Utilizing Imagery in Economic Development Applications

2004 ESRI International User Conference
Paper #1117
August 11, 2004
Stuart Blankenship
Geographic Information System Manager
Abstract

Imagery plays a vital role in the economic development process. Aerial photography, satellite imagery, and scanned topographic maps can be used to aid prospects in visualizing a site without making a physical visit. All of these raster datasets can, however, present technical challenges. For example, how do you deal with raster datasets that are not in the same spatial reference? How do you manage the storage and display of thousands of separate tiles? This presentation will highlight the important role of imagery in economic development and specific methods of storage and retrieval. An interactive demo will be given as well to illustrate the power of making large raster datasets portable. The specific methodology has been developed with an emphasis on ESRI's ArcGIS system.
How VEDP Uses Imagery in the GIS
Examples of Data Used in Economic Development

Size of Site/Special Features of Building
  Acreage, Square Footage

Transportation Infrastructure
  Roads, Railroads, Airports, Ports

Utility Infrastructure
  Sewer, Water, Telecommunications, Waste, Electricity, Gas

Workforce
  Local Labor Statistics
Environment

Wetlands, Threatened and Endangered Species,
Historic Resources, Flood Plains, Soils, CBPA,
Ozone Advisory Areas, Wilderness Areas

Education

Primary, Elementary, Middle and High Schools
Institutions of Higher Education

Quality of Life

Fire Departments, Rescue Squads, Hospitals
Neighborhoods, Recreational Facilities
Imagery

Virginia Base Mapping Program Imagery (VBMP)
USGS Digital Orthophotography
SPOT Satellite Imagery
Landsat 7 Satellite Imagery
Digital USGS Topographic Maps
National Geographic Enhanced Topo Maps
How is Imagery used at VEDP?

- Site Selection and Analysis
- Data Development
- Site Visualization
- 3-D Modeling
- VirginiaScan
Virginia Economic Development Partnership

Site Analysis and Visualization

SPOT Satellite Imagery (10 Meters)

Sources:
- Virginia Economic Development Partnership
- Virginia Department of Transportation
- SPOT
Site Analysis and Visualization

Virginia Base Mapping Program Aerial Photography (1 Foot)

Source: Virginia Base Mapping Program
Aerial Imagery © 2002
Commonwealth of Virginia
Site Analysis and Visualization

National Geographic TOPO Data
1:24,000 Scale

Sources:
Virginia Economic Development Partnership
Virginia Department of Transportation
National Geographic
Kenbridge Shell Building

ADDRESS: Main Street
LOCALITY: Lunenburg County

This Building is located in a Virginia Enterprise Zone

Building Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Square Feet</td>
<td>60,000.00</td>
</tr>
<tr>
<td>Total Space Available</td>
<td>60,000.00</td>
</tr>
<tr>
<td>Expandable</td>
<td>No</td>
</tr>
<tr>
<td>Ceilings</td>
<td>29.10</td>
</tr>
<tr>
<td>Site Acreage</td>
<td>7.51</td>
</tr>
<tr>
<td>Zoning</td>
<td>M-2, Industrial</td>
</tr>
<tr>
<td>Construction Date</td>
<td>1997</td>
</tr>
<tr>
<td>Construction Type</td>
<td>Metal</td>
</tr>
<tr>
<td>Multi-tenant?</td>
<td>No</td>
</tr>
<tr>
<td>Refrigeration Space?</td>
<td>No</td>
</tr>
<tr>
<td>Freezer Space?</td>
<td>No</td>
</tr>
<tr>
<td>Crane?</td>
<td>No</td>
</tr>
</tbody>
</table>

Utilities:

<table>
<thead>
<tr>
<th>Utility</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Power</td>
<td>Dominion Virginia Power</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>N/A</td>
</tr>
<tr>
<td>Water</td>
<td>Town of Kenbridge</td>
</tr>
<tr>
<td>Sewer</td>
<td>Town of Kenbridge</td>
</tr>
</tbody>
</table>
| Telecommunications   | Sprint/Centel/Virginia  
                       | Verizon South                  |

Transportation:

<table>
<thead>
<tr>
<th>Distance</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles to nearest interstate</td>
<td>18.00</td>
</tr>
<tr>
<td>Interstate Name</td>
<td>I-81</td>
</tr>
</tbody>
</table>

Available Photographs:

- Rear view
- Front view
- Site plan
- Front view with water tower
Virginia Economic Development Partnership

VirginiaScan

Aerial Photography
Dealing With Projections
Projections and Datums of Available Imagery

- Virginia Base Mapping Program Imagery
  *State Plane North/South – NAD 83*
- USGS Digital Orthophotography
  *UTM 17/18 – NAD 83*
- SPOT Satellite Imagery
  *Lambert Conformal Conic – NAD 83*
- Digital USGS Topographic Maps
  *UTM 17/18 – NAD 27*
- National Geographic Enhanced Topo Maps
  *Geographic – NAD 83*
- Landsat 7 Satellite Imagery
  *Lambert Conformal Conic – NAD 83*
How Can You Deal with Imagery in Multiple Projections?

 Depends on the Software

 ArcView 3.x and ArcInfo Workstation

• Project-on-the-fly is not supported (except with vector data in decimal degrees in ArcView 3.x)

• Imagery and vector data must be in same projection to overlay properly

• This may require physical reprojection of data into new files which can result in storing duplicate data
How Can You Deal with Imagery in Multiple Projections?

Depends on the Software

ArcGIS 8.x

• Project-on-the-fly IS supported

• Imagery and vector data can be in multiple projections and still overlay properly (all files must have correct projection definition)

• This doesn’t require storing multiple copies of data in different projections
Project-On-The-Fly: How Does It Work?

Projection of View is Set in ArcMap

- View projection defaults to match first layer added to project
- View projection can also be changed and set manually

ArcMap Reads Projection of Each Layer

- Projections must be defined

ArcMap Matches Each Layer to Projection of the View
Data Frame Properties

- Current Coordinate System
- Select A Coordinate System
  - Favorites
  - Predefined
- Match Projection of Layer in Current View
- Import From Other Layers Not in Current View
Defining Projections

Projection of Layer May Not Already Be Defined

• If projection is not defined or ArcMap cannot interpret the information, you will get the following message:

![Message](image)

• If you receive this message, the projection of the layer must be defined in order for it to be projected on-the-fly
Defining Projections in ArcCatalog

Spatial Reference Properties

- Projection of Each Layer Must Be Defined
- Projection Definition Can Be Selected from...
  - Predefined Coordinate System
  - Imported from Another Layer
  - Create a New System
Defining Projections in ArcToolbox

Define Projection Wizard

• Will NOT define projections for imagery

• Projections of shapefiles and geodatabases can be batched
Defining Projections of Multiple Images

Batch Scripts

- Batching of projection definition for multiple images is not a standard feature.

- Batch scripts can be downloaded from ArcScripts or ArcObjects online.

Result of Project-On-The-Fly of Imagery

Aerial Imagery © 2002 Commonwealth of Virginia
Managing Storage and Retrieval of Imagery
What About Large Numbers of Images?

For Statewide Coverage, Some Datasets Contain Thousands of Images

- VBMP Imagery
  - State Plane North Zone – App. 6,700 Images
  - State Plane South Zone – App. 17,200 Images
- USGS DOQQs
  - UTM 17 – App. 1,900 Images
  - UTM 18 – App. 1,100 Images
Image Catalogs and Mosaics

Image Catalogs

• Quick and easy to create using available scripts
• All images in the catalog must have correctly defined projections
• Not effective for drawing large areas that contain numerous images

Mosaics

• Need image processing software (or SDE) to create and are time consuming
• One projection definition
• Much more effective for drawing large areas
Image Catalogs – How Do They Work?

Components

• Image Pathname
• Bounding Coordinates
Creating Image Catalogs

Batch Scripts

- Manual creation of catalogs is extremely tedious.

- Batch scripts can be downloaded from ArcScripts or ArcObjects online.

Making Imagery Portable
Why Make Imagery Portable?

• Verification of Data in the Field
• Data Development in the Field
• Working in Remote Offices or at Home
• On the Road Presentations (Like the ESRI User Conference)
What Do You Need?

**Computer**
- Laptop
- Tablet PC
- Handheld
- Desktop PC (if storing imagery on external drive)

**Software**

**Storage**
- CD/DVD
- Internal Hard Drive
- External Hard Drive
External Hard Drives

USB/Firewire

- Affordable
- Plug and Play
- Needed for Extremely Large Datasets
- Can be Swapped Between Computers
- Up to 250 GB of Storage at this time
Acknowledgements

The following organizations have contributed to this presentation through the use of their application and/or data:

*ESRI*

*Virginia Department of Transportation*

*Virginia Geographic Information Network*

*United States Geological Survey*

*National Geographic*

*Spot Image Corporation*
Stuart Blankenship
Geographic Information System Manager
Virginia Economic Development Partnership

901 E. Byrd Street
PO Box 798
Richmond, VA 23218
(804) 371-8100
sblankenship@yesvirginia.org

http://www.yesvirginia.org