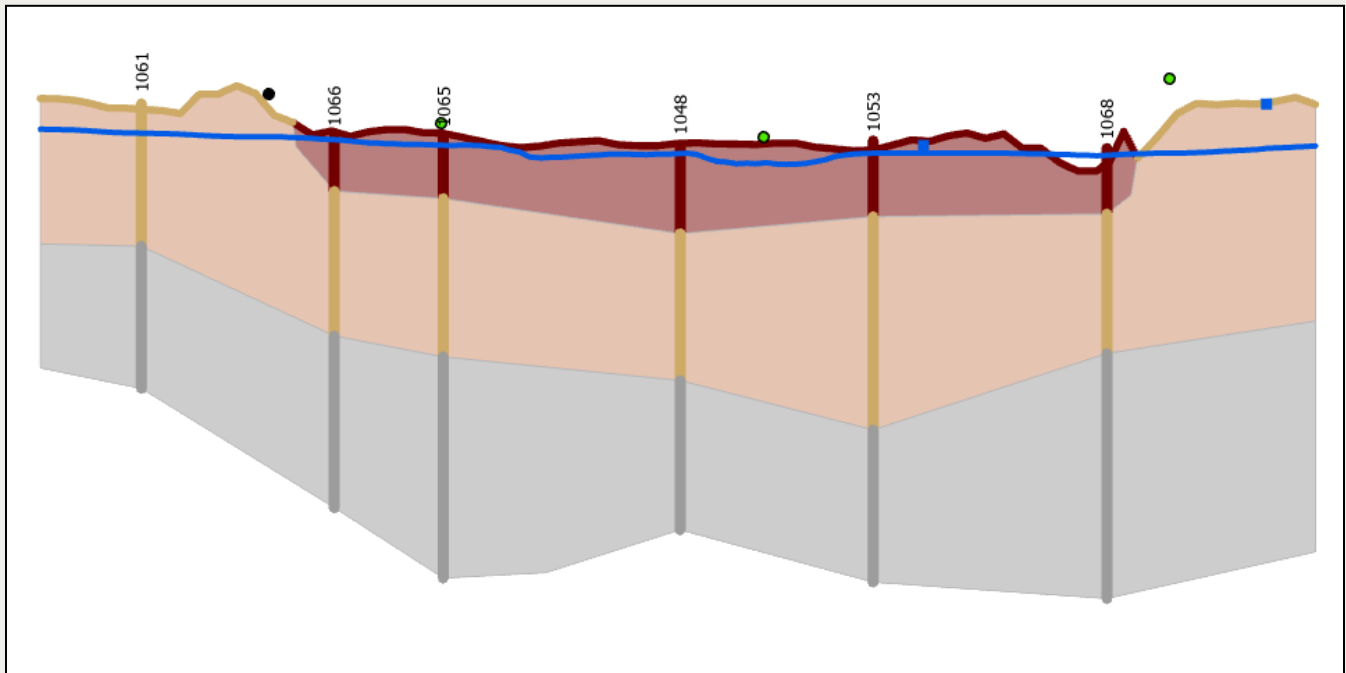




AHGW Pro 1.0 Tutorial

Subsurface Analyst – Adding XS2D Points to Cross Sections

Transform points and lines to existing cross sections in ArcGIS Pro



Objectives

Learn how to use Arc Hydro Groundwater Pro tools to transform points and lines to existing cross sections.

Prerequisite Tutorials

- Subsurface Analyst – Creating 2D Cross Sections

Required Components

- ArcGIS Pro
- Subsurface Analyst

Time

- 10–25 minutes

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1 Introduction

Arc Hydro Groundwater Pro (AHGW Pro) is a geodatabase design for representing groundwater datasets within ArcGIS Pro. The data model helps to archive, display, and analyze multidimensional groundwater data, and includes several components to represent different types of datasets, including representations of aquifers and wells/boreholes, 3D hydrogeologic models, temporal information, and data from simulation models. The *Arc Hydro Groundwater Pro Tools* help to import, edit, and manage groundwater data stored in an AHGW Pro geodatabase. *Subsurface Analyst* is a subset of the AHGW Pro Tools that is used to manage 2D and 3D hydrogeologic data, and create subsurface models including generation of borehole representations, cross sections, surfaces, and volumes.

This tutorial will demonstrate how to transform points and lines to existing cross sections.

1.1 Background

This tutorial will demonstrate how to add points to existing cross sections. A separate tutorial, named “Creating 2D Cross Sections”, describes the process of creating 2D cross sections in ArcGIS Pro. The result from that tutorial is a map document with two cross section data frames A-A' and B-B', represented in views in ArcGIS Pro. In this tutorial, additional information will be beaded from point and line features representing transportation features (roads and railroad) and gas stations (Figure 1). Data used in this tutorial was modified from its original source and some of the data are mock datasets created for the purpose of this tutorial.



Figure 1 Map layout including overview map and cross sections A-A' and B-B' created in a previous tutorial

1.2 Outline

The objective of this tutorial is to introduce the basic workflow and tools for transforming lines and point features onto cross sections in ArcGIS Pro. The tutorial includes the following steps:

1. Create an XS2D Point feature class for storing new XS2D point features.
2. Transform lines to XS2D Points.
3. Transform points to XS2D Points.
4. Visualize the transformed features in the cross sections.

1.3 Required Modules/Interfaces




The following components should be enabled in order to complete this tutorial:

- ArcGIS Pro license.
- Arc Hydro Groundwater Pro Tools.
- AHGW Pro Tutorial Files.

The AHGW Pro Tools require that a compatible ArcGIS Pro service pack be installed. Check the AHGW Pro Tools documentation to find the appropriate service pack for your version of the tools. The tutorial files should be downloaded and saved on a local drive.

2 Getting Started

To start, open the project file for this tutorial.

1. If necessary, launch *ArcGIS Pro*.
2. If on the *ArcGIS Pro* start page, select  **Open another project** in the bottom-right corner of the window to open the *Open Project* dialog.
3. If already in the user interface, use the  **Open** macro to open the *Open Project* dialog.
4. Browse to the location with tutorial files for this tutorial.
5. In the *SubsurfaceAnalystPro\XS2D Points* folder, select the file “ XS2D Points.aprx”.
6. Click **OK** to import the project and close the *Open Project* dialog.

Once the file has loaded, a map of the model domain with precreated cross sections should appear (Figure 2).

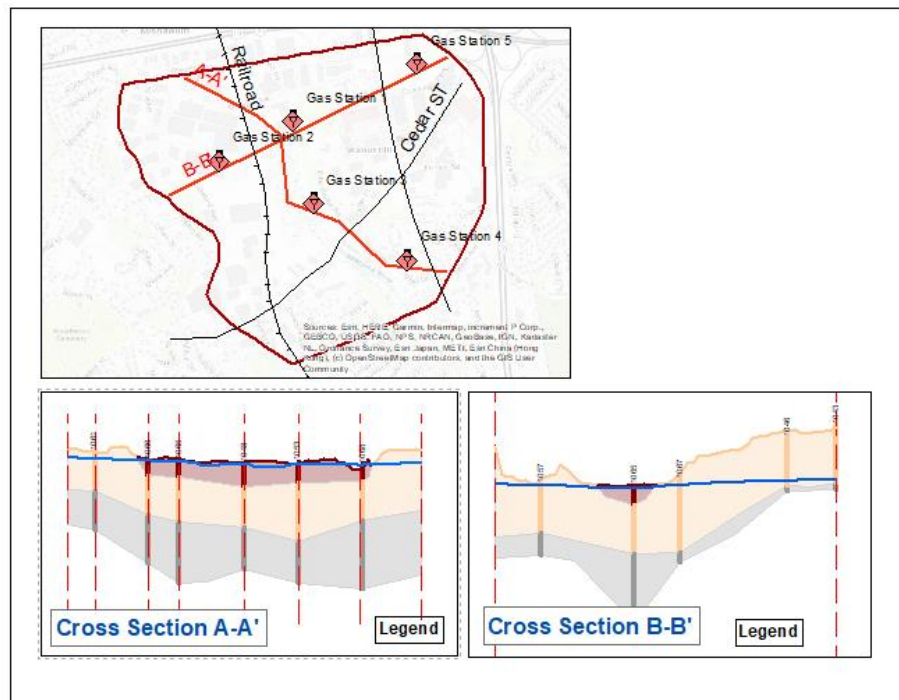








Figure 2 Map of the model domain with cross sections

Next, ensure that the AHGW Pro tools are correctly configured.





7. In the *Catalog* pane, expand the  **Toolboxes** list. Check if “ ArcHydroGroundwater.pyt” is there. If it is not there, follow steps 8-10.
8. In the *Catalog* pane, right-click on **Toolboxes** and use the  **Add Toolbox** command to open the *Add Toolbox* dialog.
9. In the *Add Toolbox* dialog, browse to the location where the Arc Hydro Groundwater Toolbox files were saved.
10. Select “ ArcHydroGroundwater.pyt” and click **OK**.

 "ArcHydroGroundwater.pyt" now appears in the *Toolboxes* list. When using geoprocessing tools, it's possible to set the tools to overwrite outputs by default, and automatically add results to the map/scene. To set these options:

11. On the ribbon, select the *Project* tab.
12. From the list on the left, select **Options** to open the *Options* dialog.
13. In the list on the left of the dialog, under *Application*, select *Geoprocessing*.
14. Ensure that *Allow geoprocessing tools to overwrite existing datasets* and *Add output datasets to an open map* are turned on.
15. Select **OK** to exit the *Options* dialog.
16. Using the  arrow in the upper-left corner, return to the main user interface.

3 Creating an XS2D Point Feature Class



This tutorial will show how to transform transportation features (lines) and gas stations (points) into XS2D points. Before transforming features to the cross sections, create feature classes to hold the transformed lines/points.

1. Select the *Map* view.
2. In the *Catalog* pane, expand  "ArcHydroGroundwater.pyt",  "Subsurface Analyst", and  "XS2D Editor".
3. Double-click on the  "Create XS2D Point Feature Class" tool to open the *Create XS2D Point Feature Class* tool in the *Geoprocessing* pane.
4. For *Input SectionLine Features* select "SectionLine".
5. For *Input XS2D Catalog Table* select "XS2D_Catalog".
6. For *XS2DType value of the XS2D point features* enter "XS2DPoints".
7. For *Feature class name prefix* enter "XS2DPoints".
8. Select **Run** to run the *Create XS2D Point Feature Class* tool.

The feature classes are not automatically added. They will be added at a later step.

4 Transforming Line and Point Features to XS2D Points

Next, populate the new XS2D point feature classes by transforming lines representing transportation features (railroad and roads). The features are intersected with the section lines, and elevations are read from a raster surface (e.g. digital elevation model). This forms a 3D point which is projected onto the selected cross section.

1. In the *Catalog* pane, under  "ArcHydroGroundwater.pyt" | *Subsurface Analyst* | *XS2D Editor*, double-click on the  "Transform Lines to XS2D Points" tool to open the *Transform Lines to XS2D Points* tool in the *Geoprocessing* pane.
2. For *Input Polyline Features* select "Transportation."
3. For *Input SectionLine Features* select "SectionLine".
4. For *Input XS2D_Catalog Table* select "XS2D_Catalog".
5. For *XS2DType* select "XS2DPoints".




Note that this value is read from the XS2D_Catalog table and is based on the input provided when creating the XS2D point feature class.

6. For *FType value of the features to create* enter "Transportation".



This value will be written to the FType field in the new XS2D point features.

7. For *Ground Surface DEM or Raster Elevation Source* select "dem100ft".
8. Leave the *Overwrite Existing XS2D Point Features* option turned on.
9. Select **Run** to run the *Transform Lines to XS2D Points* tool.

When finished, new features should be added to the XS2DPoints_1 and XS2DPoints_2 feature classes. However, these feature classes still need to be added to a view. To do so, follow these steps:



10. Select the *Section A-A'* view.
11. In the *Catalog* pane, under *Databases*, right-click on "woburn_xs2d_points.gdb" and select  **Refresh**.
12. On the ribbon, go to the *Map* tab.
13. Select  **Add Data** to open the *Add Data* dialog.
14. In the data tree on the left, under  *Project*, browse to *Databases\woburn_xs2d_points.gdb\Data*, and select "XS2DPoints_1".
15. Click **OK** to import "XS2DPoints_1" and close the *Add Data* dialog.

Three new points should appear in the *Section A-A'* view. Now, the XS2DPoints_2 feature class will be added to the *Section B-B'* view.

16. Select the *Section B-B'* view.
17. On the ribbon, go to the *Map* tab.
18. Select  **Add Data** to open the *Add Data* dialog.
19. In the data tree on the left, under  *Project*, browse to *Databases\woburn_xs2d_points.gdb\Data*, and select "XS2DPoints_2".
20. Click **OK** to import "XS2DPoints_2" and close the *Add Data* dialog.

Two new points should appear in the *Section B-B'* view.

Next, transform point features representing gas stations and append them to the XS2D point feature class:

21. Select the *Map* view.
22. On the ribbon, go to the *Map* tab.
23. Select the **Select**  tool.
24. Using the **Select**  tool, hold down the *Shift* key then select the SectionLine A-A' and Gas Stations 1, 3, and 4.

At this point the selections should be similar to Figure 3. When we run the transform tool only the selected points will be projected to the selected cross sections.

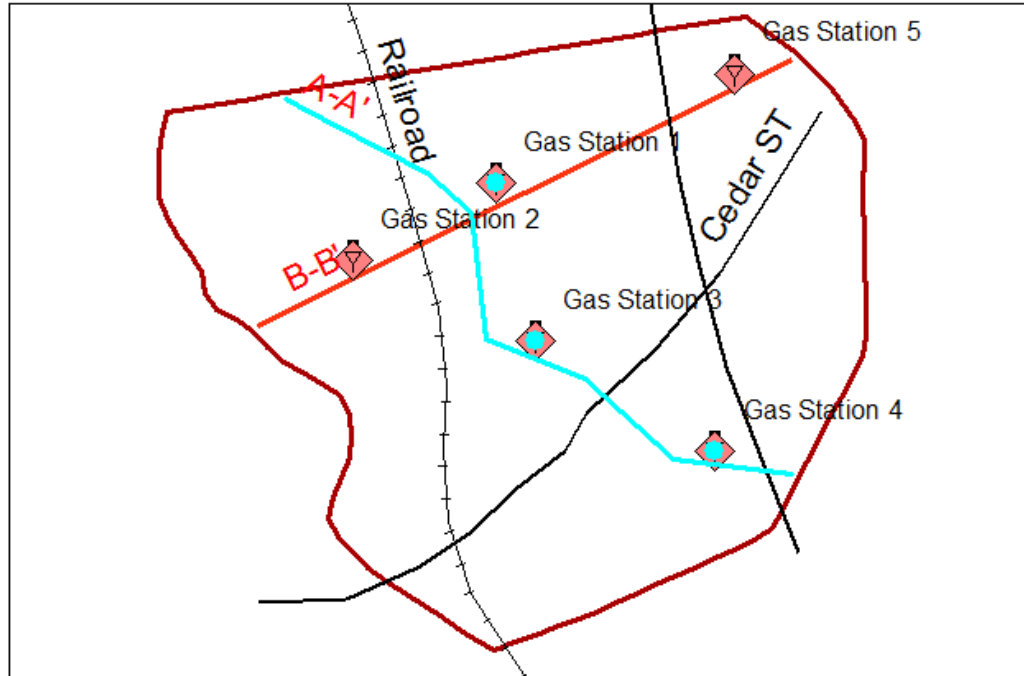


Figure 3 Selection of features before running the Transform Points to XS2D Points tool

25. In the *Catalog* pane, under *ArcHydroGroundwater.pyt* | *Subsurface Analyst* | *XS2D Editor*, double-click on the "Transform Points to XS2D Points" tool to open the *Transform Points to XS2D Points* tool in the *Geoprocessing* pane.
 26. For *Input Point Features* select "GasStations".
 27. For *Input SectionLine Features* select "SectionLine".
 28. For *Input XS2D_Catalog Table* select "XS2D_Catalog".
 29. For *XS2DType* select "XS2DPoints".
 30. For *FType* value of the features to create enter "Gas station".
This value will be written to the *FType* field in the new XS2D point features.
 31. For *Ground Surface DEM or Raster Elevation Source* select "dem100ft".
 32. Turn off the *Overwrite Existing XS2D Point Features* option.
 33. Select **Run** to run the *Transform Points to XS2D Points* tool.
- Upon completion, a set of points will be added to the XS2DPoints_1 feature class. Now, to symbolize the features based on their type. To symbolize the XS2D points:
34. Select the *Section A-A'* view.
 35. In the *Contents* pane, right-click on "XS2DPoints_1" and select **Symbolology** to open the *Symbolology - XS2DPoints_1* pane.
 36. In the drop-down below *Primary Symbolology*, select "Unique Values".
 37. Change the *Field 1* drop-down to "FType".
 38. Click **Add all values**.
 39. Modify the colors and size of the symbols as desired.

Access the editor for the color and size of the symbols by clicking on the symbol icon in the *Classes* table at the bottom of the *Symbolology* pane.

At the end of this process there should be XS2D points showing the intersection of line features (representing railroads and roads) with section line A-A', and the location of point features (e.g. gas stations) along the section line (Figure 4).

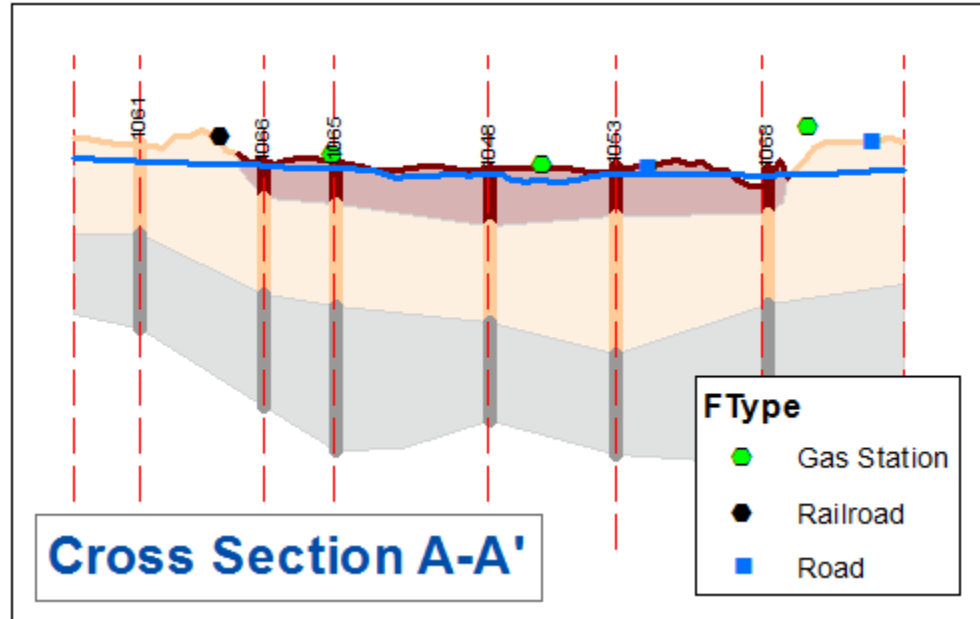


Figure 4 XS2D Points added to cross section A-A'

40. Repeat steps 21–39 to add and symbolize points in cross section B-B'. Apply the following changes:

- In step 24, change the selection to B-B' section line and to gas stations 2, 1, and 5 along section line B-B'.
- If desired, instead of steps 25-32, go to the *Analysis* ribbon tab and select **History** to open the *History* pane. Select the most recent run of the *Transform Points to XS2D Points* tool. This opens the tool with all of the appropriate settings already selected.
- In step 34, select the *Section B-B'* view.
- In step 35, right-click on "XS2DPoints_2".

Upon completion, cross section B-B' should be similar to the one shown in Figure 5.

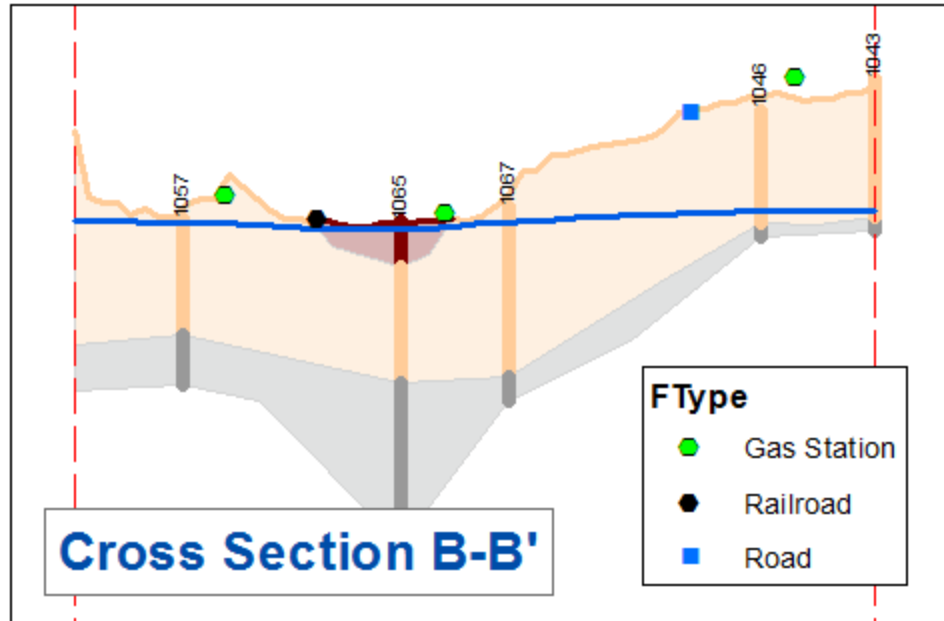


Figure 5 XS2D Points added to cross section B-B'

5 Conclusion

This concludes the tutorial. Here are some of the key concepts in this tutorial:

- XS2D points can be added to a cross section to represent a wide array of features.
- The *Transform Lines to XS2D Points* tool creates XS2D Points representing the intersection of line features with section lines.
- The *Transform Points to XS2D Points* creates XS2D Points representing point features along the section lines.