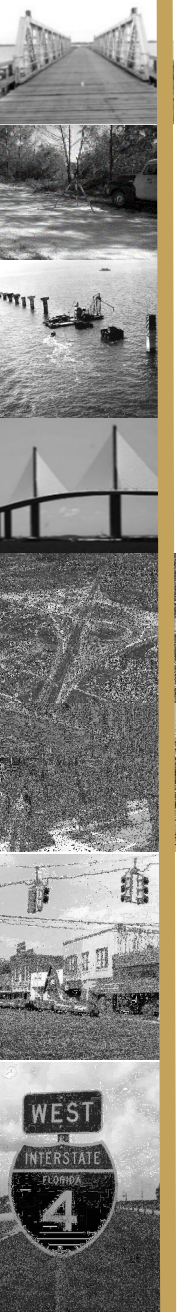
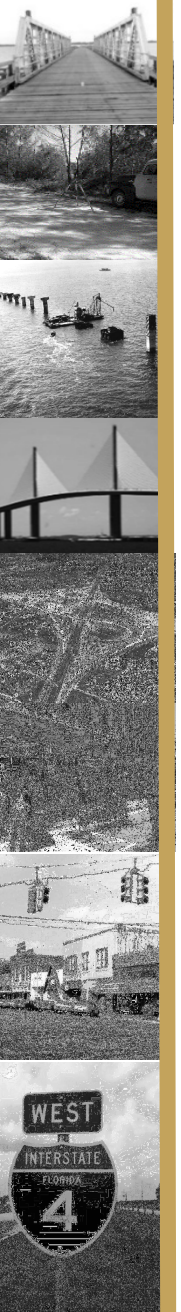
2015 Design Training Expo

3D Construction Models for Delivery in FDOTSS4



Session Objectives

- Define files provided for Automated Machine Guidance (AMG).
- Demonstrate how each file provided for AMG can be extracted from project data.



What information is provided for AMG?

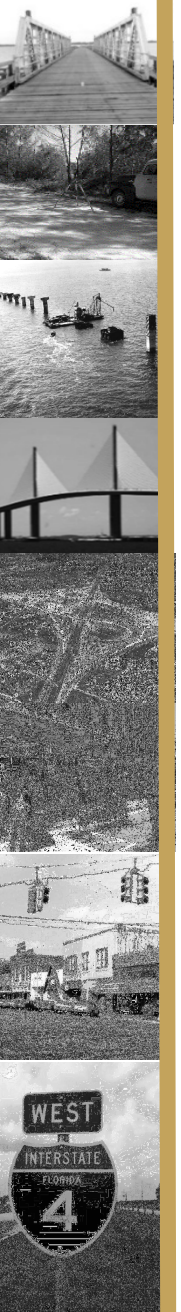
Chapter 5 sections 12.4 - 12.6 of the CADD Manual describes the data provided to contractors to support AMG.

5.12.4 3D Deliverables - Data for Machine Control in Construction

Three dimensional (3D) design and modeling is used to facilitate Automated Machine Guidance (AMG). Both Bentley and Autodesk provide 3D design tools and have been augmented through the Department's workspaces for the Department's Projects and help support exporting data usable in AMG processes. AMG technology can reduce time and cost of construction because of greater productivity by equipment operators, fewer grade checks are needed, greener construction (less fuel and equipment wear), greater safety, less rework, and less survey staking required. Contractors invest in AMG for safety, productivity, and to stay competitive. The benefits of 3D design and AMG are well documented on the Federal Highway Administration web pages here: **http://www.fhwa.dot.gov/construction/3d/**

In general, projects characterized by the following are the best candidates for modeling and AMG:

The CADD Manual is available at:
http://www.dot.state.fl.us/ecso/downloads/publications/Manual/default.shtm



Files for AMG?

Contract Plans

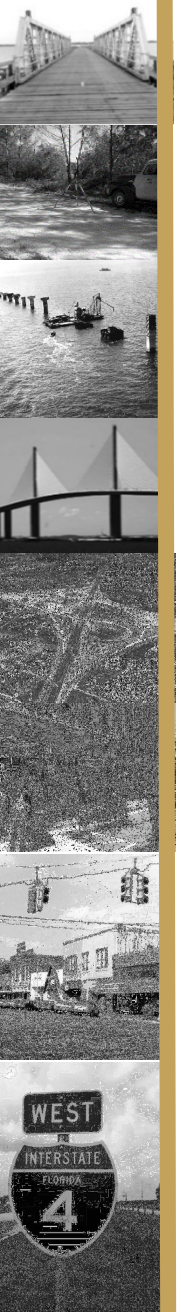
- Multiple DGN\DWG Files – See CPCH for names and content. A PDF of the Contract Plans is to be Signed and Sealed using Digital Signature.

Existing Planimetrics (2D and 3D)

- TOPORD.DGN – 2D & 3D existing topography
- DREXRD.DGN – 2D & 3D existing drainage
- UTEXRD.DGN – 2D & 3D existing utilities

3D Existing Surface(s)

- GDTMRD.DGN – 3D existing surfaces triangles
- LandXML of the existing (Ground) surface



Files for AMG?

Alignments

- ALGNRD.DGN\DWG – 2D file of Alignments and stationing and LandXML file of the alignment data.

2D Proposed Planimetrics

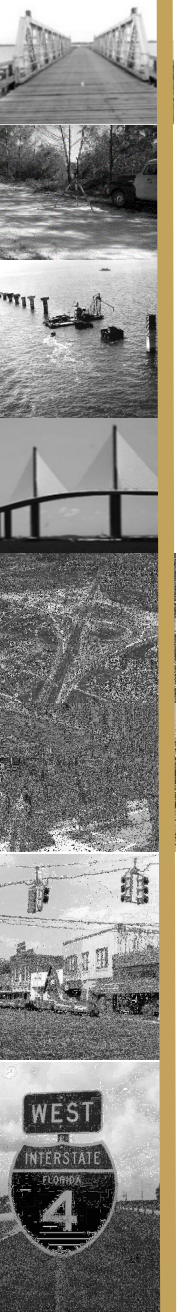
- DSGNRD. DGN\DWG – 2D proposed roadway design
- DRPRRD. DGN\DWG – 2D proposed drainage design
- PDPLRD. DGN\DWG – 2D proposed pond design

3D Proposed Surface(s)

- AMGMRD. DGN\DWG – 3D proposed roadway model top surface (3D break lines can be together or in separate files).
- LandXML of the Proposed (Top) surface.

3D Proposed Break Lines

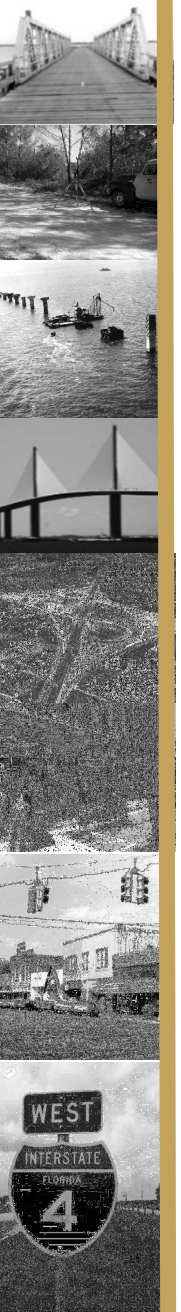
- AMGMRD. DGN\DWG – 3D proposed roadway break lines



File Naming

- There is a table in chapter 5.12.4.2 that defines the naming convention of files that are extracted into a 3DDeliverables folder in the project.
  - Alignments\Profiles
  - Planimetrics
    - Existing
    - Proposed
  - Surfaces
  - Break Lines

3D DELIVERABLES SUPPORTING AMG for 3D PROJECTS	
File Name (put in .\3DDeliverables)	Description
Design Alignments and Profiles	
AMG-ALGN##.xml	All Alignments and Profiles extracted from the .\Roadway\ALGNRD, PROF or model files..\Roadway\DSGNRD OR CORRRD file in LandXML format.
2D Proposed Planimetrics Design	
AMG-2DSGN##.dwg/dgn	2D proposed Roadway design extracted from the .\Roadway\DSGNRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2DRPR##.dwg/dgn	2D proposed Drainage design extracted from the .\Roadway\DRPRRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2PDPL##.dwg/dgn	2D proposed Pond design extracted from the .\Roadway\PDPLRD file. (Production of this file for construction is at the designer's discretion.)
2D Existing Survey (Note: These are being considered to merge into a single survey Planimetrics file)	
AMG-2TOPO##.dwg/dgn	2D proposed existing Topography extracted from the .\Survey\TOPORD file. (Production of this file for construction is at the designer's discretion.)
AMG-2DREX##.dwg/dgn	2D proposed existing Drainage extracted from the .\Survey\DREXRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2UTEX##.dwg/dgn	2D proposed existing Utilities extracted from the .\Survey\UTEXRD file. (Production of this file for construction is at the designer's discretion.)
3D Existing Survey Surfaces	
AMG-3SURFACEEX##.xml	3D existing terrain surface to be exported from the .\Survey\GDTMRD file as LandXML format. (Production of this file for construction is at the designer's discretion. This file will be produced if the 3D Existing Surface dwg/dgn file(s) are not produced.)
AMG-3SURFACEEX##. dwg/dgn	3D existing terrain surface to be exported from the .\Survey\GDTMRD file. (Production of this file for construction is at the designer's discretion. This file will be produced if the 3D Existing Surface LandXML file(s) are not produced.)
3D Proposed Surfaces	
AMG-3SURFACEPR##.xml	3D proposed finished (top) surface to be exported as LandXML format from the .\Roadway\AMGMRD file. (Production of his file for construction is at the designer's discretion. This file will be produced if the 3D Proposed Break line(s) dwg/dgn file is not produced.)
3D Proposed Break Lines	
AMG-3DSGN##.dwg/dgn	3D proposed Roadway design extracted from the .\Roadway\DSGNRD file. (Production of this file for construction is at the designer's discretion. This file will be produced if the 3D Proposed Surface(s) LandXML file(s) is not produced. Geometric elements should be in vector.)



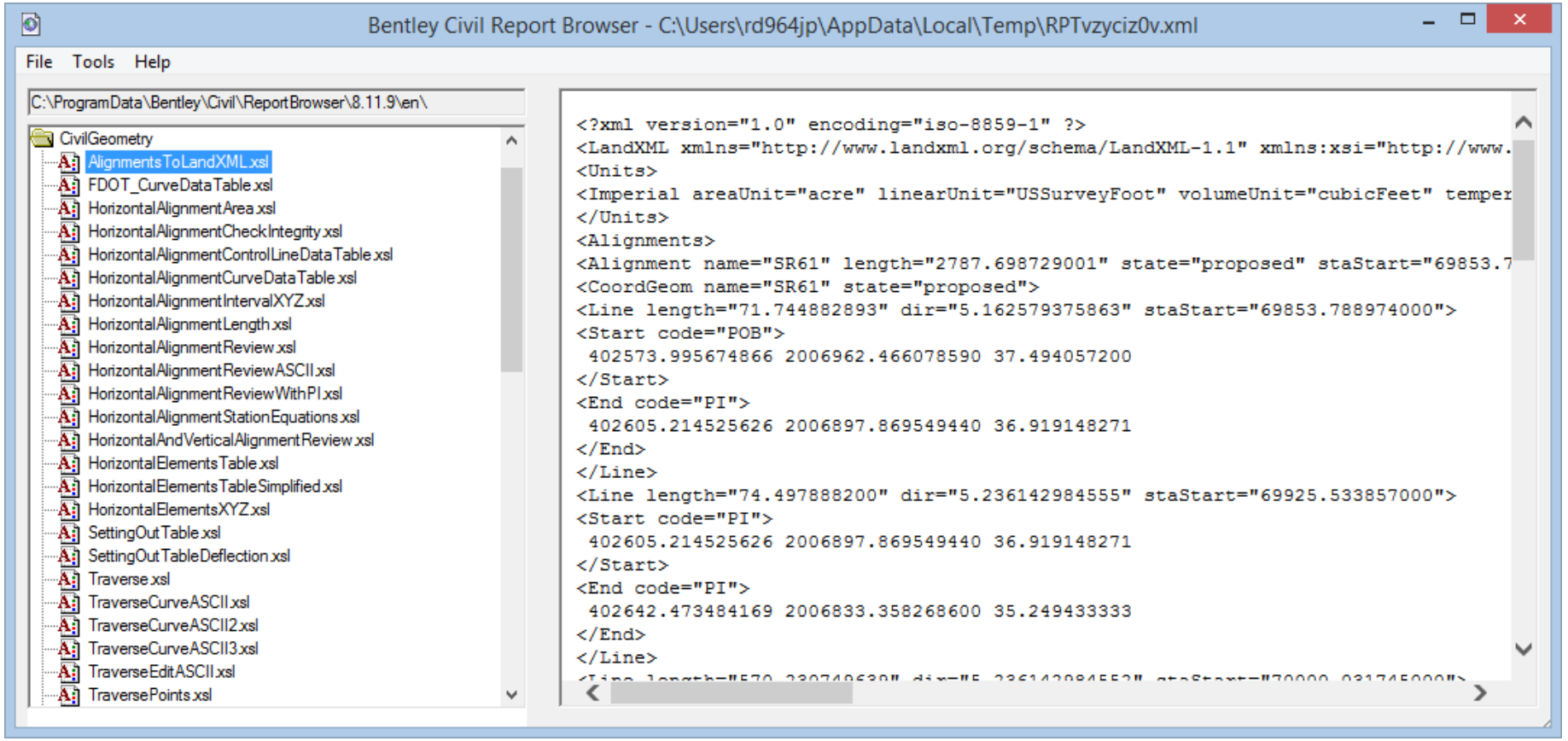
Exporting Alignments

You can export alignments and profiles directly from the elements in the DGN file.

- Open the DSGNRDxx.DGN
- Select, then hover over an alignment, to choose the "Horizontal Geometry Report" from the context menu.

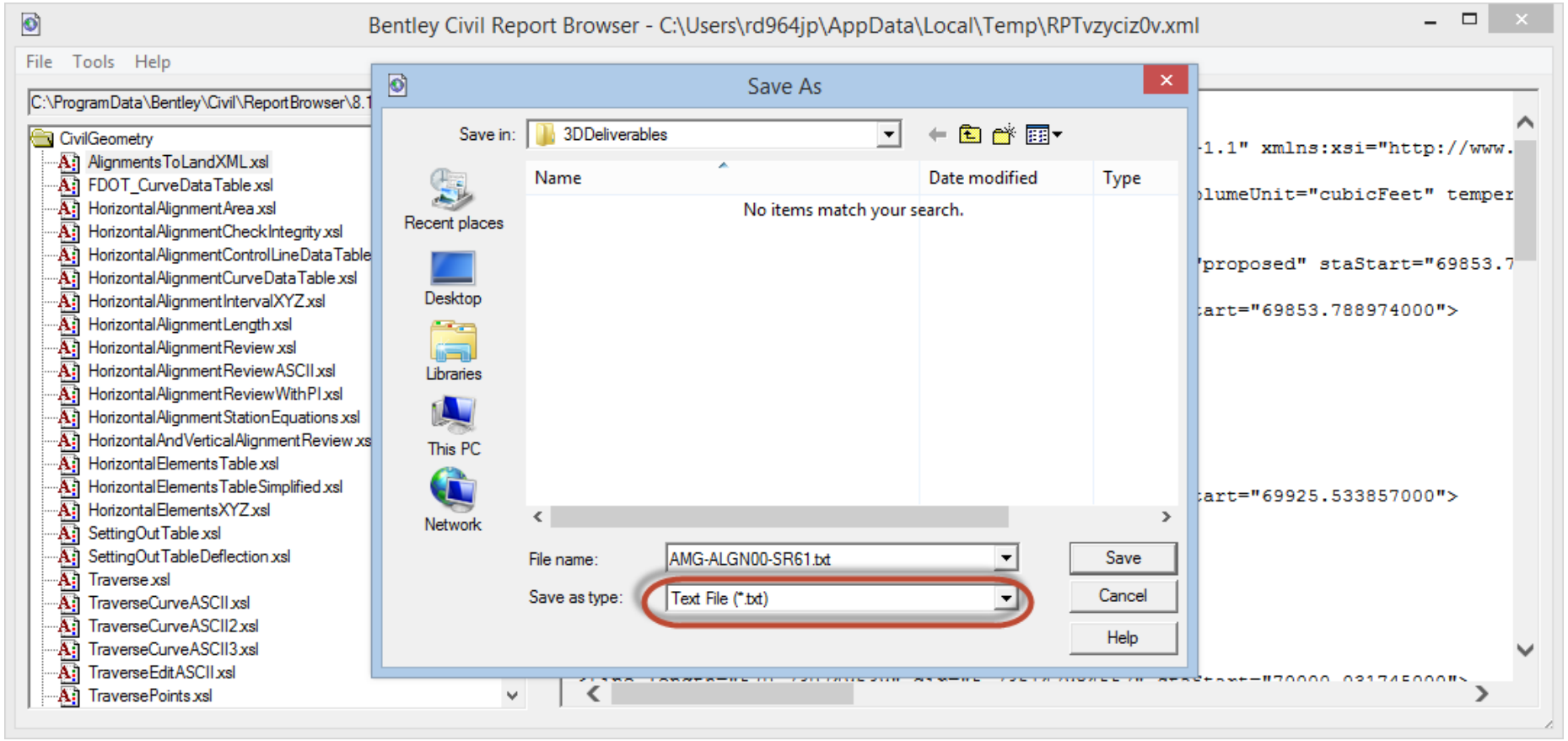
Exporting Alignments

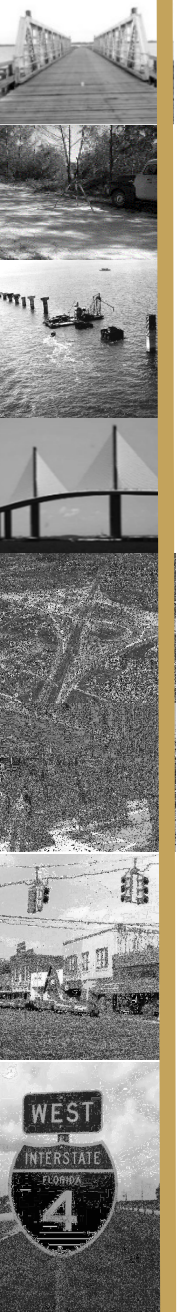
- In the Bentley Civil Report Browser select the "AlignmentsToLandXML.xsl" report.



Exporting Alignments

- Select "File > Save As" and navigate to the 3DDeliverables directory.
  - Choose "Text File(.txt)" as the "Save as type". (rename extensions later)



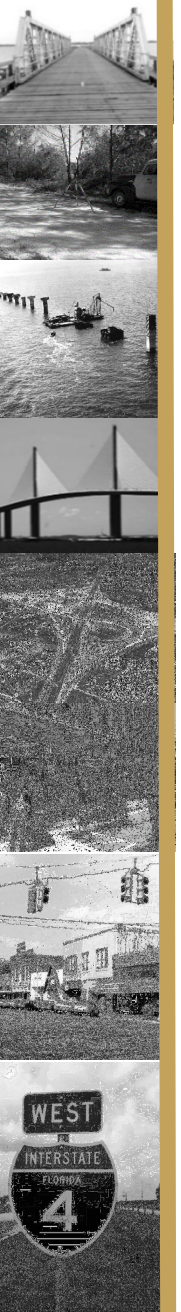


2D Proposed Planimetrics

Use MicroStation's "Save As" command to save copies of the proposed design files into the 3DDeliverables directory with AMG-2 names in DGN and DWG formats.

- AMG-2DSGNRDxx.DGN, AMG-2DSGNRDxx.DWG
- AMG-2DSGNRDxx.DGN, AMG-2DSGNRDxx.DWG
- AMG-2DSGNRDxx.DGN, AMG-2DSGNRDxx.DWG

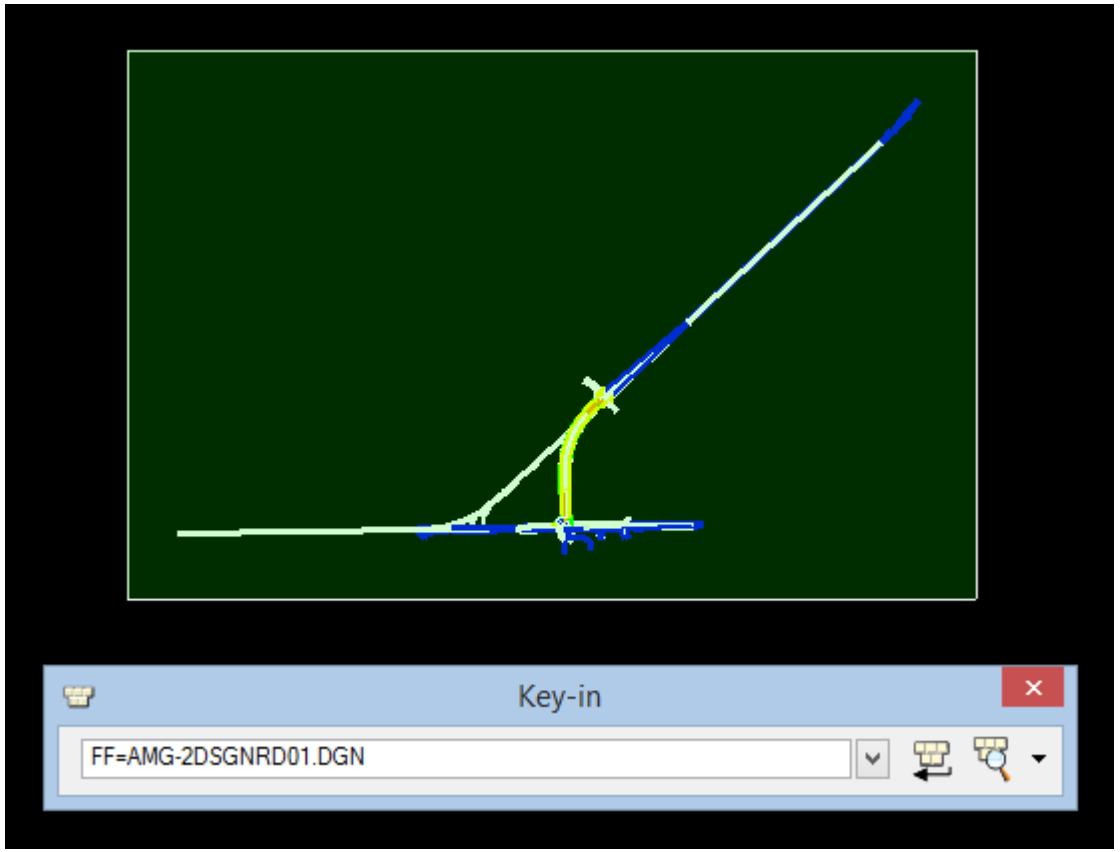
NOTE: These steps can also be used for 2D existing survey files TOPORD, DREXRD, UTEXRD

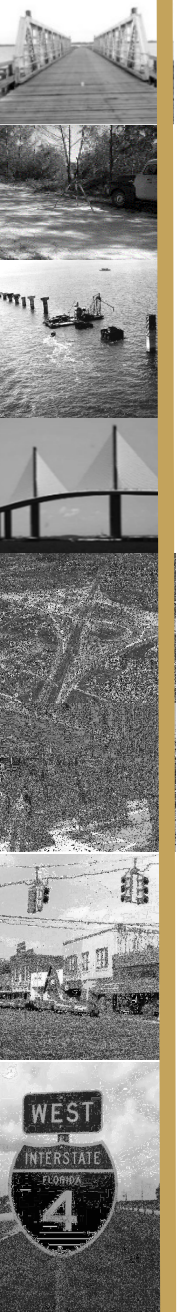


2D Proposed Planimetrics

First you need to dumb down the data.

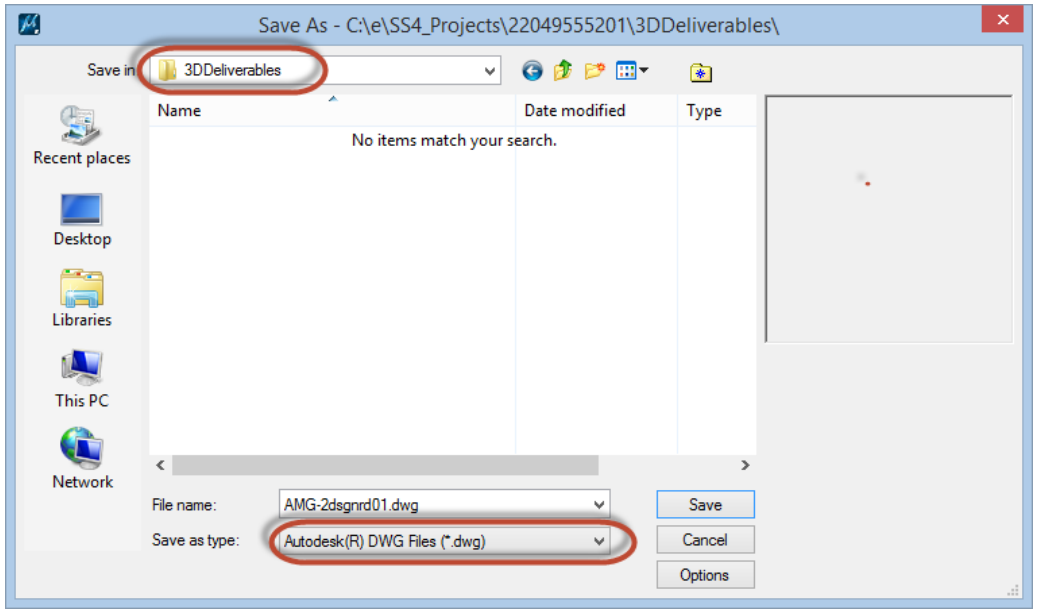
1. Use the F7 key to turn off "Construction" class elements
2. Place a Fence around all elements in the design file
3. In the Key-in window type "FF=AMG-2DSGNRDxx.DGN"
   - DataPoint to accept

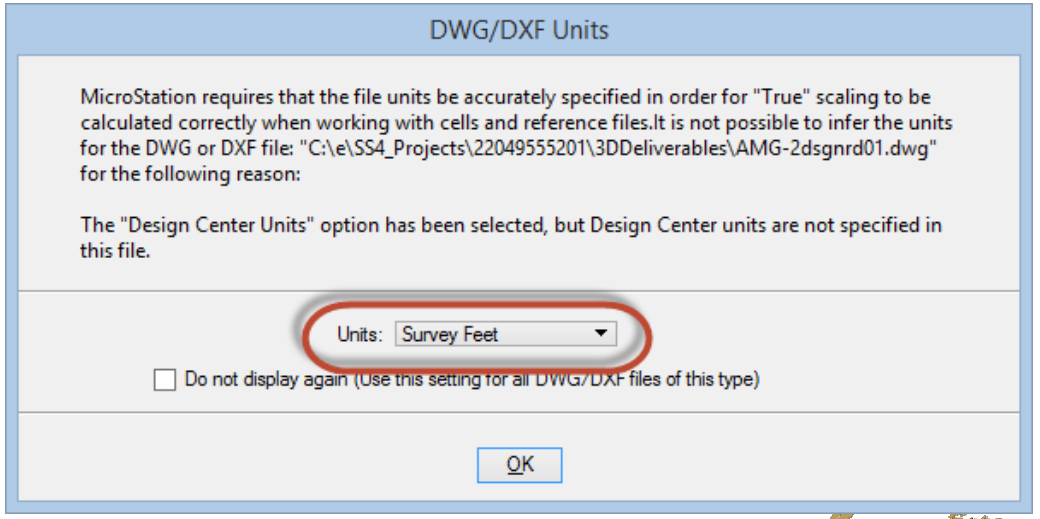


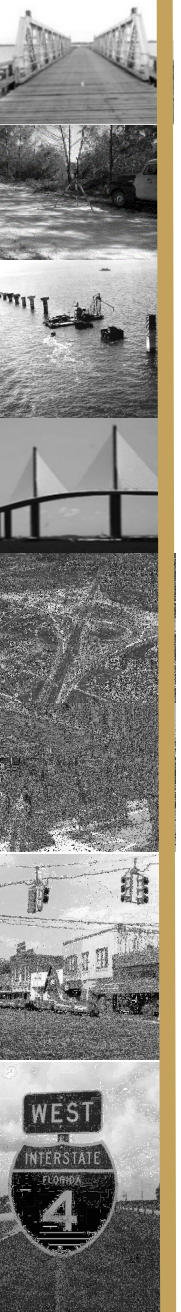


2D Proposed Planimetrics

4. Open the AMG-2DSGNRDxx.DGN design file
5. Select "File > Save As" from the MicroStation menu
6. Choose DWG as the "Save as type"
7. Navigate to 3DDeliverables directory
8. Key in the filename & Click Save.
9. Select the Units Survey Feet & click OK.





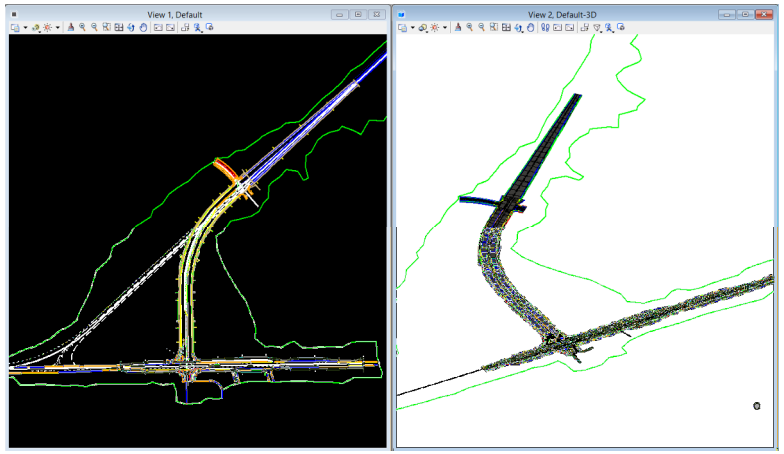


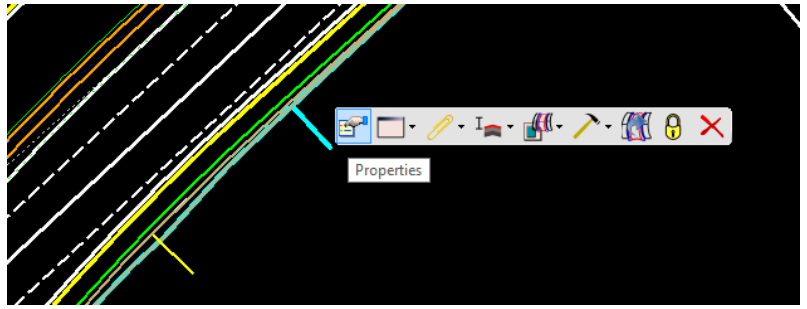
Exporting 3D Break Lines

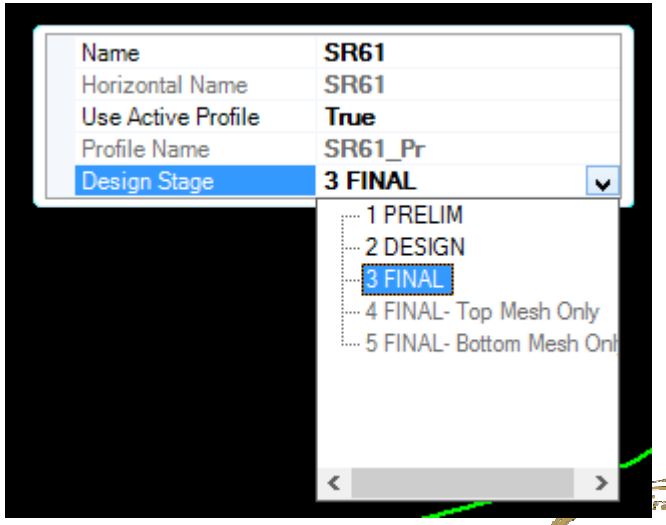
1. Open the DSGNRDxx.DGN file.
   - Display 2D and 3D views (F2)

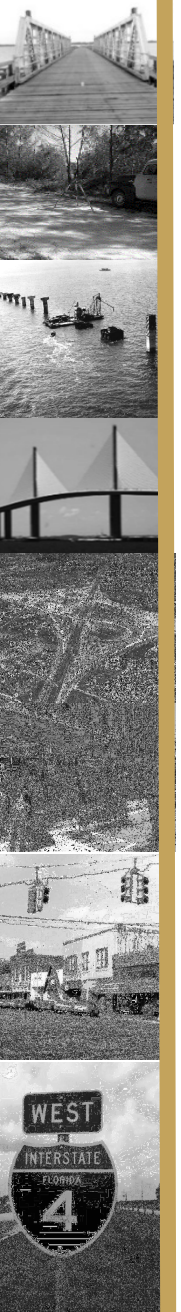
2. In 2D, Select and hover over the corridor handle then select Properties from the Context menu

3. Choose the Design Stage "3 FINAL"







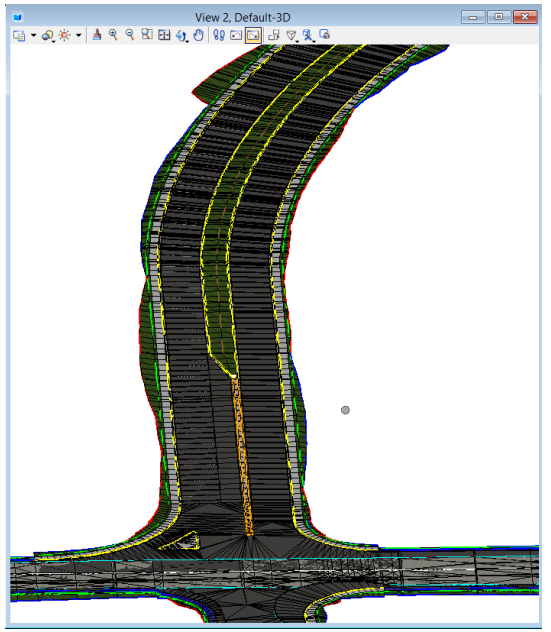


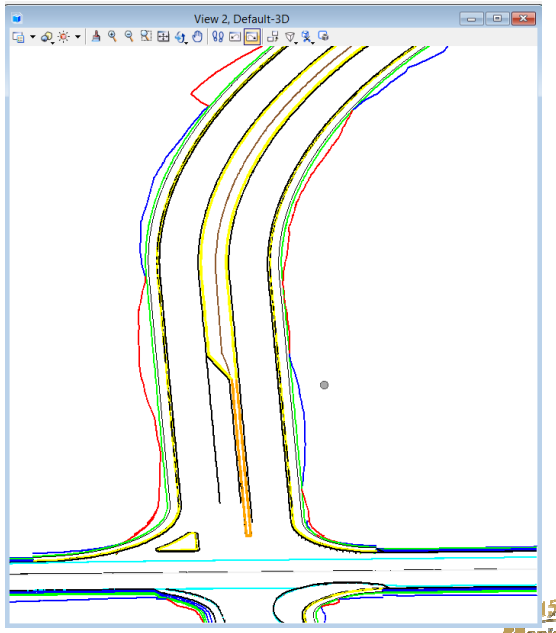
Exporting 3D Break Lines

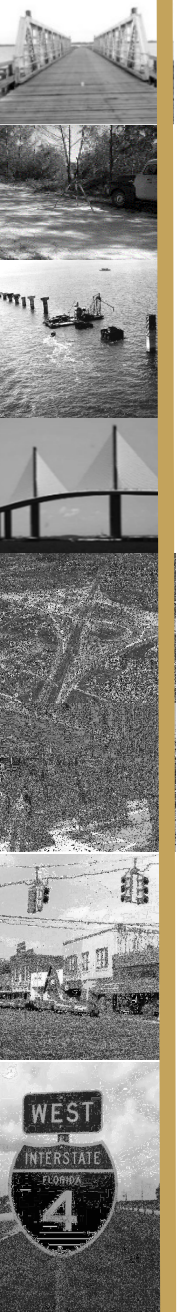
4. Click in the 3D view to give it focus then hit F7 to turn off Construction class elements

5. Hit F9 to turn off the Components, leaving only the 3D Features

6. Review the 3D lines to ensure only surface lines that you want to provide to the contractor are displayed

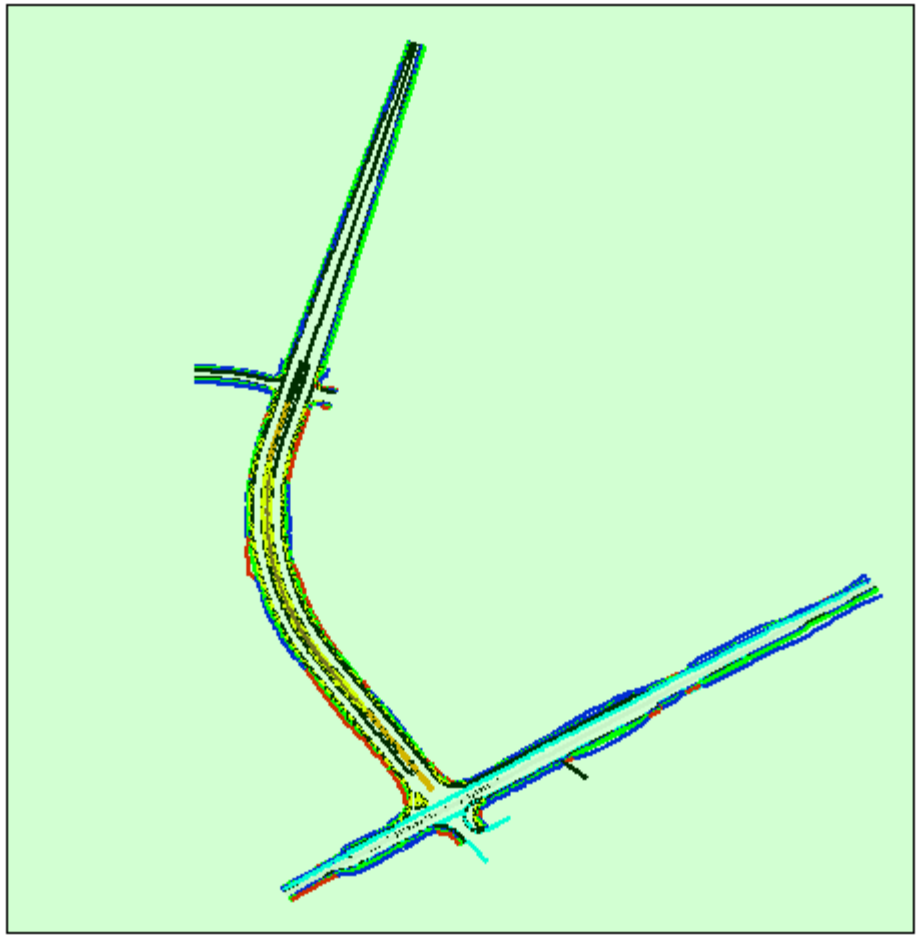


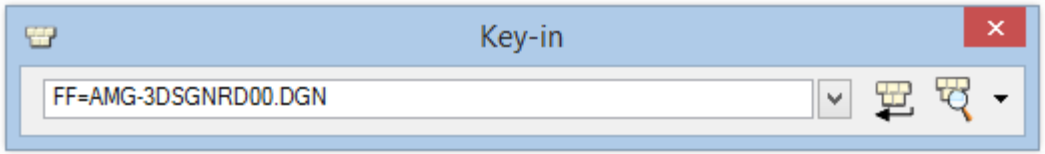


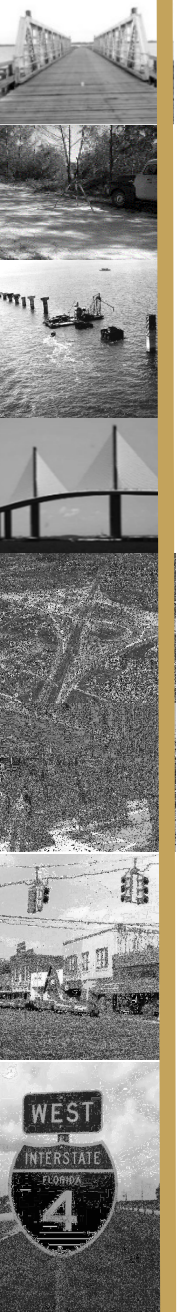


Exporting 3D Break Lines

4. Fence elements in 3D view
6. In the Key-in window type "FF=AMG-3DSGNRDxx.DGN"
   - DataPoint to accept

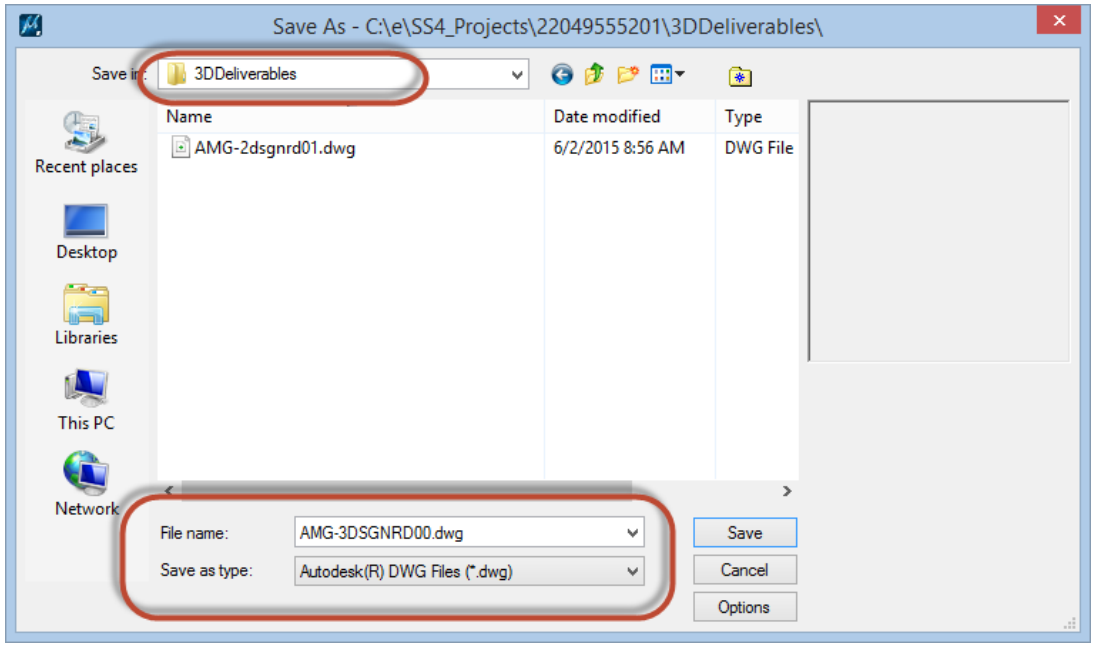


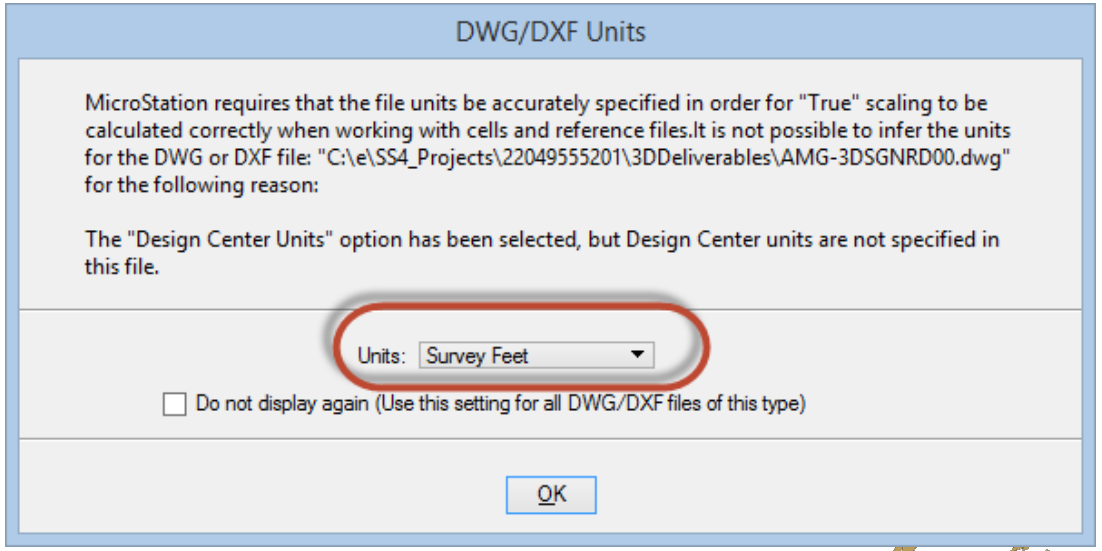


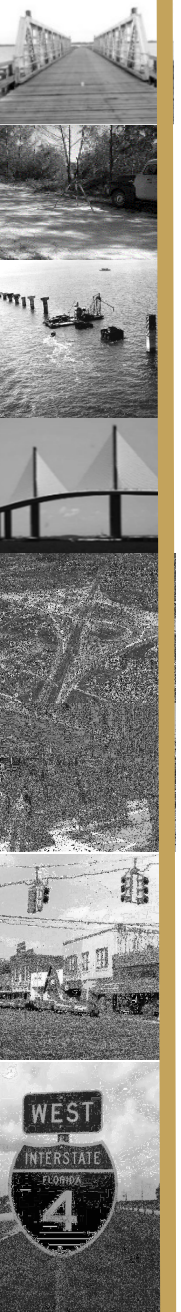


Exporting 3D Break Lines

7. Open the AMG-3DSGNRDxx.DGN design file
8. Select "File > Save As" from the MicroStation menu
9. Choose DWG as the "Save as type"
10. Navigate to 3DDeliverables directory
11. Key in the filename & Click Save.
12. Select the Units Survey Feet & click OK.

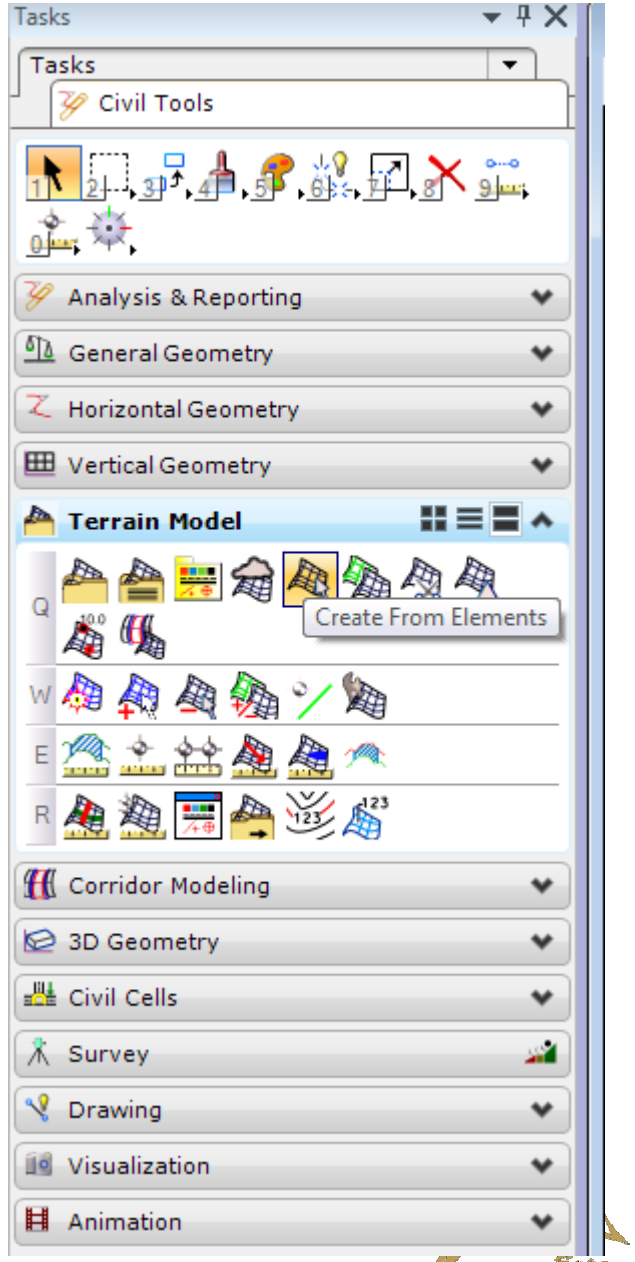


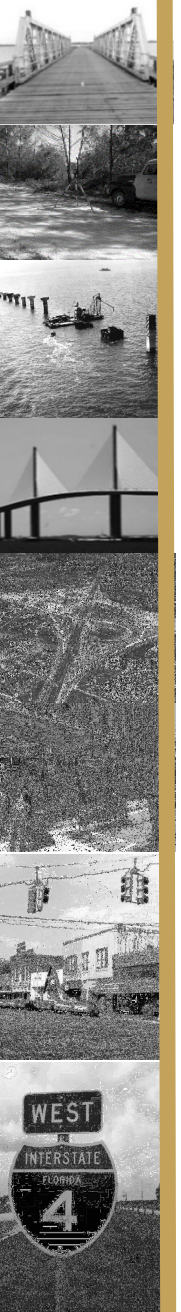




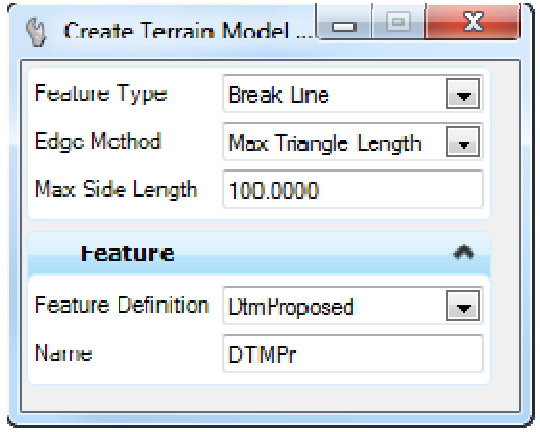
Exporting Proposed Surface

1. Create a new AMGMRDxx.DGN file
2. Open AMGMRDxx.DGN file
3. Reference the AMG-3DSGNRDxx.DGN File
4. Select all elements
5. Click "Create From Elements" on the "Civil Tools > Terrain Model" task menu.

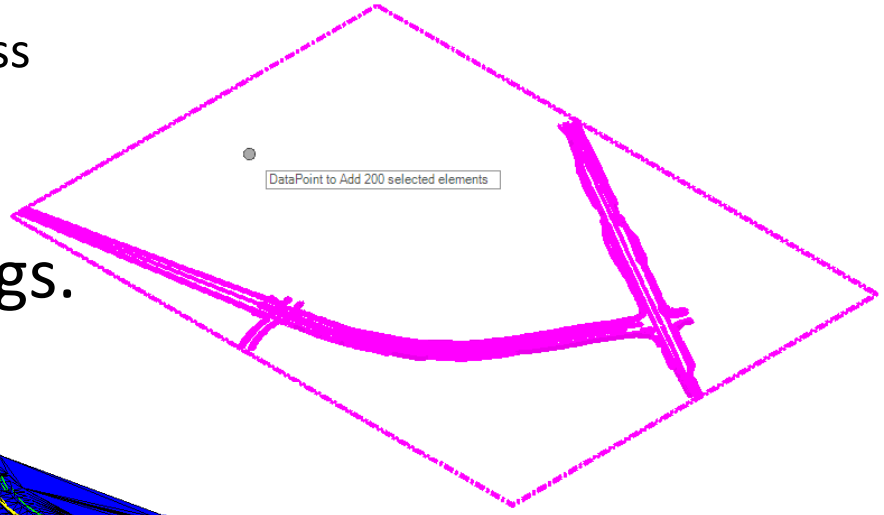




Exporting Proposed Surface

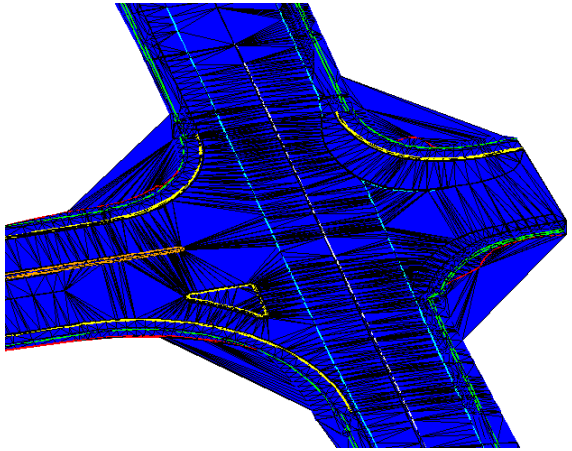


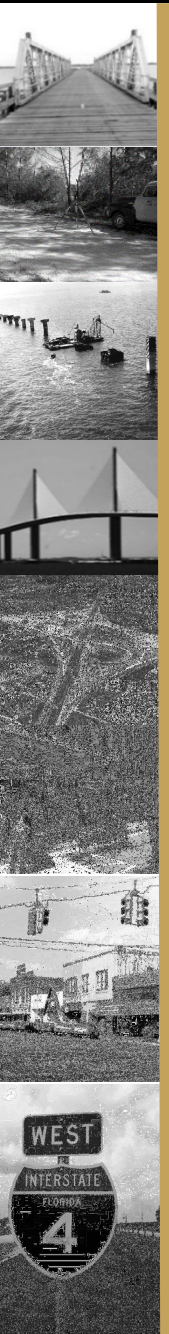
6. Set the following in the Create Terrain Model dialog:
    - Feature Type: Break Line
    - Edge Method: Max Triangle Length
    - Max Side Length: (Enter a number wide enough to cross your widest component)
    - Feature Definition: DTMProposed
7. DataPoint through prompts to accept settings.



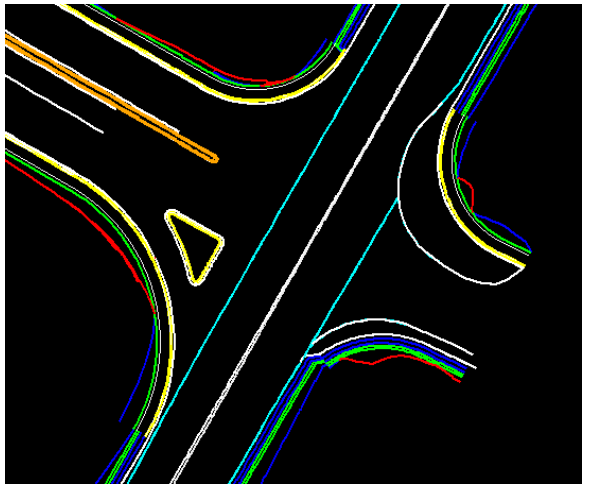
A Surface is created

- external triangles must be trimmed





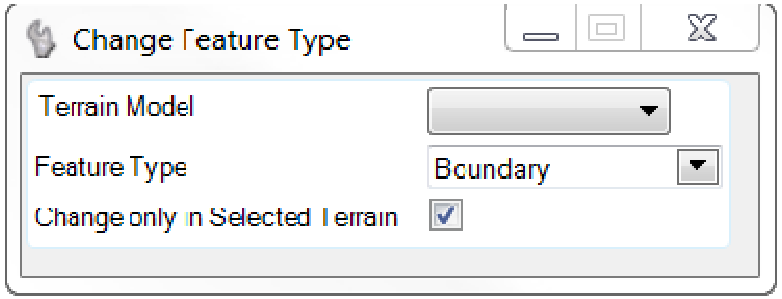
Exporting Proposed Surface

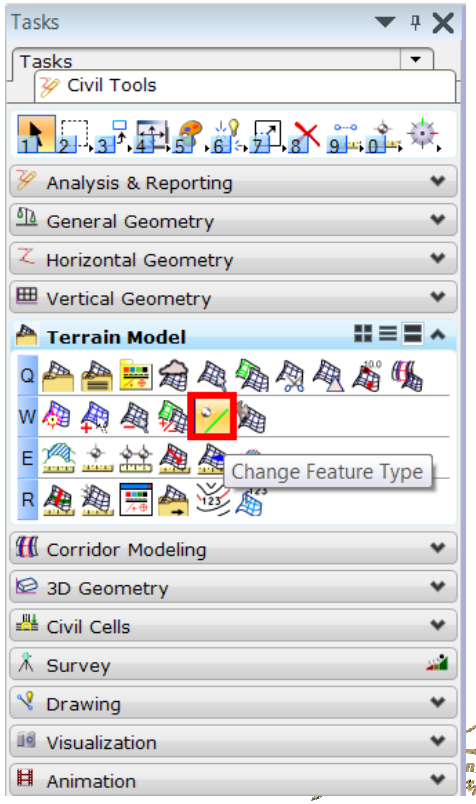


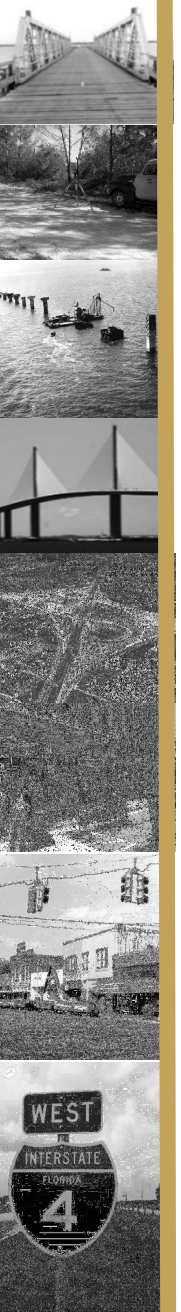
8. Use the F7 key to turn off the surface in View 1

9. Select "Change Feature Type" on the "Civil Tools > Terrain Model" task menu.

10. Set the Feature Type to Boundary



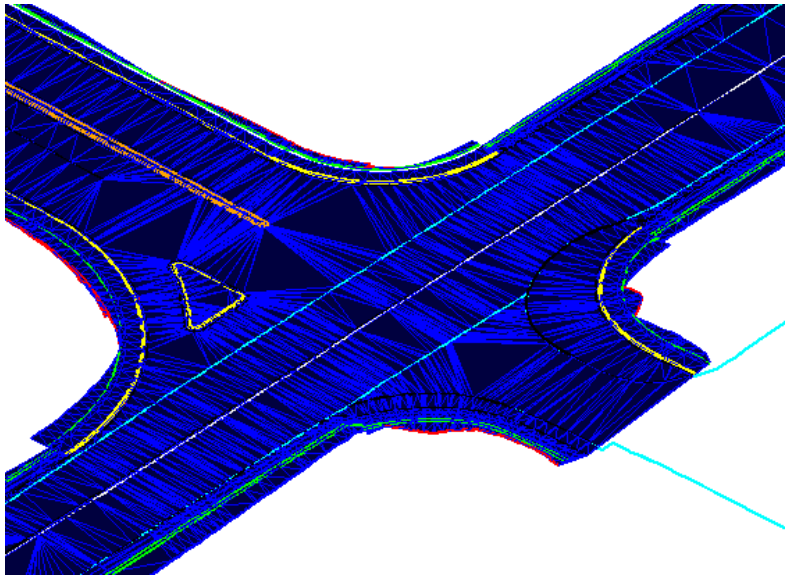


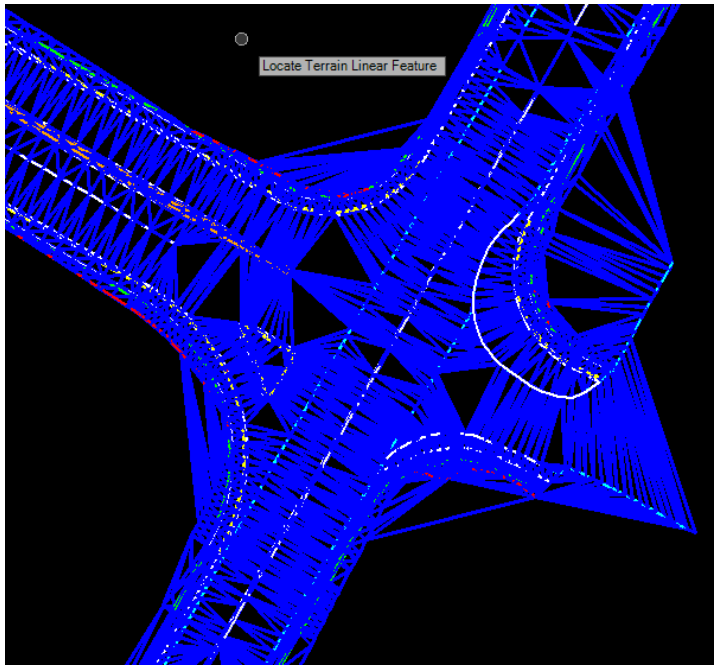


Exporting Proposed Surface

11. When prompted to "Locate Terrain Linear Features" select the cut and fill lines defining the external limits of the surface.
12. When all have been selected click the "reset button (right-click) to apply the changes.

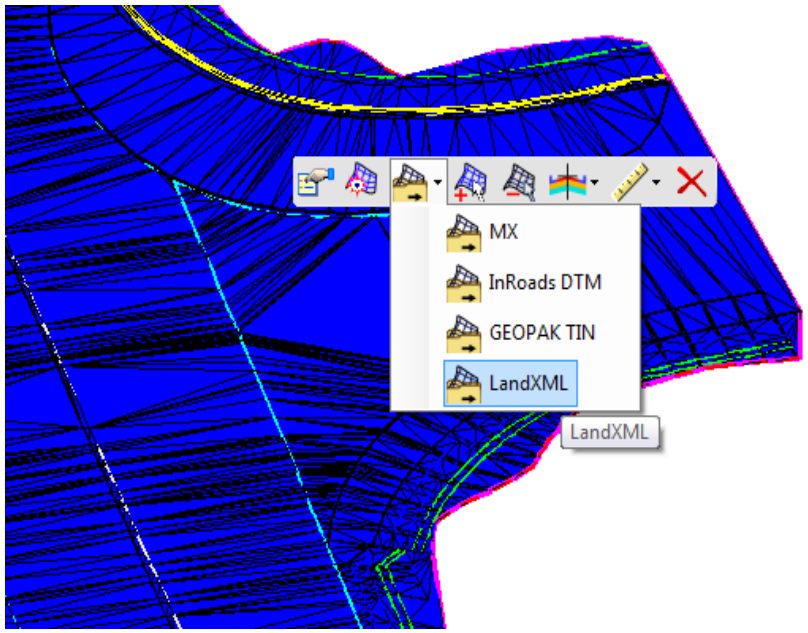
- External triangles are trimmed

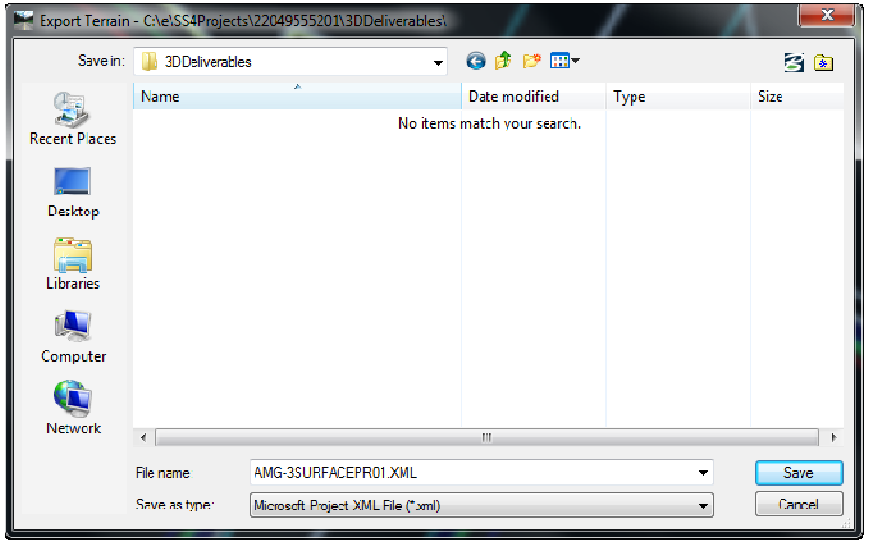


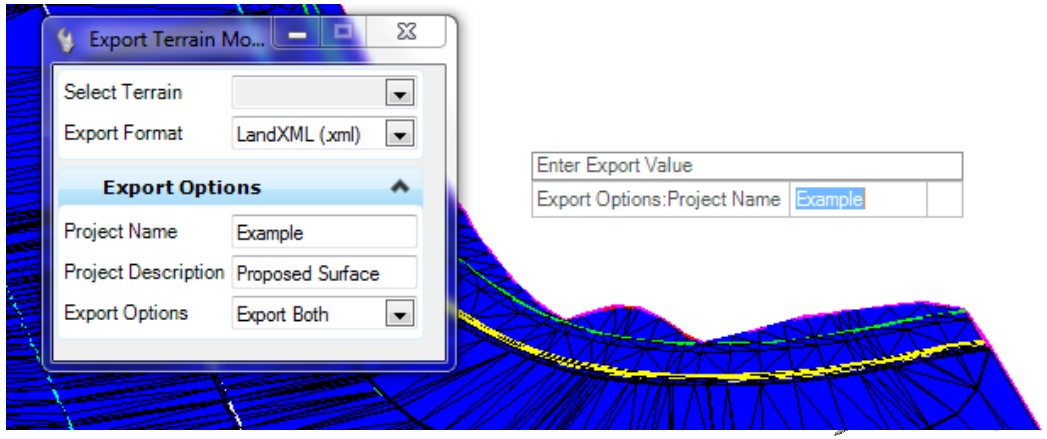


Exporting Proposed Surface

13. Select and hover over the surface then select "Export Terrain Model > LandXML".
14. When prompted navigate to the 3DDeliverables directory, key in the filename "AMG-3SURFACEPRxx.XML" and click Save.

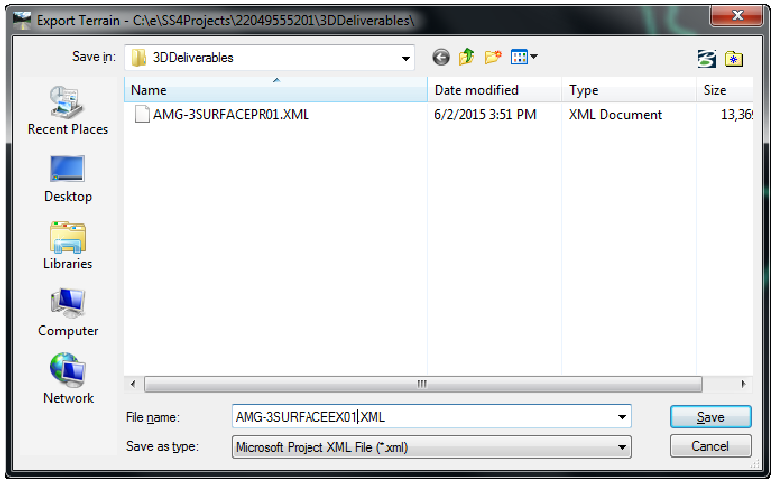


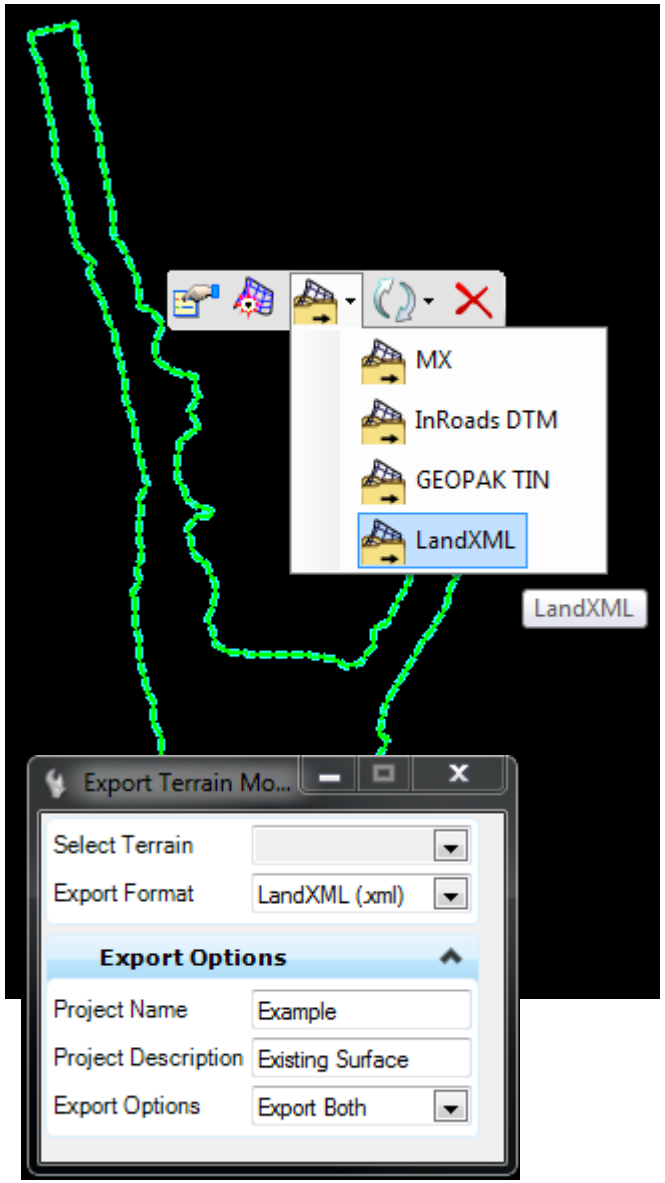


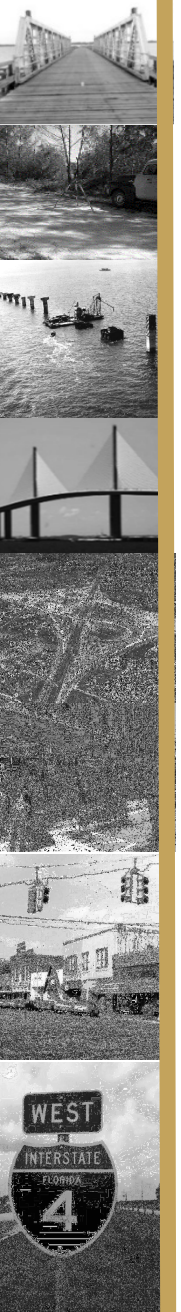


Exporting Existing Surface

1. Open the GDTMRDxx.DGN file.
2. Select and hover over the existing surface then select "Export Terrain Model > LandXML".
3. When prompted navigate to the 3DDeliverables directory, key in the filename "AMG-3SURFACEEX*xx*.XML" and click Save.

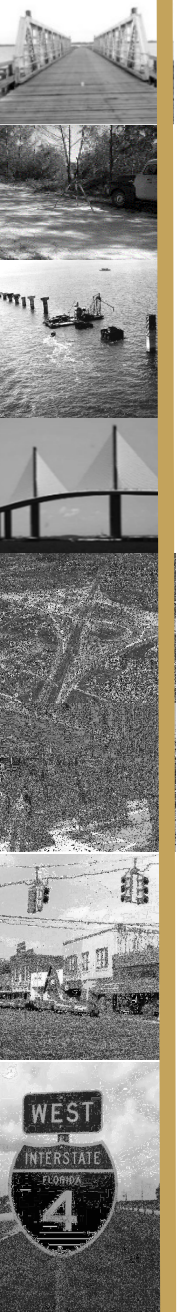






Native Design and Survey Files

- Copy the native (DGN) proposed design and survey files to the 3DDeliverables directory.
- Rename them, placing the "AMG-" prefix before the file name.



Contact Information

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