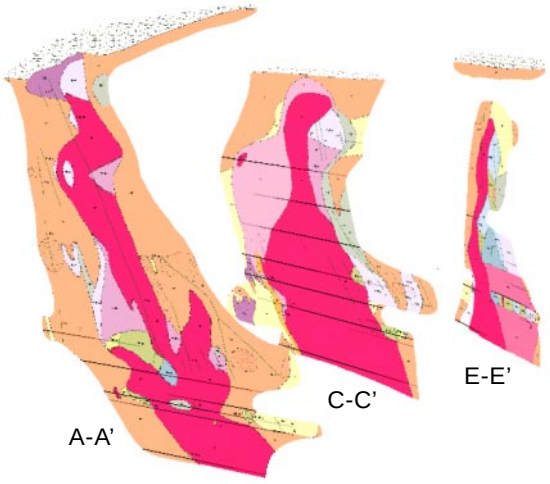
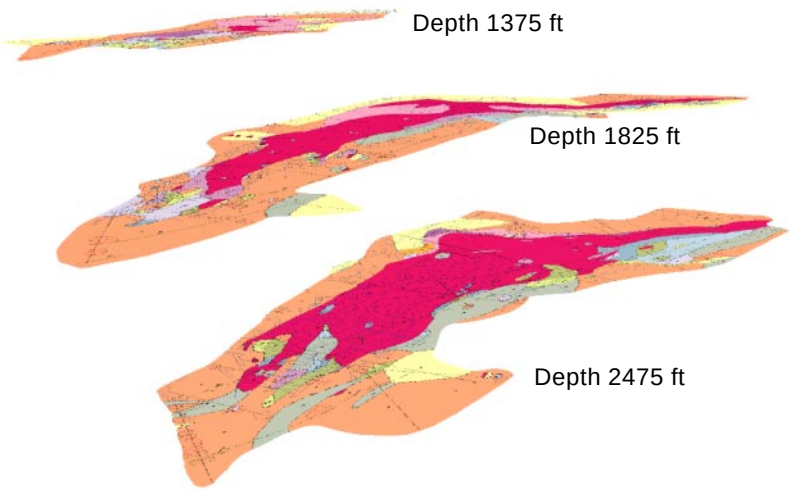
3D Subsurface Model Using Manifolds

Manifolds can be used in TNT 3D perspective views to depict cross-sections with any orientation. You can also use multiple manifold sections with different locations and orientations in a single view to reveal the 3D geometry of objects, such as geologic units in the subsurface. The subsurface model on this page shows the shape of the ore body and enclosing rock units at a subsurface iron mine in Missouri, USA. The mine workings include vertical shafts connecting networks of horizontal tunnels at various depths below the surface. The model incorporates geologic maps (horizontal sections) of selected depth levels and interpreted vertical cross-sections, each of which has been georeferenced with 3D control points to create a planar manifold surface. The perspective view with both horizontal and vertical sections can be viewed from any orientation to help visualize the 3-dimensional shape of the ore body and other rock units.

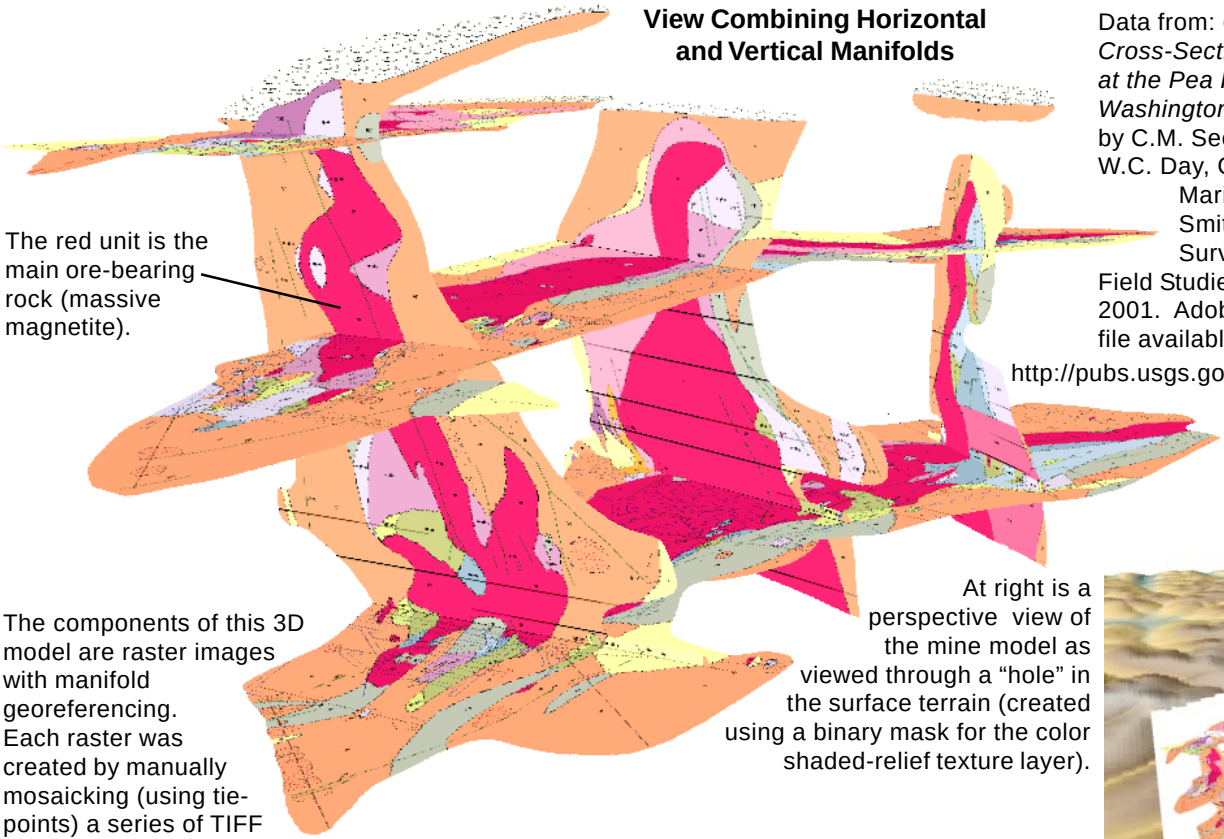
Perspective View of Vertical Section Manifolds



Perspective View of Horizontal Section Manifolds



View Combining Horizontal and Vertical Manifolds

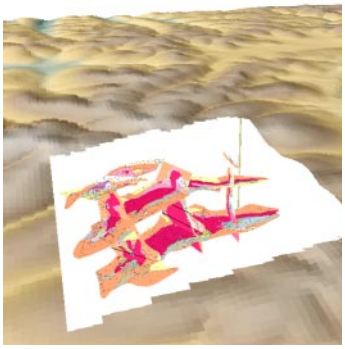


The red unit is the main ore-bearing rock (massive magnetite).

Data from: *Geologic Maps and Cross-Sections of Mine Levels at the Pea Ridge Iron Mine, Washington County, Missouri*, by C.M. Seeger, L.M. Nuelle, W.C. Day, G.B. Sidder, M.A. Marikos, and D.C. Smith; U.S. Geological Survey Miscellaneous Field Studies Map MF-2353, 2001. Adobe Acrobat (PDF) file available online at:
http://pubs.usgs.gov/mf/2001/mf-2353/

The components of this 3D model are raster images with manifold georeferencing. Each raster was created by manually mosaicking (using tie-points) a series of TIFF files screen-captured from displays of the large-format pages in the source PDF file. Vector versions of the maps and sections (if available) would produce a better-quality display.

At right is a perspective view of the mine model as viewed through a "hole" in the surface terrain (created using a binary mask for the color shaded-relief texture layer).



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