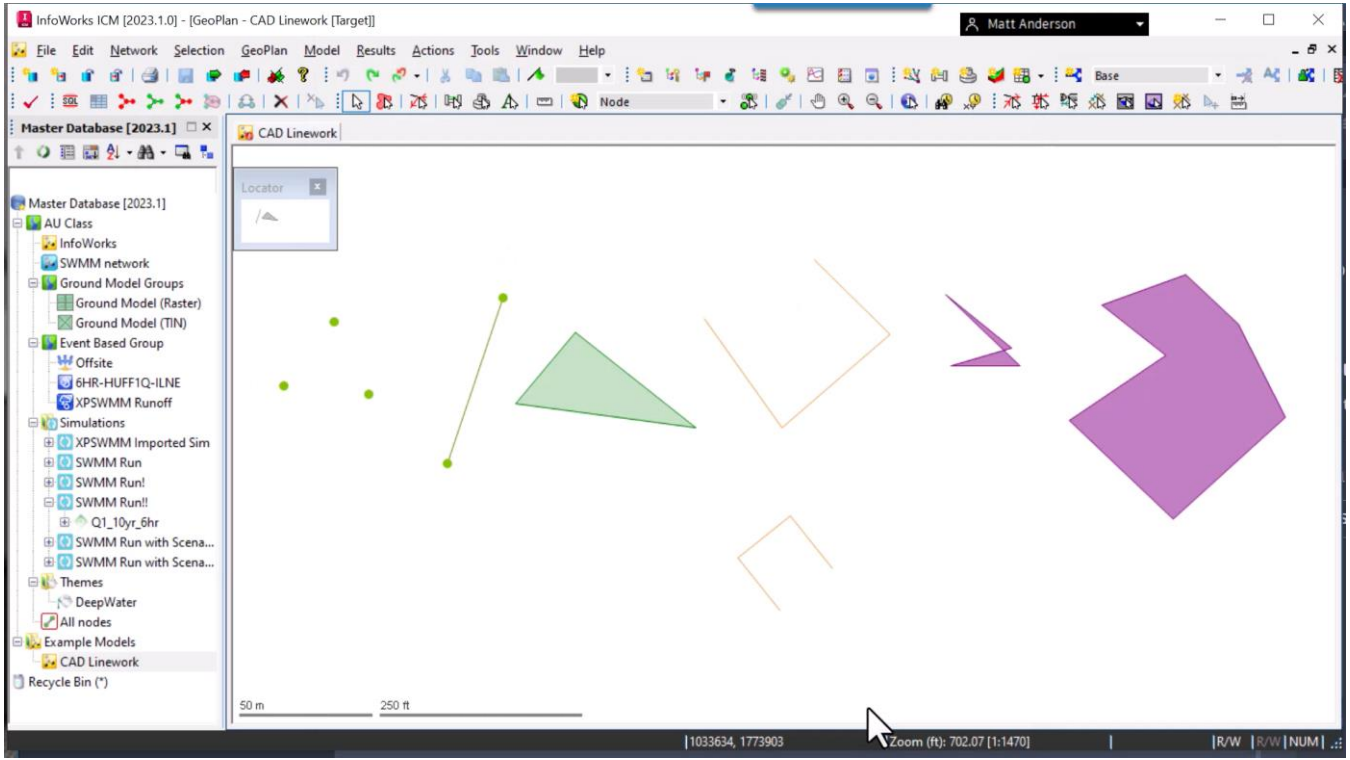


Linework

DWG Lines, Points and Polylines

- AutoCAD Linework to build Hydraulic Model elements
  - Points ► Nodes (Junctions, Outfalls, Storage)
  - Lines ► Linear elements, (River section, conduit, …)
  - Lines ► Text Elements (General Line & Import Text into)
  - Polylines ► Area elements (Zone, polygon, roughness zone)
  - 2D Polylines ► Area element (One Z elevation)
  - 3D Polylines ► Mesh element (Many Z elevation)

CAD Linework

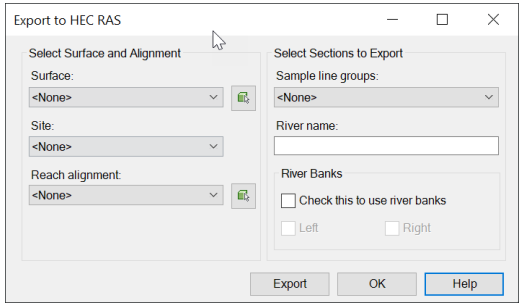


Rivers

Civil 3D

2-steps to convert

- Surface (cut cross-sections)
- Alignment
- Sample Line Groups (use polylines)
- Bank Lines (optional)

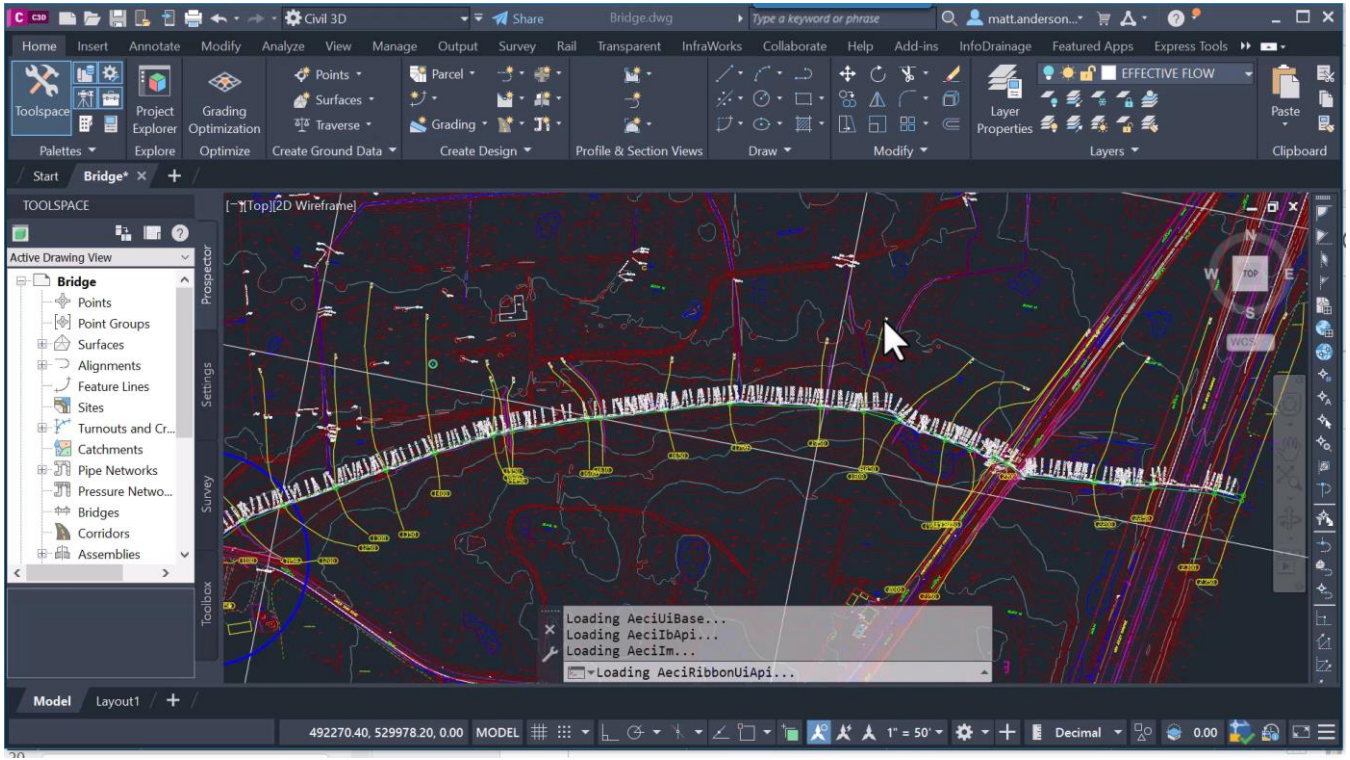


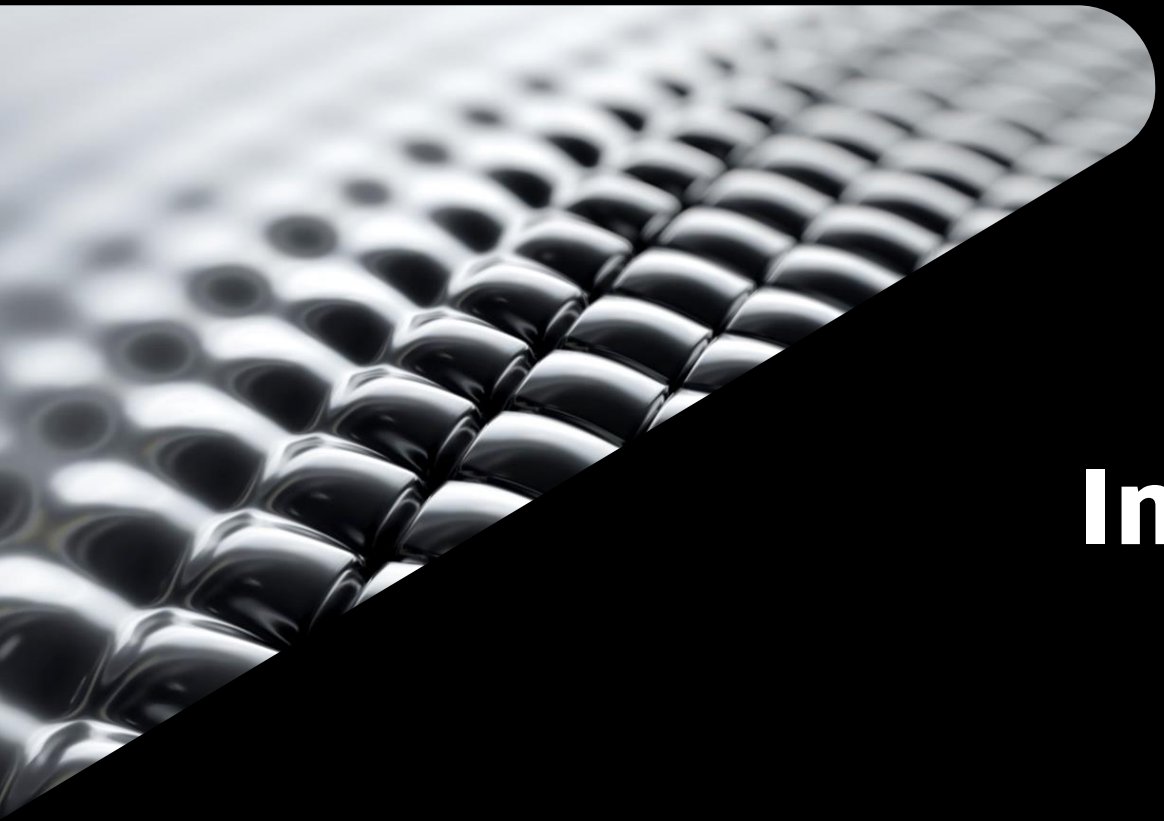
- Open HEC-RAS v5 ► Import GIS data

Flooding

Requires HEC-RAS for conversion

Export to HEC-RAS





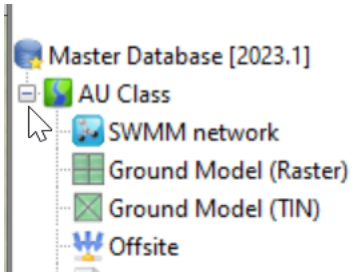
InfoWorks ICM

Import / Export Key Elements

Ground Models

Surfaces from Civil 3D

InfoWorks ICM



1. Source Data

a) LiDAR / Remote Sensing / GIS

b) Terrestrial Survey

- Point, Survey Database

A

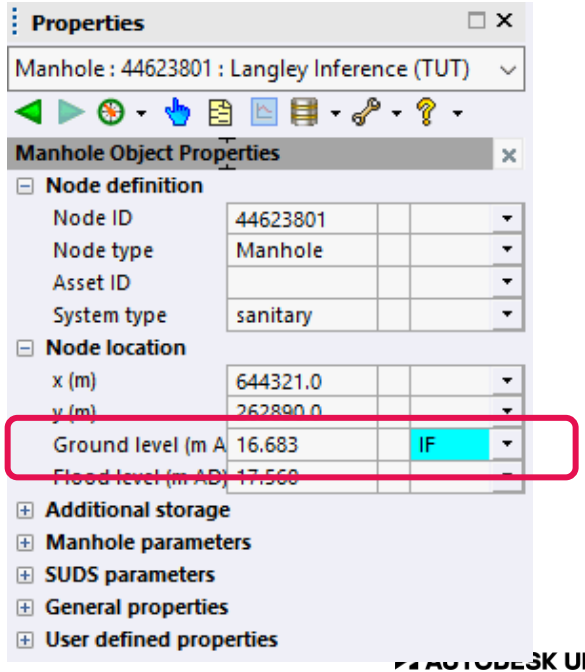
LandXML Surface

Import Ground Models ▶ Import LandXML

A

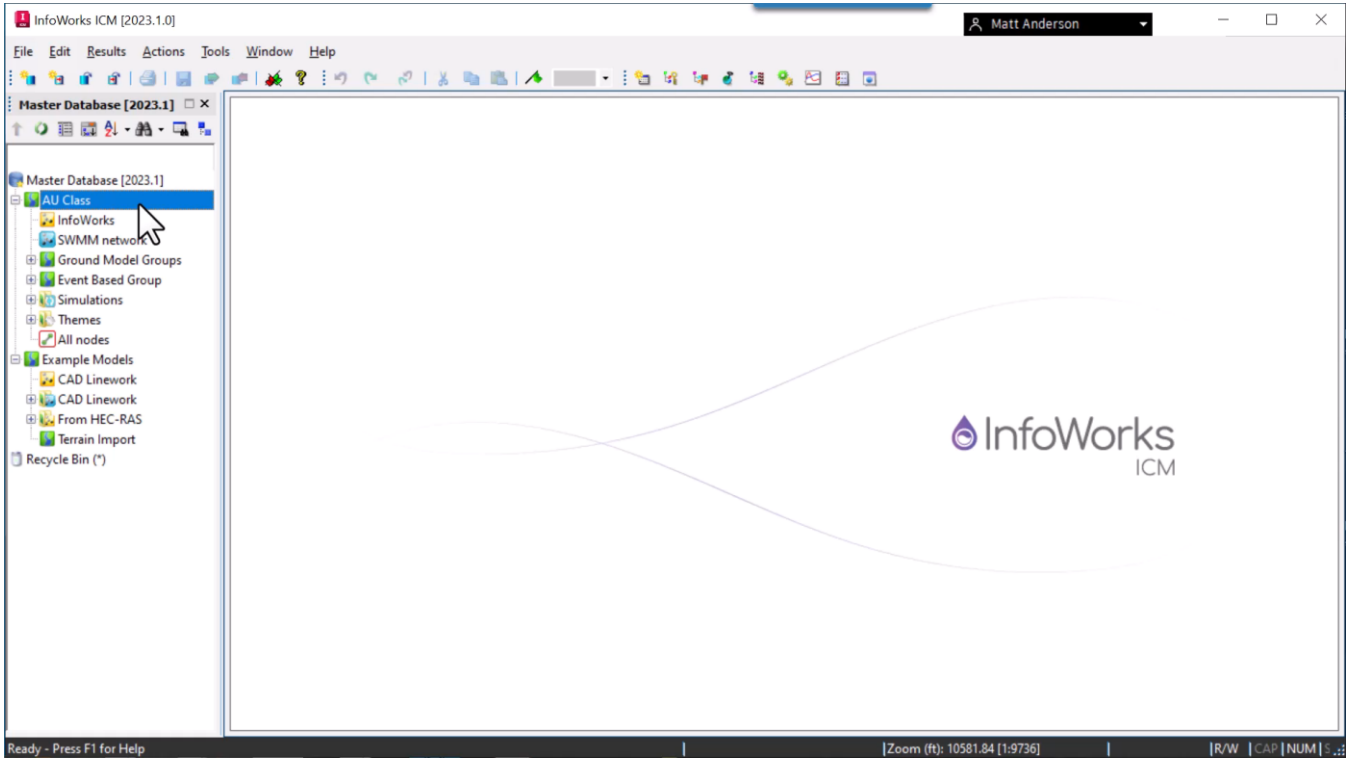
GIS or Raster Surface

Import ▶ Ground model grid ▶ From ground model grid



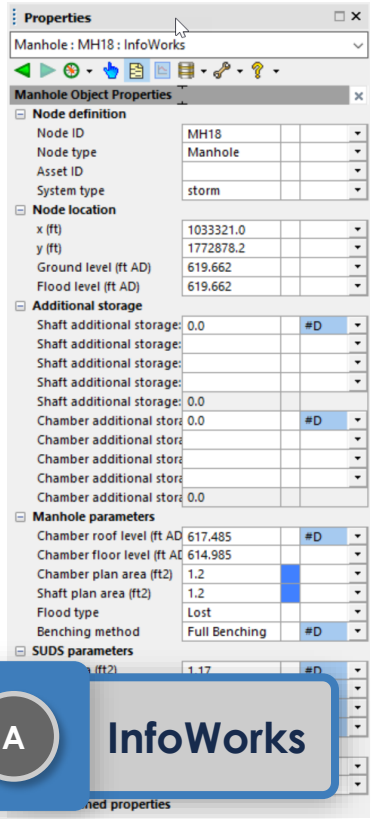
Ground Models

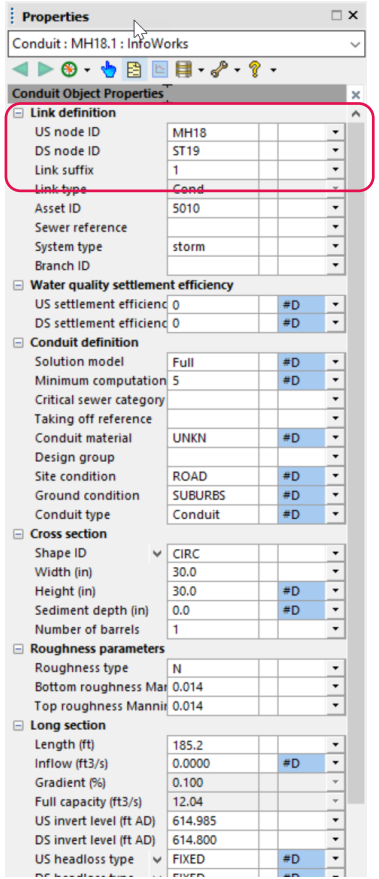
From GIS or From TIN

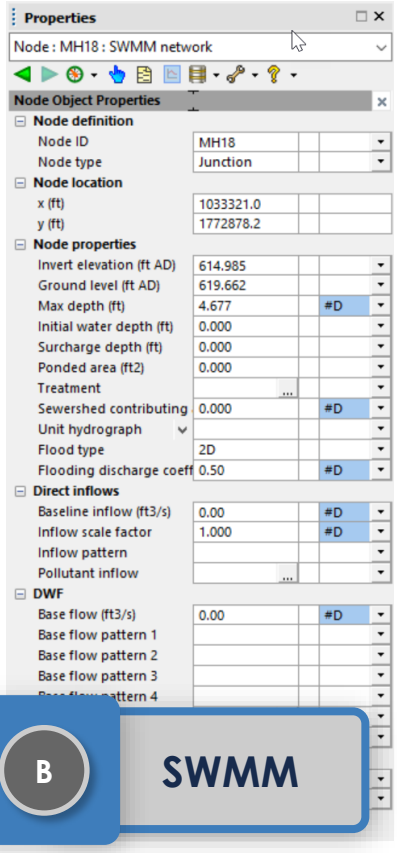


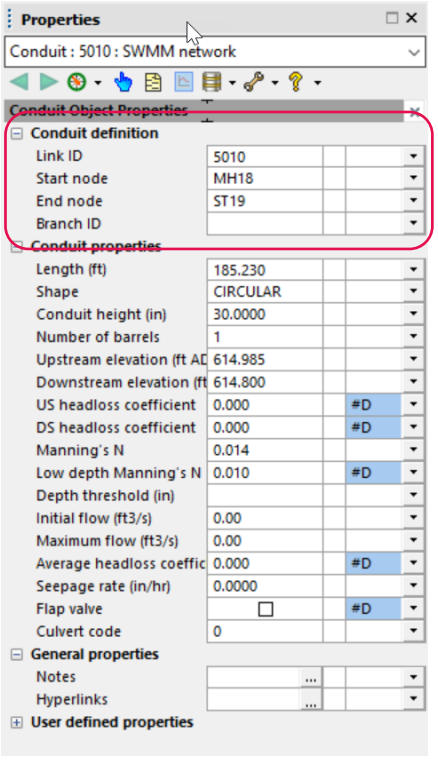
Network types

InfoWorks ICM









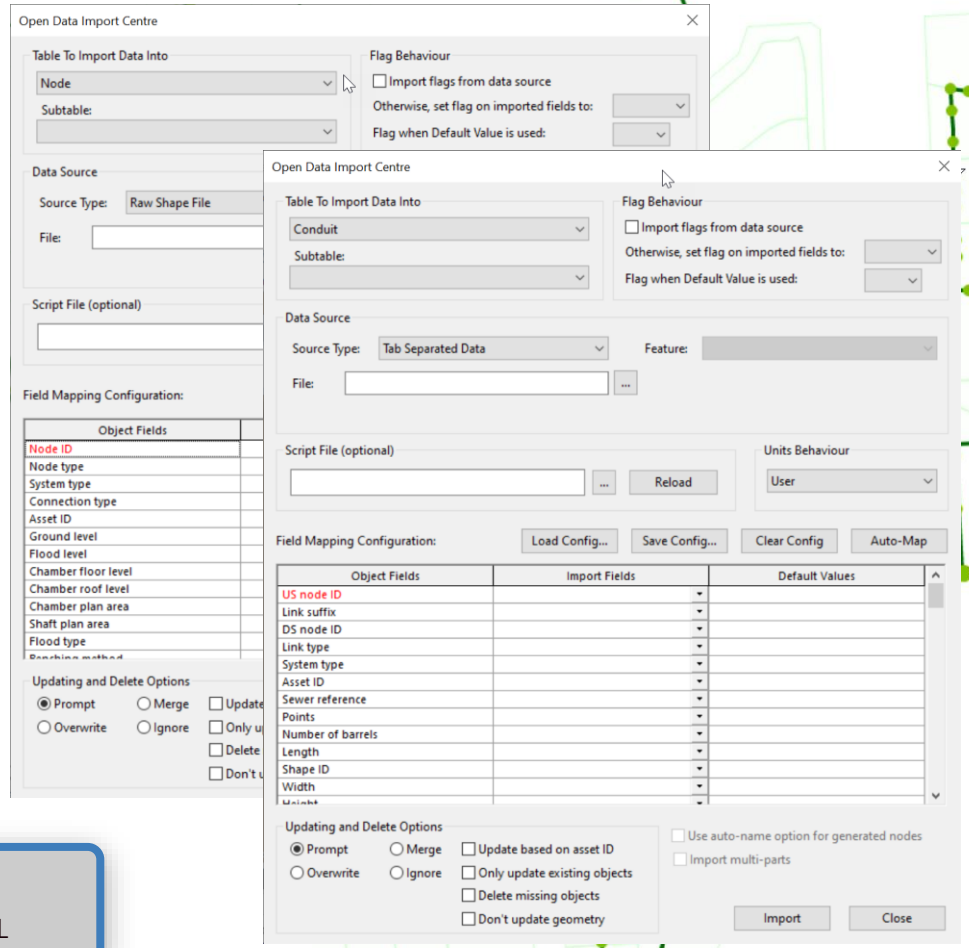
A InfoWorks

B SWMM

InfoWorks Networks

Open Data Import Center

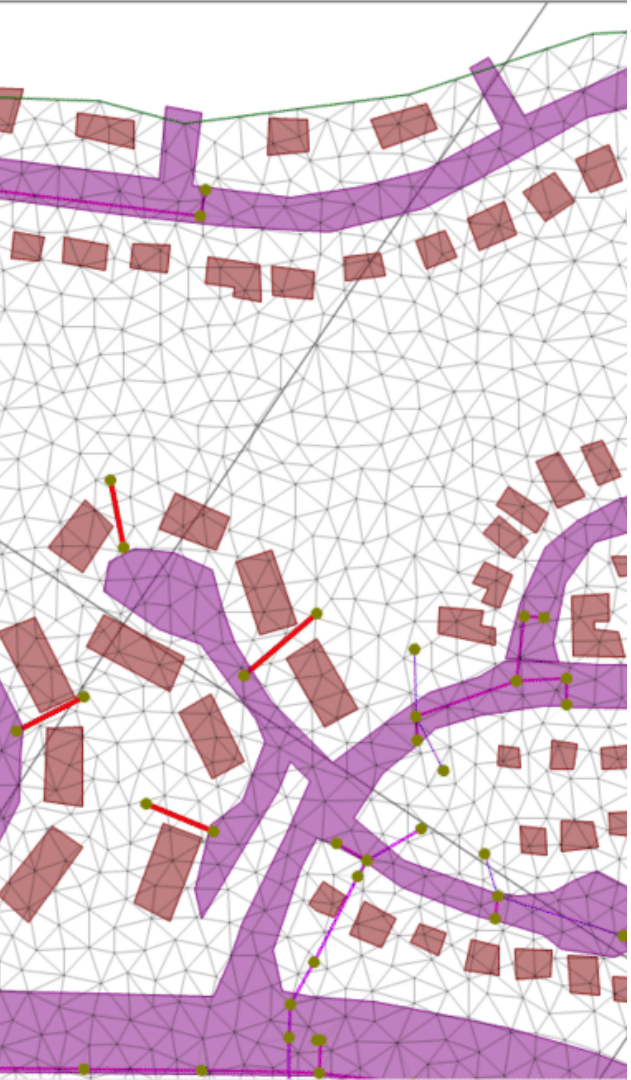
- **Open Data Import Center (GIS)**
  - Raw Shape File
  - CSV or Tab
    - Avoid *field ground-level cannot accept value 650.836'*
  - *Other GIS formats*
- **Model Imports**
  - Import SWMM Network
- **Exchange SWMM into InfoWorks**



A

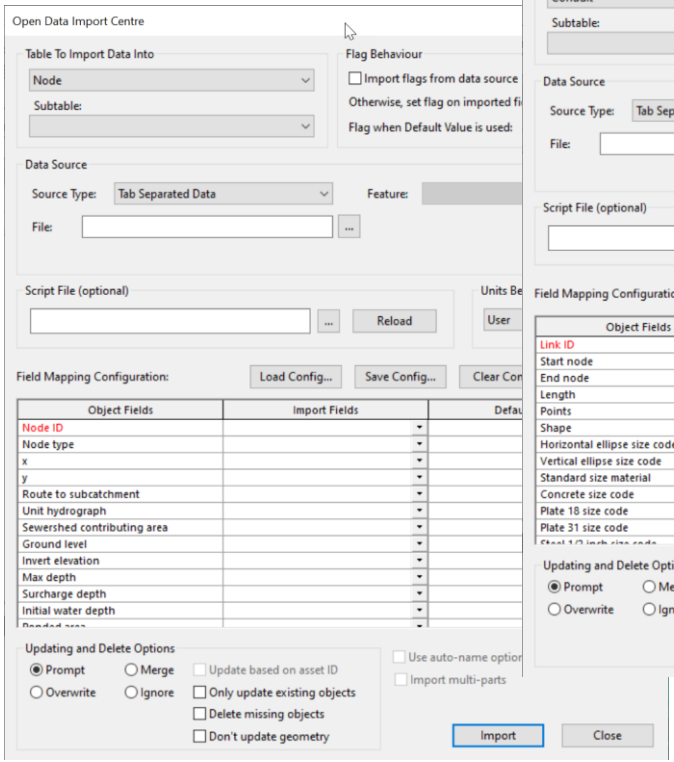
SWMM Network

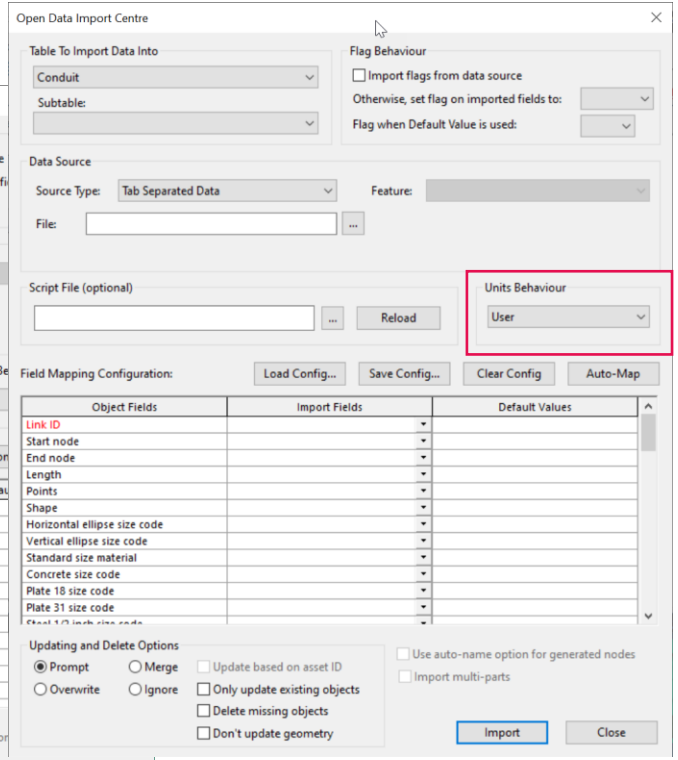
Import SWMM Network ► Import LandXML



SWMM Networks

Open Data Import Center

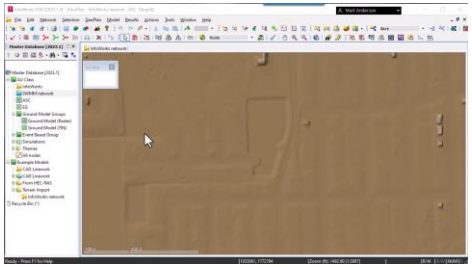


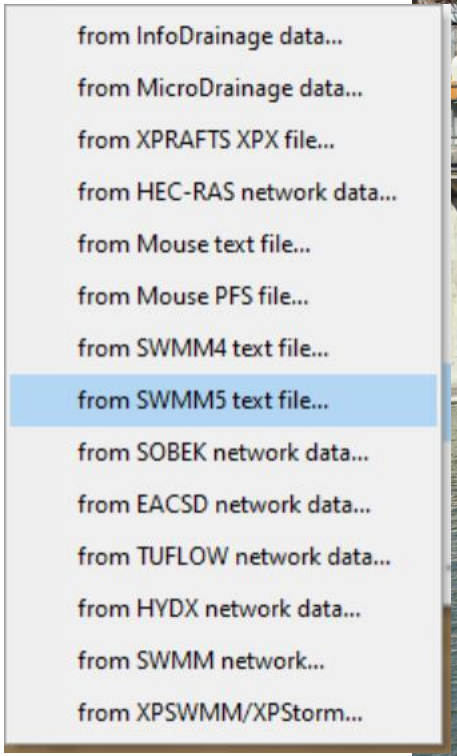


Import ► Model...

Other Hydraulic networks

- **from HEC-RAS network data...**
- **from SWMM5 text file...**
  - Autodesk Storm & Sanitary export
  - From SWMM Network



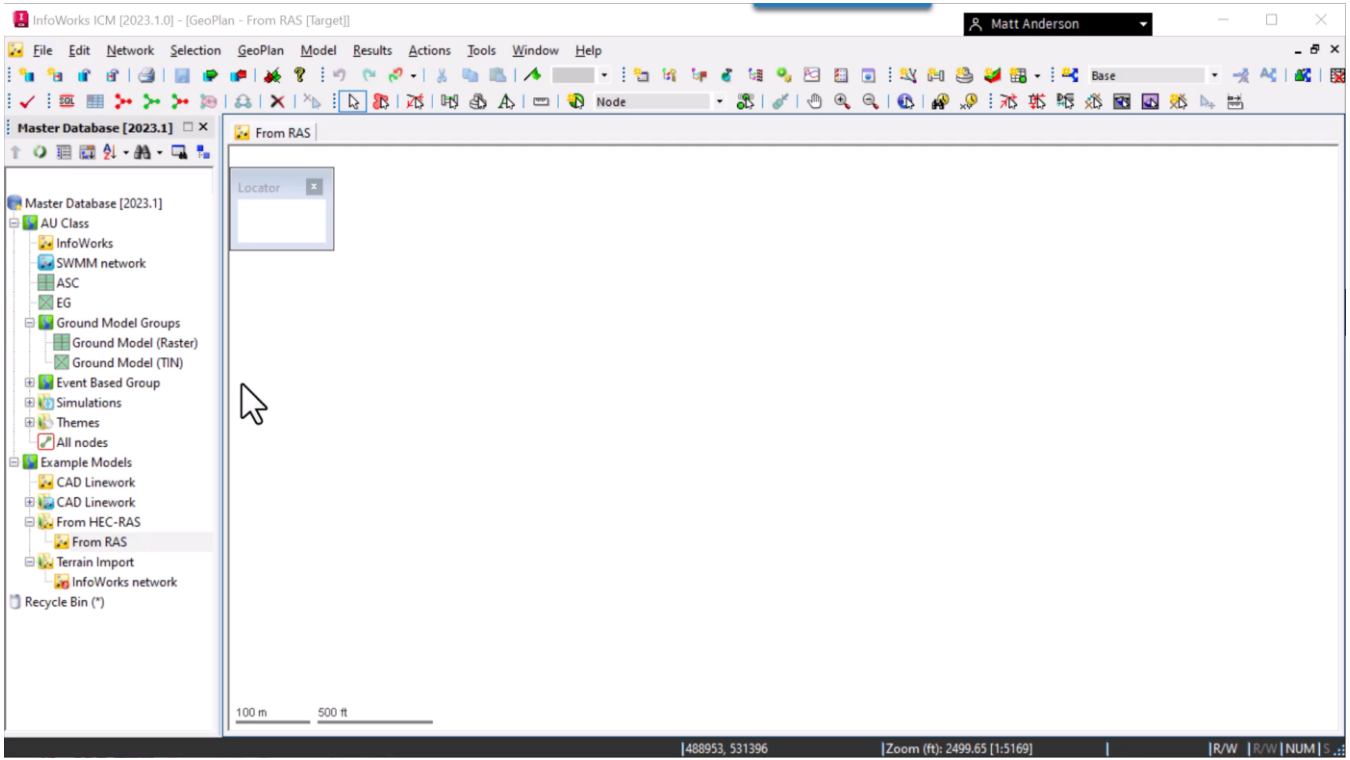


C

Model Import

Network ► Import ► Model ► from HEC-RAS network data

Import from HEC-RAS



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Scenarios & Collaboration

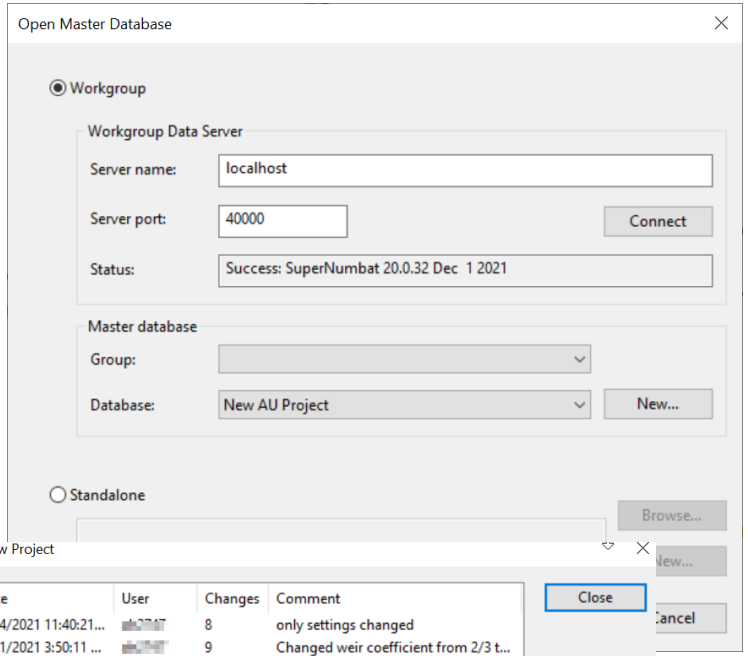
Start Optioneering

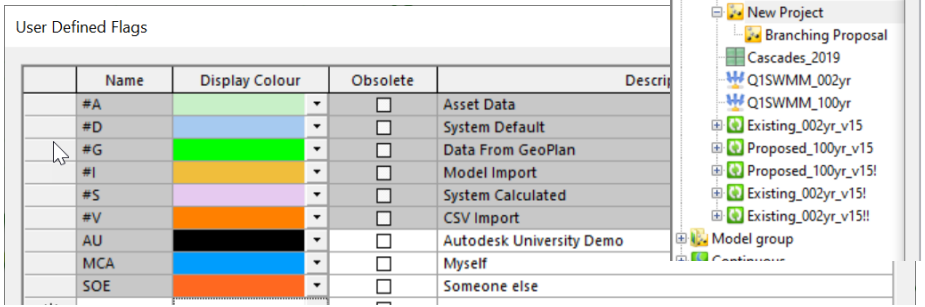
Collaboration

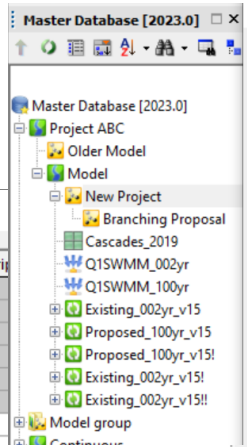
Building a modeling team

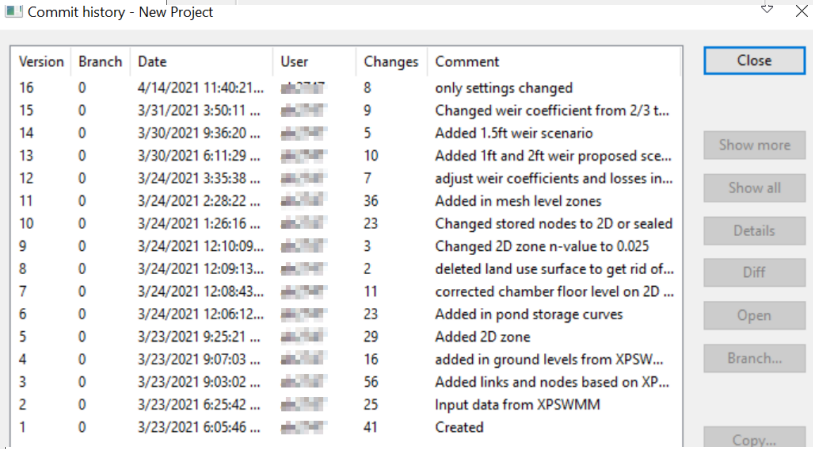
Workgroup Server

- Server Installation
- Multi-user version control system that allows concurrent editing of a network.
- User Define Flags







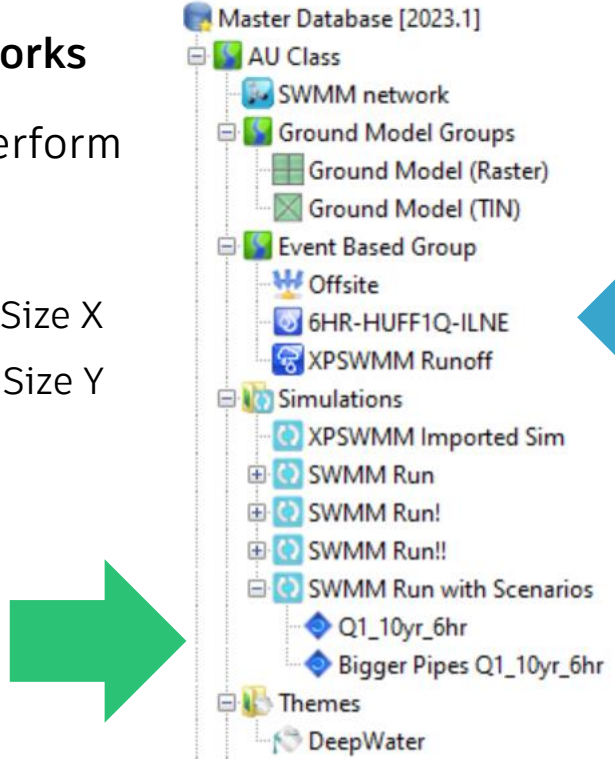


Scenarios

Optioneering

Physical Networks

- How does the system perform with changed physical attributes?
  - Option 1 – Single Pipe – Size X
  - Option 2 – Single Pipe – Size Y
  - Option 3… other options



Range of Events

- Network is separate from Event-based conditions
- Simulations and Results bring events together.

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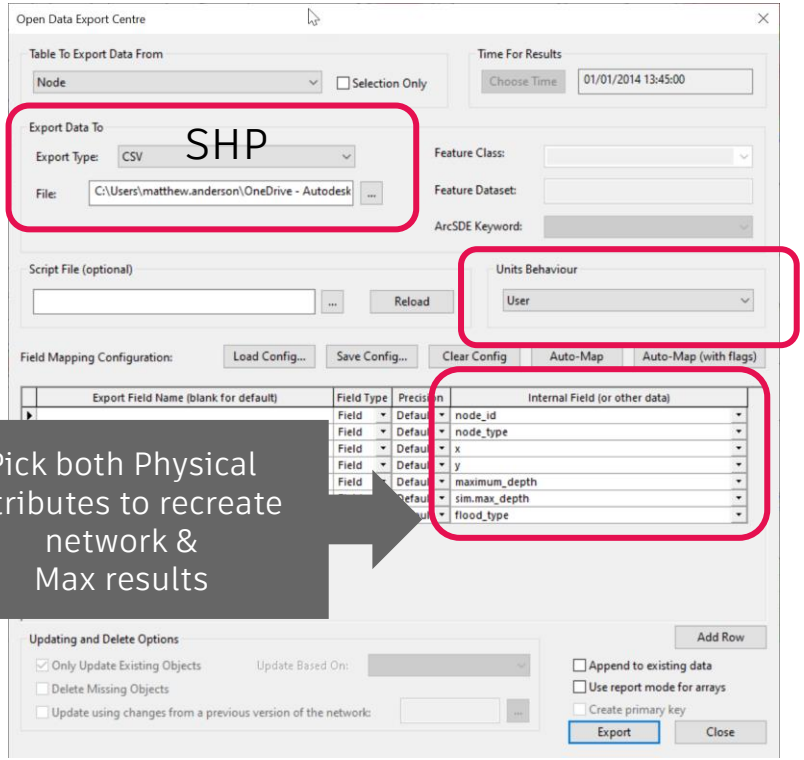
Flood Damages

Pulling results into Civil 3D

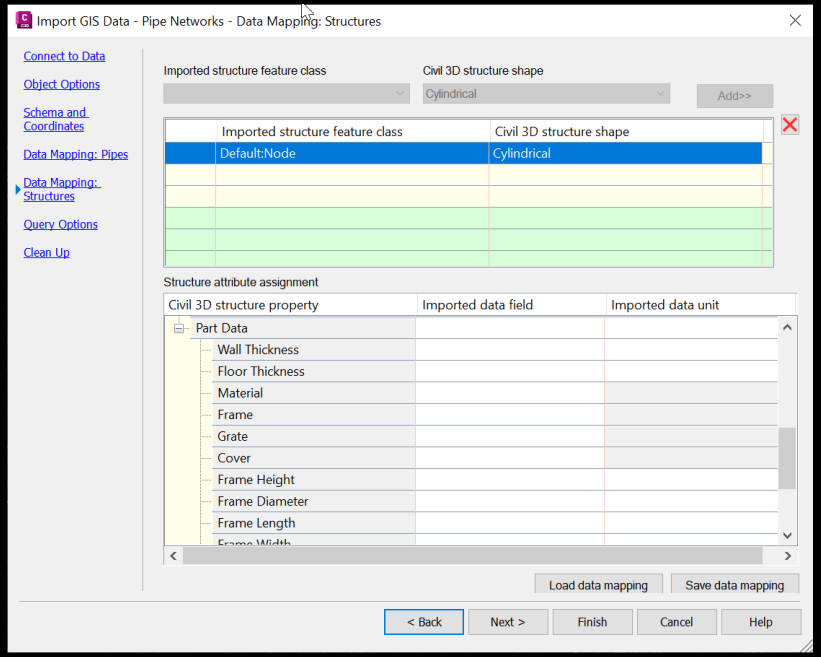
Open Data Export Center

InfoWorks ICM



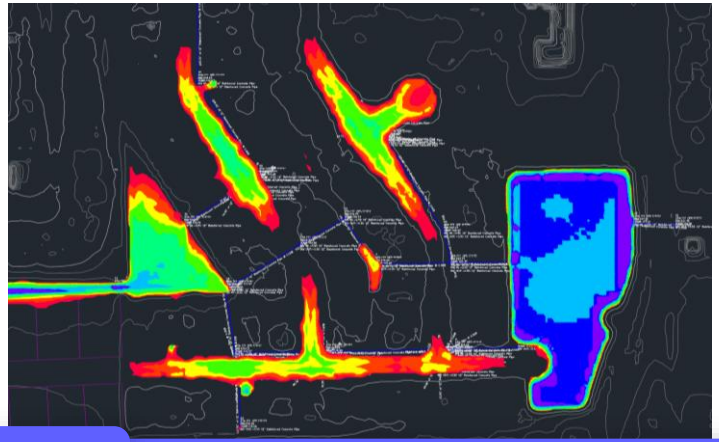
Pick both Physical Attributes to recreate network & Max results

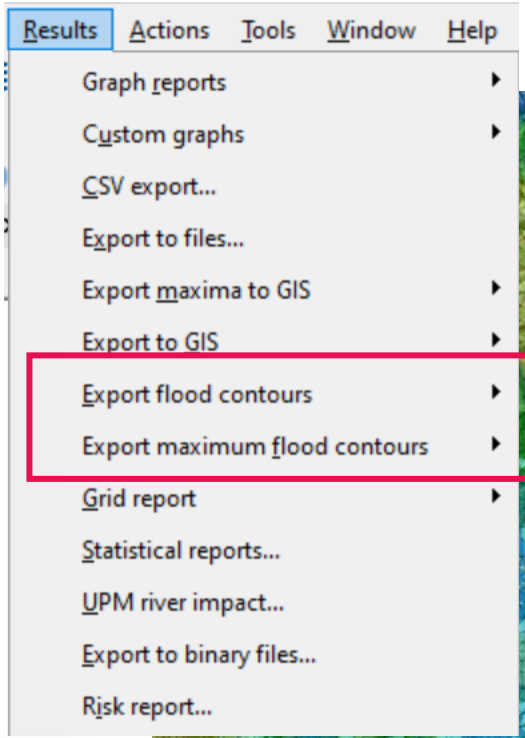
Import GIS Data

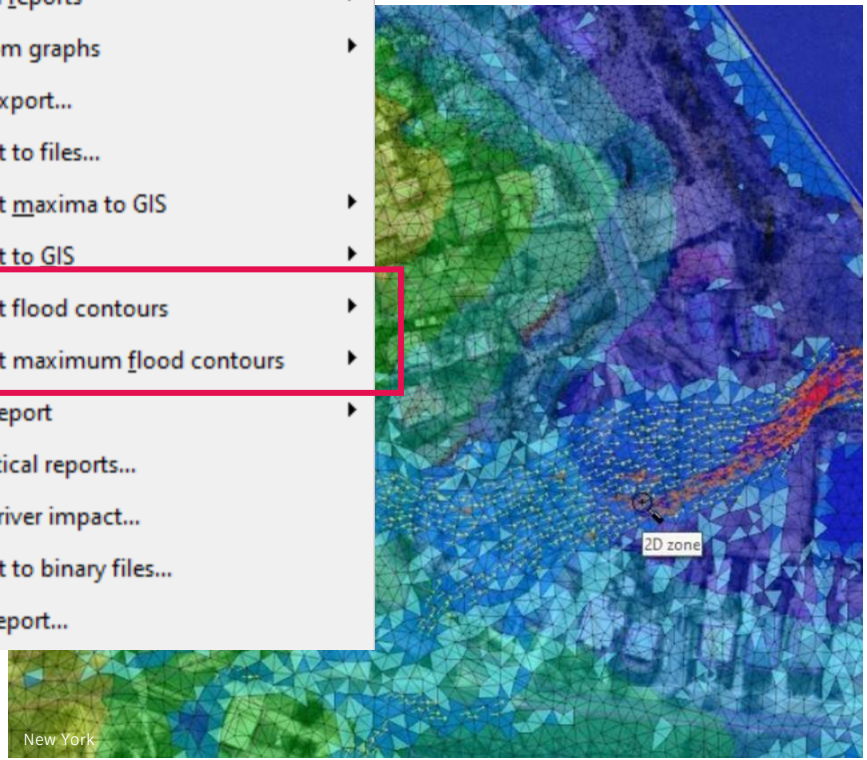


Pushing Results Back

- InfoWorks ICM Networks
  - Themes drive values exported
  - Depths looks good – but elevation is needed.





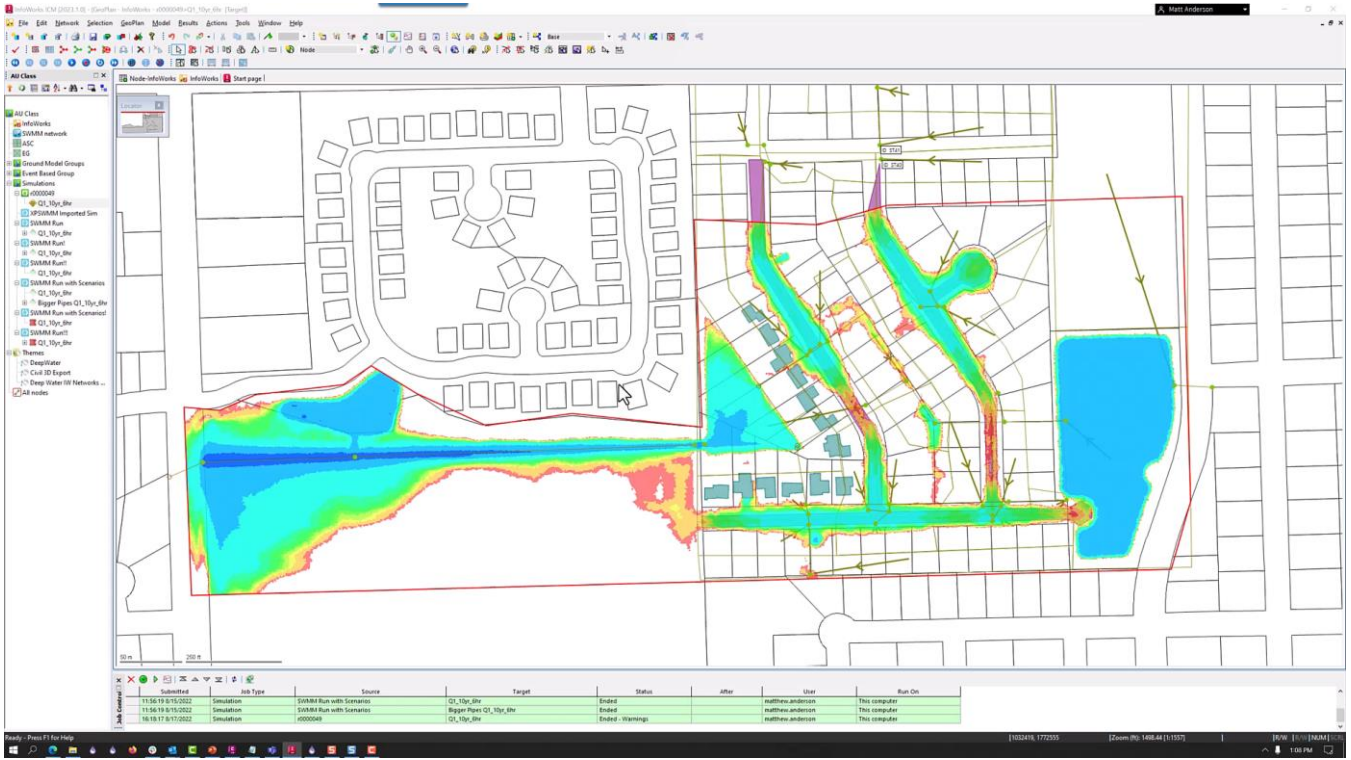


C

Export maximum flood contours

Surface ▶ DEM ▶ Import ▶ from DEM

Results back to Civil 3D



Data Exchange between C3D and ICM

Know Data

Understand potential scope of data exchange across a project.

Surfaces ► Ground Models

Pipe Networks ► Networks

CAD linework ► Sections…

Results ► C3D Object

Scenarios & Branches

ICM supports groups and multiple networks in one master database – use scenarios and branches to migrate data back and forth.

Test designs fit & performance

Understand Limits

Be on the lookout for those unique situations outside of the commonalities.

- **Unique Structures**
- **Multiple Barrels**
- **Inlet Conditions**
- **Export Themes**

Engage

Let us know what problems you would like to see tackled.

feedback.innovyze.com

Civil Infrastructure – Public Roadmap - Infrastructure Reimagined (autodesk.com)