

Converting Adobe Illustrator Maps to ArcMap Format

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BACKGROUND

The Nevada Bureau of Mines and Geology has developed a new cartographic production system for completion of geologic maps. Under this new system, all *new* maps will be completed using ESRI's (Environmental Systems Research Institute) ArcGIS Desktop software package—from initial digitization of lines through final layout design. Previously, a combination of software applications were used, which included Adobe Illustrator, ESRI ArcView 3.x, ESRI ArcInfo, Canvas, Microsoft Excel, and Avenza Map Publisher. Since the new cartographic production system is used for *new* maps, most geologic maps presently available at the Nevada Bureau of Mines and Geology are in Adobe Illustrator format and need to be converted to ArcMap format.

Various factors help us to determine whether a map will be converted to ArcMap format. We take into consideration time, effort, difficulty, and cost. For example, if an Illustrator map has been released as an Open-File Report (and therefore does not have a full office or field review), and a geologist decides to finalize the map for publication (full review) with minimal changes to the geology, we will opt to finalize in Illustrator rather than make the conversion. In instances, however, where funding for conversion is available or a request for conversion is submitted by geologists mapping in a particular area where a GIS (geographic information system) version will be beneficial, conversion of those maps under consideration will need to be implemented.

After a map is converted to ArcMap, final file types include an ArcMap document (.mxd), a geodatabase (.mdb), a topographic base map (.tif), and the digital file used for publication (.pdf). With the exception of the publication digital file, which is used for web and sales purposes at our agency, all those listed above are common GIS file formats for use with current versions of ArcMap. Other file types can be exported from these formats, which allows us to meet specific project requirements and provide digital data to those whose software applications are not compatible with the formats we typically provide.

There are substantial benefits to using the geodatabase format because all information in that format is bundled together as opposed to comprising a collection of shapefiles, coverages, dxfs, linked text documents, various projection files, etc., that make up the final map files. Although some of these files are generated as intermediate steps during the conversion process, they no longer need to be included in our final files after a map has been fully converted. The final digital files are few in number, organized, and pre-defined, which results in easy data transfer and viewing between colleagues, clients, and customers.

HOW THE ILLUSTRATOR MAPS COMPARE WITH THE ARCMAP MAPS

We have worked hard to make our ArcMap maps match the cartographic quality of our Illustrator maps. Improvements over the years to the ESRI software suite's cartographic functionality and presentation have made it possible to complete high-end cartographic products entirely in ArcGIS. Specific tools such as the Endpoint-Arc tool in ArcMap allow smooth digitizing of lines, while general improvements in the symbology options help to produce much more visually appealing products using ESRI software.

Specific cartographic differences we have observed between Illustrator and ArcMap maps include color display, font use, labeling methods, and difficulty in formatting the map layout in ArcMap. We have also dealt with differences between printer drivers after upgrading our large-format printer during transition to our new cartographic production system.

Color: RGB vs. CMYK

ArcMap and Illustrator maps differ in color display both onscreen and in print. ArcMap displays colors in RGB (red, green, blue) even though CMYK (cyan, magenta, yellow, black) color sliders may be used to enter the same percentages for each color value as used in the Illustrator CMYK color palette. The ArcMap CMYK

color sliders simply allow a user to specify color values using the CMYK method, but do not actually *display* the map in CMYK color. When comparing a map printed from Illustrator with a version of that same map printed from ArcMap, it may appear that completely different colors were chosen to produce the two maps, even though Illustrator and ArcMap use the same CMYK color values. This is because the ArcMap map is actually displaying in RGB and, therefore, is printed in RGB even though the printer may be set to print using CMYK.

Fonts: Arial vs. Helvetica

Since the Helvetica font is not automatically installed on the majority of our geologists' computers, we decided to use Arial as the default font which does come automatically installed. This is due to the frequent file sharing with geologists and other cartographers at our agency who work directly from our map documents. We use Helvetica, however, on maps we decide to leave in Illustrator and especially those that cartographically began on a Macintosh. Often, Illustrator maps at our agency that have been started in previous years and are now nearing publication are Macintosh-based and were first created using the Helvetica font.

Labeling: Floating Text vs. Annotation

Labeling geologic units in Illustrator is simple; however, the labels are not georeferenced and are stand-alone text elements that are not linked to a GIS attribute table. To add a label, one needs only to type new text, or copy and paste an existing label and move it on top of its corresponding geologic unit. Labeling in ArcMap is not that easy. First of all, the labels are generated from the geologic unit attribute table, rather than being typed as "floating" text labels directly onto the map. After defining a label field in the symbology and turning on the label features option, the map is labeled but the labels are static and unselectable. To maintain control over label placements, we convert our labels to annotation after turning on the label features option. This creates a feature class that is added to the map document as a layer. The feature class has its own set of attributes in a table, and the features can be moved around on the map in editing mode.

Dealing with superscripts and subscripts within labels is also a challenge. Before converting labels to annotation, label classes are set up in the label properties, which allow VB Script expressions to be used for specifying superscripts and subscripts. Setting these expressions can be time consuming when many label classes contain superscripts and subscripts. Once label classes are set up and labels have been converted to annotation, proper placement of each label is needed. Due to the irregular-shaped

geological units on a geologic map, annotation labels are not always placed in the best cartographic location and need to be manually moved to a better location. Additionally, some labels require leader lines and also need to be manually moved with a leader line assigned.

Layout: Graphical Interface vs. Technical Interface

To avoid using multiple applications for layout finalization, we now use ArcMap's Layout View rather than Illustrator. This not only allows the map to be completed in one document, but also enables an interactive view of the georeferenced data in the document's Data View by a click of a button. When Illustrator was used for final map layout, a separate application, for example ArcView 3.x, had to be opened in order to view the data interactively while displayed in its proper coordinate system.

The graphical interface of Illustrator contributed to the efficiency of layout finalization in our previous cartographic production system. However, the benefits of viewing spatial data in one map document and the efficiency and accuracy of making revisions to geology led us to finalize the map production in ArcMap. Even though ArcMap's Layout View is not as graphically oriented as Illustrator and often requires more steps to perform similar tasks, the overall map finalization process is much easier and organized using one application that provides all desired functionality.

Print Drivers: PS vs. RTL

As our agency moved toward our new conversion system, we purchased a 42-inch HP 5500 DesignJet PS3 large-format printer to be used as our draft plotter. After using the 42-inch plotter for our draft printouts and comparing various settings used, as well as previous drafts from old plotters, we discovered that using the RTL (raster transfer language) driver combined with the appropriate settings, instead of the Post Script driver, produced crisper lines, higher quality base images, and more accurate color.

CURRENT CHALLENGES DURING CONVERSION

Clean Up of Illustrator Layers

Illustrator documents are not always clean before converting to ArcMap. It is necessary to go through each layer and make sure map elements are on correct layers. We usually have to move misplaced elements back to their proper layers. Often, small elements such as unit labels, leader lines, strike and dip symbols and other small

symbols are accidentally added to polygon, line, and other layers. Having map elements on incorrect layers can create problems when bringing the layers into GIS, such as causing polygon topology to fail to build and features to attribute incorrectly.

Preliminary Setup before Exporting

There are many steps involved in preliminary setup for conversion. Before an Illustrator file is ready to be imported into ArcMap, the user must add anchorpoints to the lines, simplify the anchorpoints on the lines using the straight lines option, and convert the file to a Drawing Exchange File (.dxf) before converting to coverage or shapefile. If these steps are not done properly, the coverage, shapefile or even DXF file will appear broken apart when viewed in ArcMap and be useless. Additionally, the user must make sure to join the Illustrator attributes (the layer names) with the coverage or shapefile so he or she can properly symbolize our ArcMap layers based on their attributes.

Line Clean Up, Building Polygons

Since we rebuild the polygons during conversion rather than converting the existing Illustrator polygons, we must clean the lines and check for potential problems that would cause the polygons to build incorrectly. Unfortunately, as an Illustrator map moves closer to finalization, it is much easier to make edits directly in the Illustrator document rather than going back to the original shapefiles or coverages that were used to import into the Illustrator document. This means that those original shapefiles and coverages become obsolete. Rebuilding polygons from our Illustrator line layer during conversion ensures that any edits made to the lines are reflected in the polygons, and our GIS data are accurate. However, this also means that we must perform clean up of overshoots, undershoots, and other errors that could cause the polygons to build incorrectly. To do this, we either use the ET GeoWizards tools (<http://www.ian-ko.com/>), Topology Rules in ArcMap, or the Advanced Editing tools in ArcMap to clean up our lines. Often a combination of methods is used during map conversion. This cleanup can require multiple iterations until all linework is properly closed and all polygons have properly built.

Re-labeling the Map

Although we found a quick way to convert Illustrator labels to ArcMap, it still requires clean up of duplicate labels or incorrect labels, which can be time consuming. The process involves exporting the Illustrator text labels to a point feature class that may be used to

attribute polygons, and then further converting the point feature class to an annotation feature class, which requires manual cartographic placement of labels and leaders. The alternative to the quick method of generating labels is to manually select polygons on the map, attribute them, and generate labels, which are then converted to annotation. This method is ideal for maps that have simple geology; however, for very detailed maps, a judgment call should be made as to which method is more efficient.

Redigitizing Strike and Dip Symbols as Points

Since we use strike and dip symbols as point feature classes, which are symbolized and rotated within the map document, rather than graphical floating symbols as in Illustrator, the strike and dips are redigitized as a point feature class. They are then symbolized as a strike and dip cartographic marker symbol in the ArcMap document and rotated using the rotation tool with the geographic rotation option in the symbology window linked to the field in the attribute table that will store the rotation. As an alternative to redigitizing points, we are currently experimenting with exporting strike and dips to points to increase productivity of the strike and dip symbol conversion.

However, symbolizing the strike and dip point feature class in the ArcMap document leads to another challenge. When people request the files but are not capable of supporting our ArcGIS file types, they will only see the point feature class as a point, and *not* the symbolized strike and dip symbol, when they bring the point layer into their map documents. This is because the symbolization is stored in the ArcMap document that we supply. As a cartographic solution, we convert strike and dips to lines when using alternative file formats.

Although an entire new map can be completed from start to finish in ArcMap, the conversion process of an existing map from Illustrator to ArcMap is not as straightforward. As far as we are aware, ArcGIS simply does not have the capabilities to import a raw Illustrator file and generate a completely attributed map that is cartographically high in quality. In addition to an experienced cartographer, the conversion process requires multiple software applications and file formats to get the job done.

OUR SUCCESS WITH CONVERSION

Although we have only converted a handful of maps since developing our system for conversion, we have been successful in generating accurate and cartographically pleasing products that closely match the Illustrator versions. The balance between the extra steps involved in maintaining our high quality cartographic products when using ArcMap, and the ability to have georeferenced,

attributed data all in one document, is reasonable. As the software continues to improve, our lives as cartographers will only become easier, which will allow us to produce

more appealing maps, more accurately. The positives far outweigh the challenges that we have encountered, and we will continue to use ArcMap for map production.

APPENDIX A

Software used for conversion:

Adobe Illustrator 8, 10
Adobe Photoshop (minimal use) 7, CS
Canvas (for label conversion only)
ArcInfo Workstation 9.0, 9.1
ArcGIS Desktop 9.0, 9.1

Output devices currently used:

HP 5500 DesignJet PS3 (42-inch, dye ink)
HP 5500 DesignJet PS3 (60-inch, dye ink)
HP 5000 DesignJet PS3 (42-inch, dye ink)

Output devices previously used:

HP 2500 DesignJet
HP 755 Design Jet

Note: Avenza Map Publisher and ESRI ArcView 3.x not used during current conversion process.