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# Virginia Mine Mapping Information System

Virginia Department of Mines,  
Minerals and Energy



**Intergovernmental  
Benchmarking Workshop on  
Underground Mine Mapping**

**October 15 & 16, 2003**

**Louisville, Kentucky**



# Background of Mine Mapping Program

## Coalbed Mapping Program

- DMME has had a mine archiving/mine cataloging/ digital spatial database activity underway since 1990 that has located abandoned mines in the Southwest Virginia coalfields

# Scope of Coalbed Mapping Program

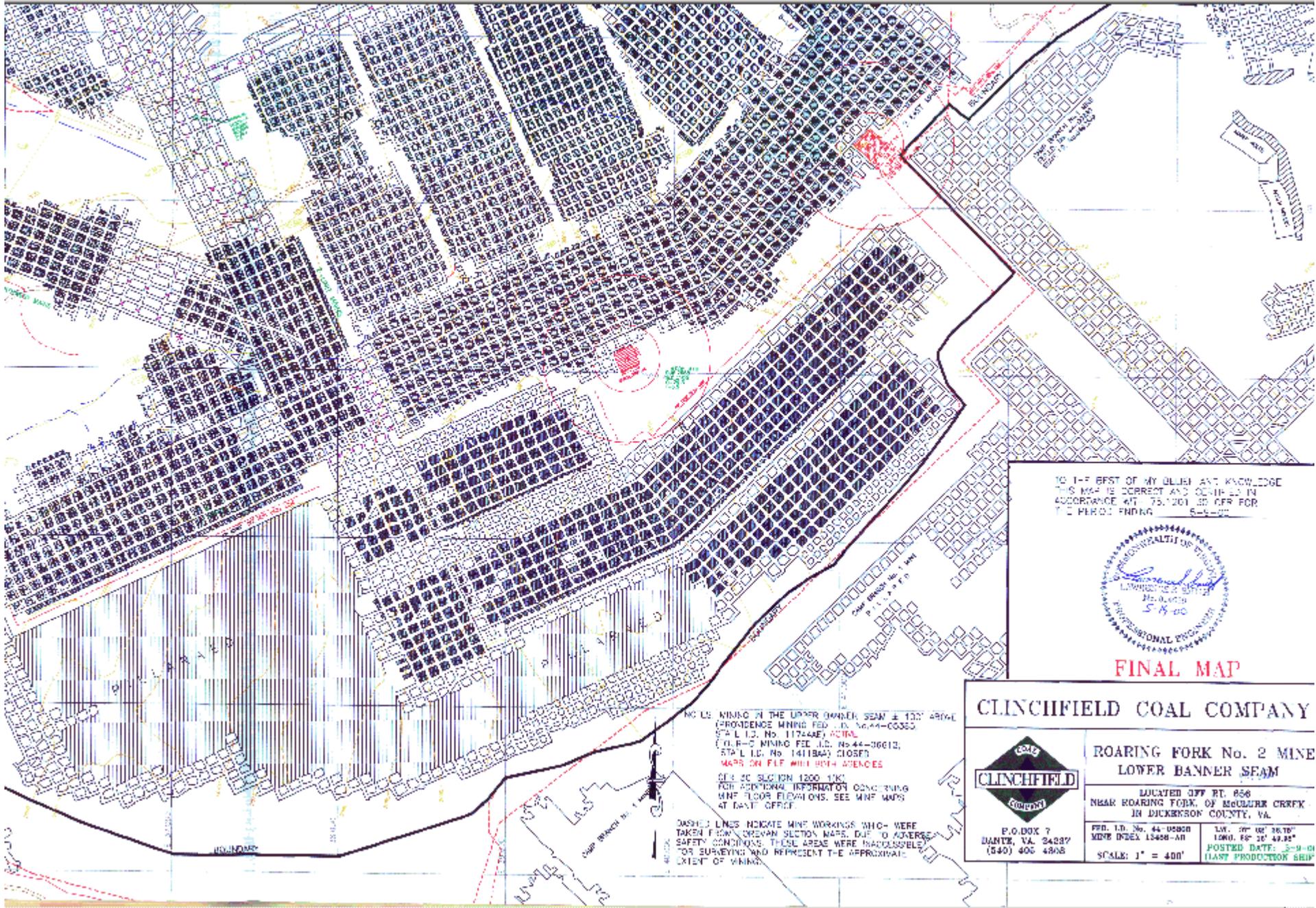
- Collect and Catalog all available abandoned Mine Maps
- Scan maps with large format scanner
- Georeference scanned mine map images
- Digitize boundary of mine works
- Create database containing information derived from maps

# Map Sources

- State Library of Virginia
- DMME Client Assistance Center
- OSM National Mine Map Archive
- DMME Active Mines
- Map Archives of Collaborating Mining and Land Companies
- DMME Division of Mineral Resources Archive
- DMME Previously Donated Map Collection
- DMME Scanned Map Archives

# Acquisition of Mine Maps

- Campaign launched through various media outlets requesting mine maps
- On-site scanning – large format scanner taken on site to scan company map archives
- Private Party collections donated for scanning



TO THE BEST OF MY BELIEF AND KNOWLEDGE THIS MAP IS CORRECT AND COMPILED IN ACCORDANCE WITH 26 V.S.A. § 2613B FOR THE PERIOD ENDING 6-30-00



FINAL MAP

### CLINCHFIELD COAL COMPANY



### ROARING FORK No. 2 MINE LOWER BANNER SEAM

LOCATED OFF RT. 856  
NEAR ROARING FORK, OF McLELLAN CREEK  
IN DICKERSON COUNTY, VA.

P.O. BOX 7  
DANTE, VA. 24287  
(540) 406 4808

FED. I.D. No. 44-05828  
MINE INDEX 13458-AH  
SCALE: 1" = 400'

1/4" = 100' 36.75"  
1/800, 80' 10" 49.95"  
POSTED DATE: 5-9-00  
HAZ. PRODUCTION SHEET

NO US MINING IN THE UPPER BANNER SEAM ± 130' ABOVE  
(PROVIDENCE MINING FED. I.D. No. 44-00363  
F.A.L.I.D. No. 117448) ACTUAL  
(G.R.-O MINING FED. I.D. No. 44-36612;  
S.P.L.I.D. No. 141184) CLOSED  
MAPS ON FILE WITH BOTH AGENCIES

SEE SECTION 1200 1/4"  
FOR ADDITIONAL INFORMATION ON MINE  
MINE FLOOR ELEVATIONS. SEE MINE MAPS  
AT DANTE OFFICE.

DASHED LINES INDICATE MINE WORKINGS WHICH WERE  
TAKEN FROM OREMAN SECTION MAPS, DUE TO ADVERSE  
SAFETY CONDITIONS. THESE AREAS WERE INACCESSIBLE  
FOR SURVEYING AND REPRESENT THE APPROXIMATE  
EXTENT OF MINING.

# Tools

- Hardware
  - Laptop/Desktop
  - Large-format Scanners
    - ColorTrac 5480
    - Vidar Titan TruScan
    - Vidar TruScan B&W
- Software
  - Proprietary scanning software
  - ESRI
  - AutoDesk
- Data Available
  - Coal Mine Map and Mine Database
- Printers/plotters
- Internet web browser



# Georeferencing

- Maps geo-referenced into Virginia State Plane Coordinate System
- Information shown on the map such as coordinate grids, identifiable surface features, coal outcrop configuration, land tracts, etc., are used to place maps.

# Database

- Capture important information shown on maps
- User friendly intuitive input screen developed to aide in efficient data entry
- Data stored on Microsoft SQL server

# Data Entry





## Coal Mine and Mine Map Database

**Basic Map Information**

Collection Name:

CollectionID:

DMME ID:

MapID:

Date of Mine Map:  No Date

Date Type:

Map Scale:

Company Name:

Certified Engineer:

Map Type:

Map Quality:

**Geographic Information**

Georeferencing Method:

Quadrangle Location: 

Quadrangle
<input type="text"/>

  
Record:

County Location: 

County
<input type="text"/>

  
Record:

State Plane?  Northing  Easting

Lat/Long Point?  Latitude Deg  Min  Sec   
Longitude Deg  Min  Sec

Company Coordinates?

General Location: 

Feature_Name
<input type="text"/>

  
Record:  of 1

**Items Present on Map**

Thickness Data?  Water?

Elevation Data?  Roof Falls?

Surface Mines?  Final Map?

Adjacent Mines?  Drains?

Auger Mines?  Crop Line?

Coreholes Present?  Other Portals?

Gas Wells Present?  VVHs?

Comments:

**Mines Shown**

MineID
<input type="text"/>

Record:

**Map Status**

Entry Date:  Entry Initials:

Scanned?  Vectorized?

Georeferenced?  Status:

Scan Information

Scan_Name	Scan_Who	Scan_Date	Scan_DPI	Scan_Fmt	Scan_Path
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	TIF	<input type="text"/>

Record:  of 1

**Coalbed Information**

Company Coalbed(s):

Standard Coalbed(s): 

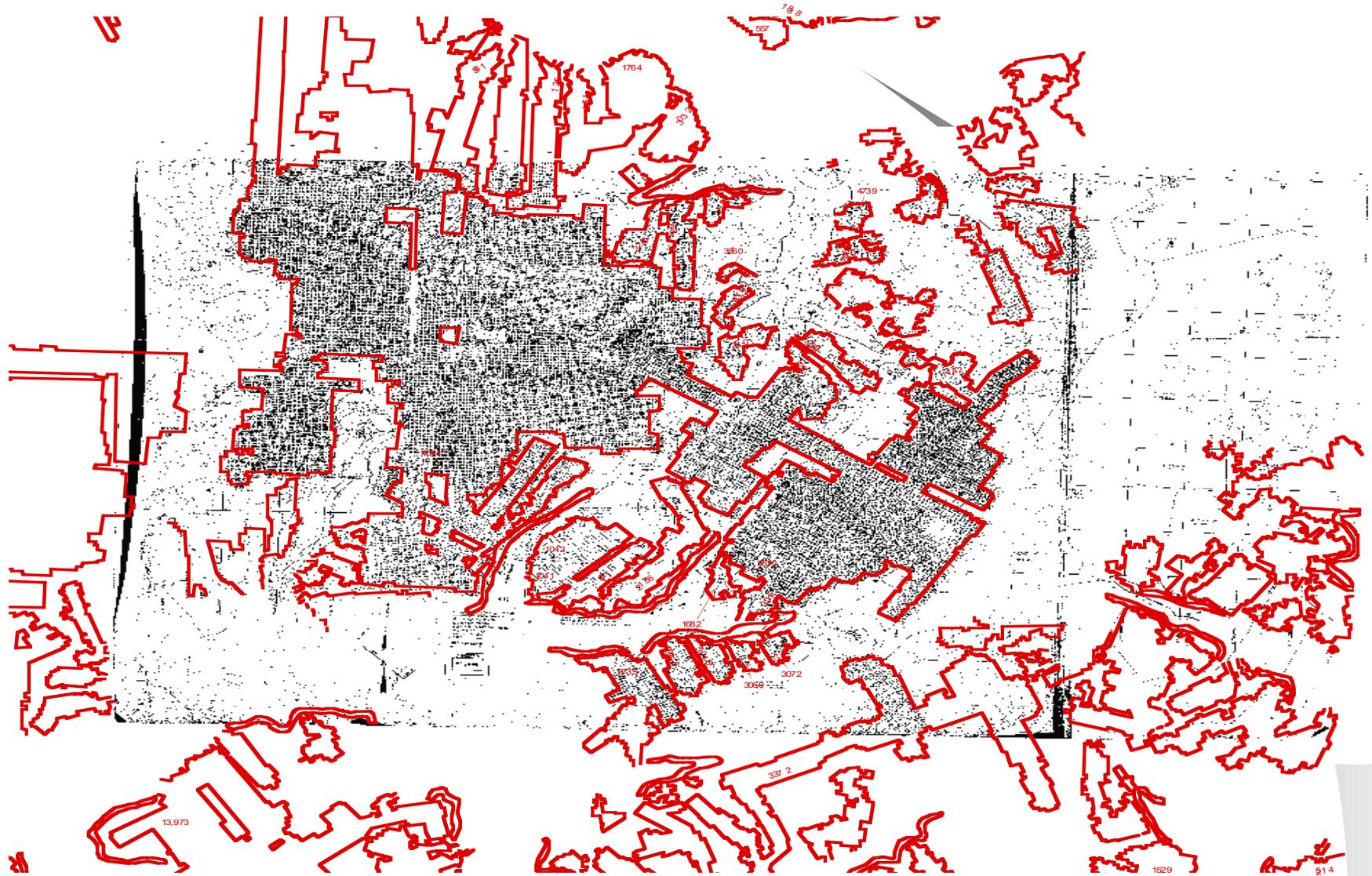
Coal
<input type="text"/>

  
Record:

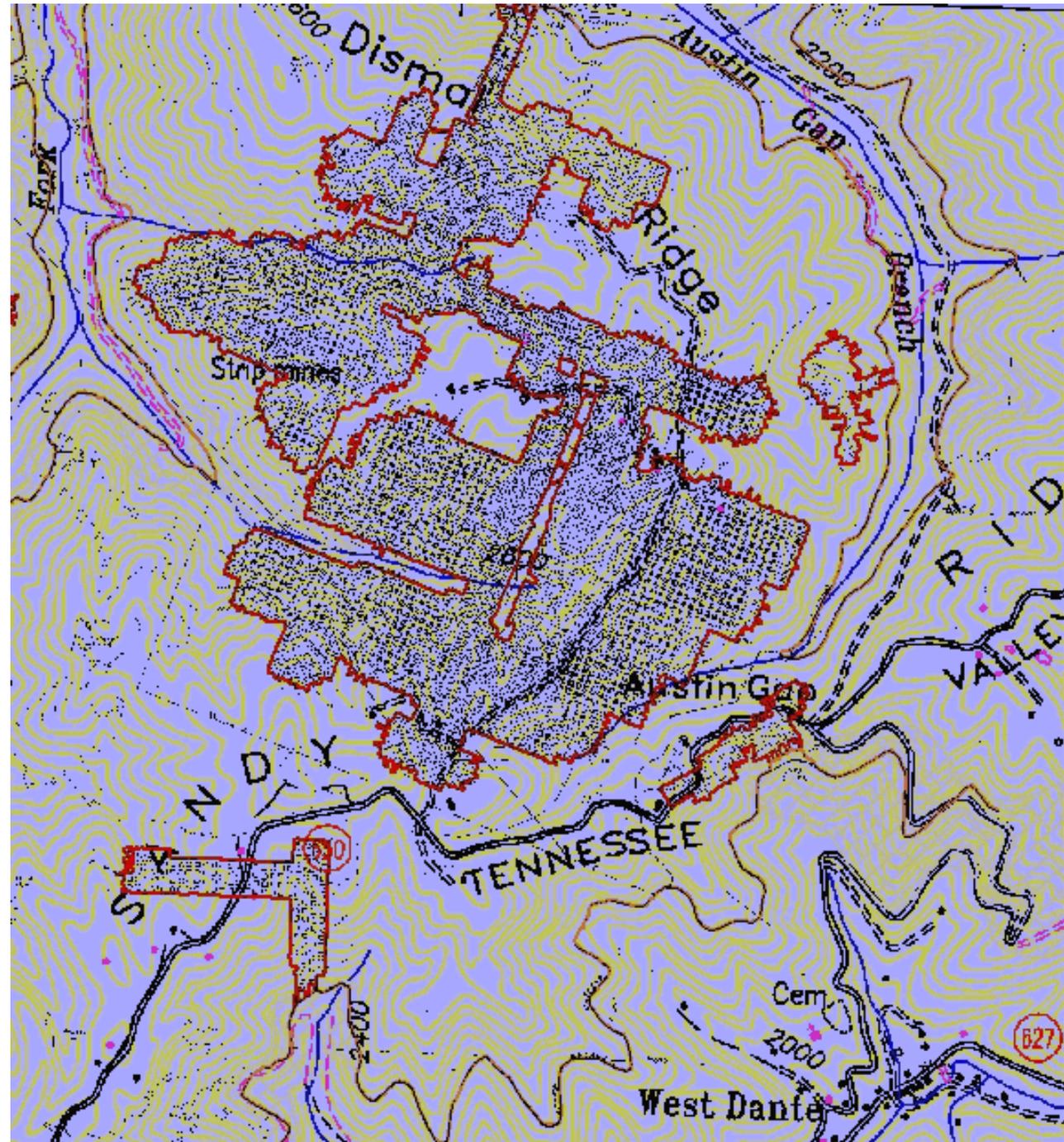
# Digitizing

- Heads-up onscreen digitizing performed with geo-referenced images
- Industry standard software used – ESRI, AutoDesk
- Industry standard file formats – allows for easy migration from one software package to another

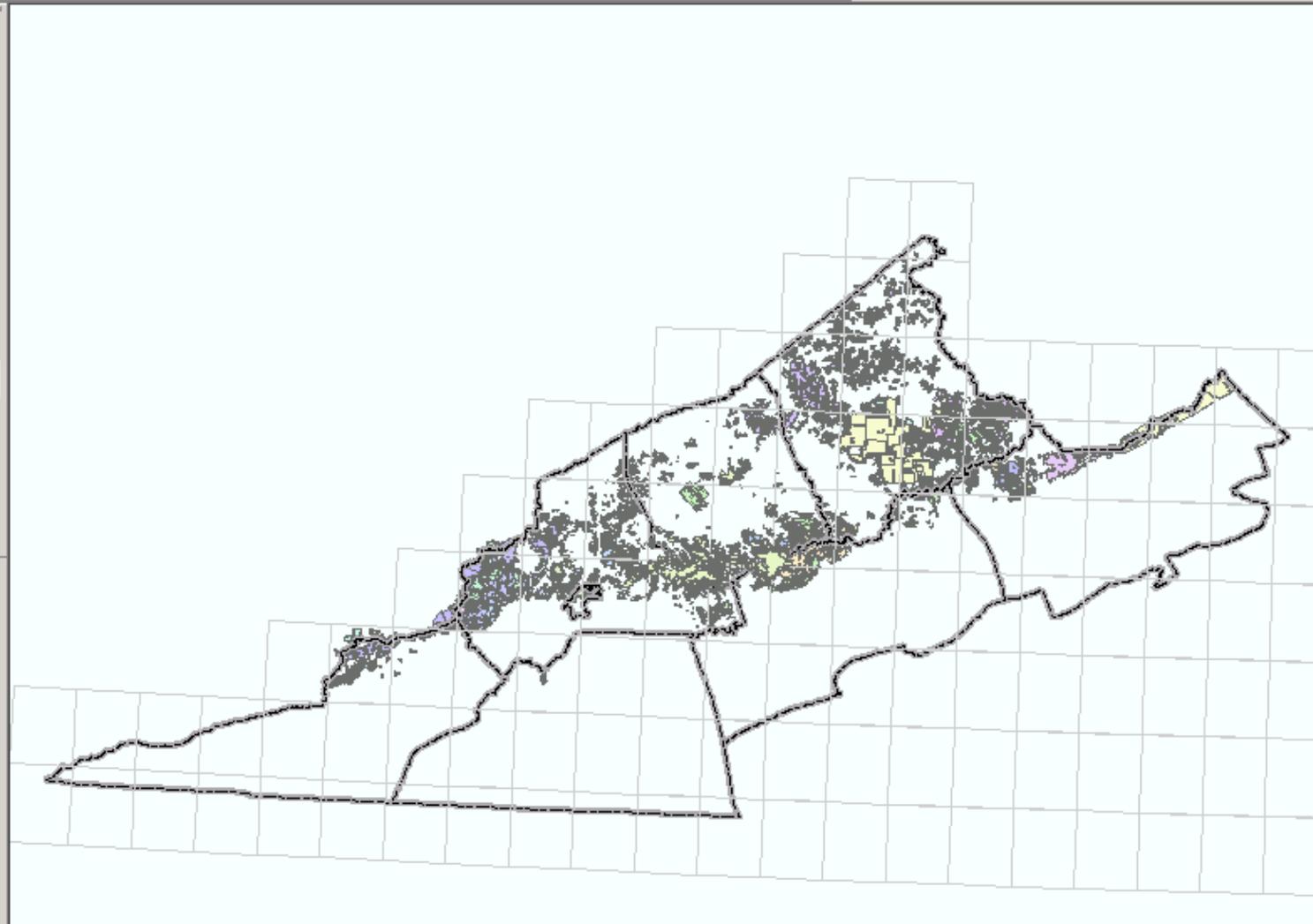
# Scanned Map



Raster mine map  
inserted into  
underground mine  
outlines



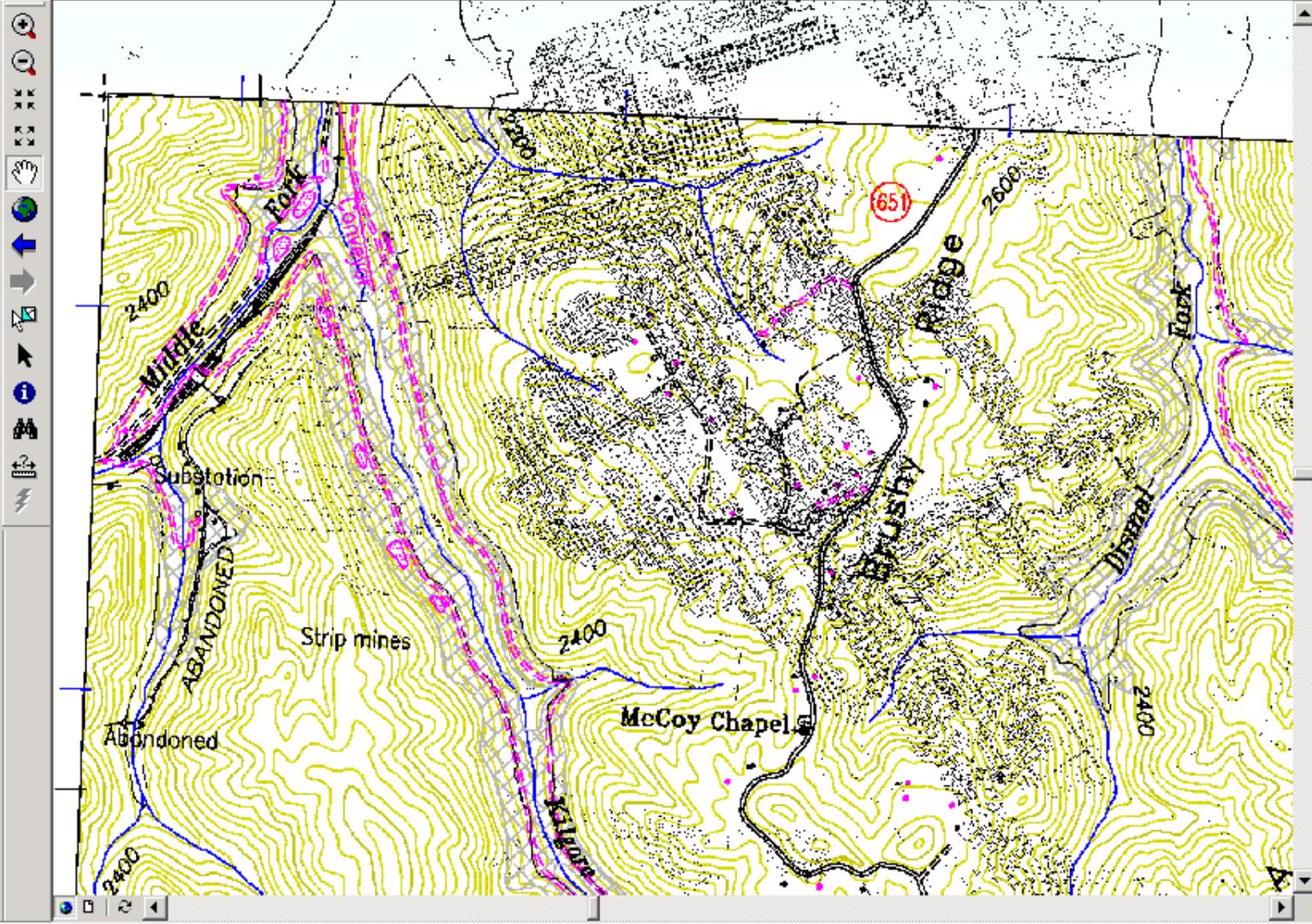
- Black Creek
- CBM Detail
- CBM**
- Overview
- Layers



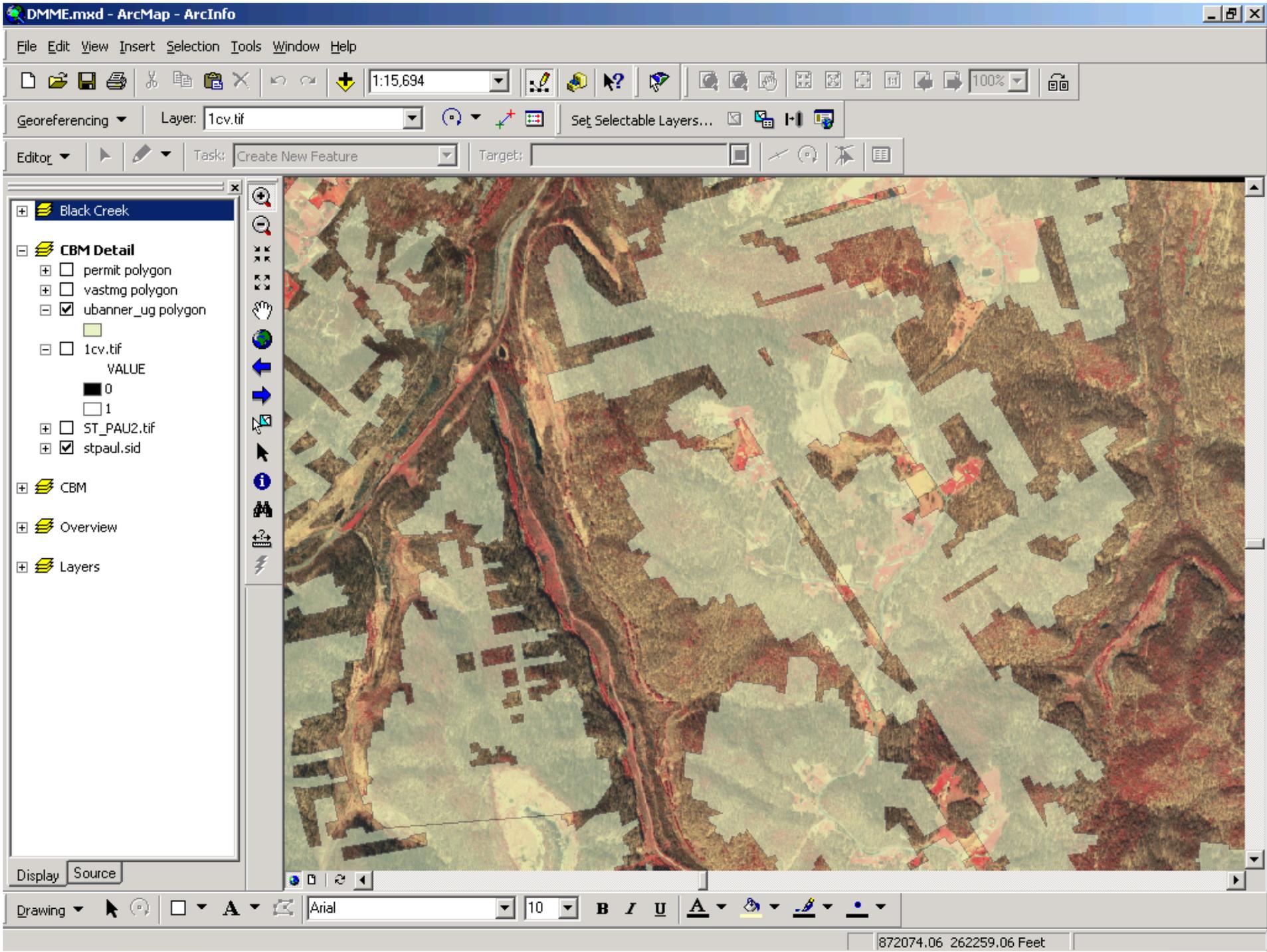


**Black Creek**

- CBM Detail
  - permit polygon
  - vastmg polygon
  - ubanner\_ug polygon
  - 1cv.tif
    - VALUE
      - 0
      - 1
  - ST\_PAU2.tif
  - stpaul.sid
- CBM
- Overview
- Layers



Display Source



# Retrieval of Information

- Geographic Information System – Spatial data joined with database can be utilized for quick retrieval of information. Information is easily accessed through a standard ArcView project activated in Electronic permitting application
- DMME intranet “Mine Map Search Tool” – Allows users to search for mine maps and related information based on specific queries
- DMME is continuing to develop web-based access to mapping information, which will allow the public to view certain maps and information while restricting other information that is not open to the public

[DM Microfiche Search](#) [Permit/Index Search](#) [Adjacent Mine Search](#) [Lat/Long Search](#) [DM mine/Map Search Tool](#)

Search in the:

Search in the:  Counter: 13437

Search in the: [HELP?](#)

- DM Mine Index Number
- County
- Seam
- Quad
- Location Description
- Mine Name
- Mine Operator**
- Leasor
- Map Database
- Federal Identifier
- Latitude
- Longitude

Total Records - 3 Current Page 1 of Pages 1

1

Find Nearby	View Details	View Maps	Mine Name	DM Index Number	FEDID	Database	County	DMR Coalbed	Seam	Quad	Leasor	Operator
<input type="button" value="Find"/>	<input type="button" value="Details"/>	<input type="button" value="Maps"/>	H & V Coal Co. #4	12419	44-05722	DMLRCoalBed	Buchanan	Hagy	Splashdam	Patterson		
<input type="button" value="Find"/>	<input type="button" value="Details"/>	<input type="button" value="Maps"/>	4	12419		CardIndex	Buchanan		Splashdam		Va. Fuels, Inc.	K & V Coal Co., Inc.
<input type="button" value="Find"/>	<input type="button" value="Details"/>	<input type="button" value="Maps"/>	H & V Coal Co. #4	12419	44-05722	OSMBMW	Buchanan	Hagy	Splashdam	Patterson		

# Efficiencies and Deficiencies

- Increased scan quality allows more accurate map interpretation
- Utilization of industry standard software
- Improved and expanded data entry and collection procedures
- Qualification of geo-referenced accuracy assessments

# Efficiencies and Deficiencies

- Mine map condition
- Lack of mine location information
- Undecipherable or illegible map information
- Coordinate transformation methods from local or company coordinate systems
- Duplication of mine map scans
- Lack of elevation and coal seam data

# Program today

- Over 8,000 Mine Maps Scanned and over 3,300 Mines Digitized
- Spatial Data generated by Coal Seam and Quadrangle
- User friendly intranet search engine to identify and locate mines in database
- Continuing effort to scan and catalog mine maps from various sources

# Evolution of Program

So, What has changed?

- Software and Hardware capabilities have advanced
- Improvements have been made to database structure and data entry procedure
- Availability of maps not previously accessible

# Data Dissemination

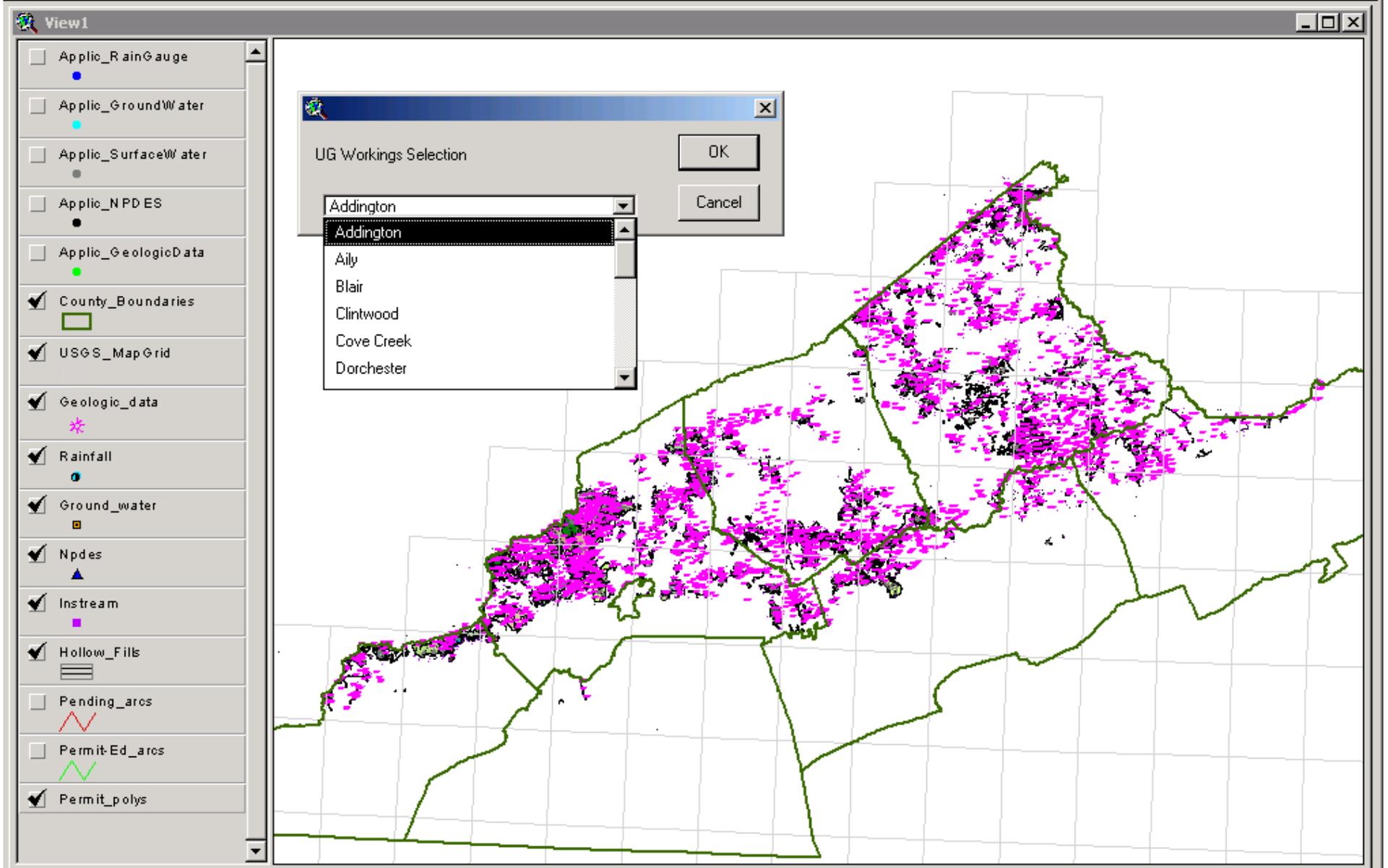
- Electronic Permitting Application
  - Eastman Workflow System
- DMME Laptop System
- DMME website – ftp data sharing

- Appl 1001001 - P1
- Appl 1001001 - E1
- I GENERAL INFORMATION
- II ADMINISTRATIVE INFORMATION
- III SITE INFORMATION
- IV GEOLOGY
- V HYDROLOGY
- VI PHC/HRP
- VII LAND USE
- VIII FISH AND WILDLIFE
- IX SOILS AND REVEGETATION
- X OPERATIONS PLAN
- XI DRAINAGE CONTROL
- XII SEDIMENT CONTROL
- XIII BACKFILLING/GRADING
- XIV EXCESS MATERIALS DISPOSAL
- XV TOXIC MATERIALS AND NON-C
- XVI BLASTING
- XVII TRANSPORTATION PLAN
- XVIII UNDERGROUND CONTROL
- XIX BONDING
- XX SPECIAL CATEGORIES
- XXI VERIFICATIONS/CERTIFICATI
- Appl 1001001 - O1

Ver. 1.1.9

Exit Word Done

Map Insp. Info



# Workflow

**Routing ...** Ver: 1.0.3 **Routing for Revision 4 Of Application 1001001** [View Comment Doc](#)

Section	Receipient	Start Date	Finish Date	Approve	Comment Doc
<b>DRFT(Drafting)</b>	DXK - Daniel Kestner	2003-09-11 08:04:			
GEO (Geo/GW)	JLM - JOHN L. MOLINARY	2003-09-11 08:04:	2003-09-11 11:17:	Y	
PERM(Permitting)	TAC - TIM COX	2003-09-11 08:04:	2003-09-11 10:13:	Y	
ENG (Dr/Eng)	RAB - ROGER BIRCHFIEL	2003-09-11 08:04:	2003-09-18 10:09:	T	
H2O (Monitoring)	PRB - PHILIP RODNEY B	2003-09-11 08:05:	2003-09-19 09:39:	Y	

Available:

Section	Receipient	Full Name
AGR (Agron/Eco)	CJS	Chris Stanley
AGR (Agron/Eco)	JEL	JERRY E LEGG
BLST(Blasting)	DRC	DON R. CARTER
BLST(Blasting)	MNW	MIKE WASHBURN
DRFT(Drafting)	DSM	Doug Mullins
DRFT(Drafting)	DXK	Daniel Kestner
DRFT(Drafting)	SXC	SCOTTY COX

Will be notified:

Section	Receipient
---------	------------

**Review** **Status** **Route Application** **Exit**

Ready

# Types of Technology Used by Inspectors



**DMLR Enforcement Menu Screen**

**DMLR Enforcement**



Permit Number:

Insp:   CONSOLIDATION COAL COMPANY

Enforcement	Permit/Complaints	Data Entry
<input type="button" value="Inspection"/>	<input type="button" value="NOV"/>	<input type="button" value="NOV Activity"/>
<input type="button" value="Diary &amp; Hours"/>	<input type="button" value="CO"/>	<input type="button" value="CO Activity"/>
	<input type="button" value="RON"/>	<input type="button" value="RON Activity"/>
		<input type="button" value="Batch Process"/>
		<input type="button" value="Complaint"/>
		<input type="button" value="Complaint Investigation"/>

Ver 2.0.0

Date and Time: 3/28/02 11:50:48 AM



Customer Services

Remining

Coal in Virginia

Complaints

Laws

Regulations

Reasonably

Available Spoil

Public Participation

Opportunities

Abandoned Mine

Land Program

Technical Services

Reclamation

Services

E-Mail IDs

Office Locations

Operator Memos

Awards

Forms/Guides/Maps  
for Downloading

Public Access to  
Agency Records



### Dmlr

Server: 165.176.6.36  
User Name: Anonymous



Adobe



AML



dmlrfile



downloads



Drawing



GPS



USGS\_DWGs



Word



WordPerfect

[Click here](#) to learn about browsing FTP sites.

# Future of the Virginia Mine Mapping Information System

- Continuing to advance current procedures and enact the following:
  - Creating a comprehensive digital mine map system by collection, digital conversion and analysis of all available sources of mine maps.
  - Using high-resolution remote sensing data to develop topographic data sets and to map abandoned mine features with accuracy and order of magnitude better than available data.
  - Creating a three-dimensional model of the 54 mineable coal beds in the Southwest Virginia coalfields.

- Continued

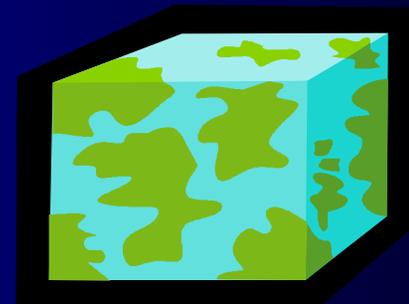
- Creating an abandoned mine map information system designed to enable site-specific risk assessments including quantitative estimates of factors such as uncertainty in mine boundary locations and the probability that a particular abandoned mine is flooded.
- Evaluating the cost effectiveness of geophysical techniques for underground void detection
- Developing information sharing consortiums and partnerships with industry and other states

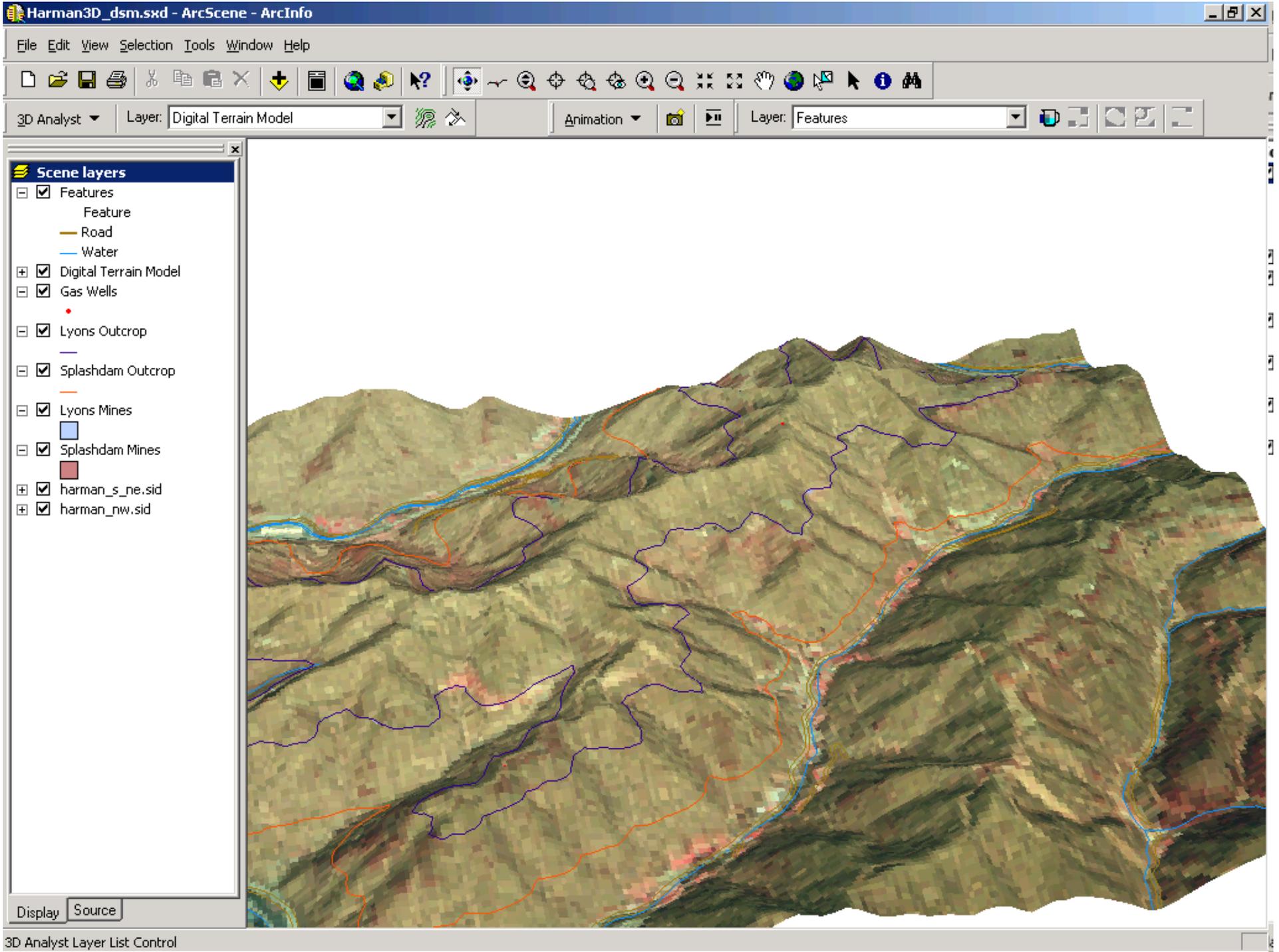
# Virginia's Mine Map Inventory Prototype Project

- Proposed project consists of six major tasks. They include:
  - Task One: Creating a comprehensive, digital underground coal mine map inventory and database
  - Task Two: Acquiring and interpreting high-accuracy remote sensing data to more accurately show the locations of underground coal seams and mines relation to the surface and each other.
  - Task Three: Creating a three-dimensional model of Virginia's 54 coal seams and underground mines.
  - Task Four: Enhancing the DMME Coal Mine Map Information System based on the database and maps of coal mines and the three-dimensional model of the coal seams.
  - Task Five: Evaluating various geophysical void-detection technologies to determine which are appropriate for use in Virginia's mining environment.
  - Task Six: Providing information sharing and technology transfer based on the results of this project.

# 3-D Modeling

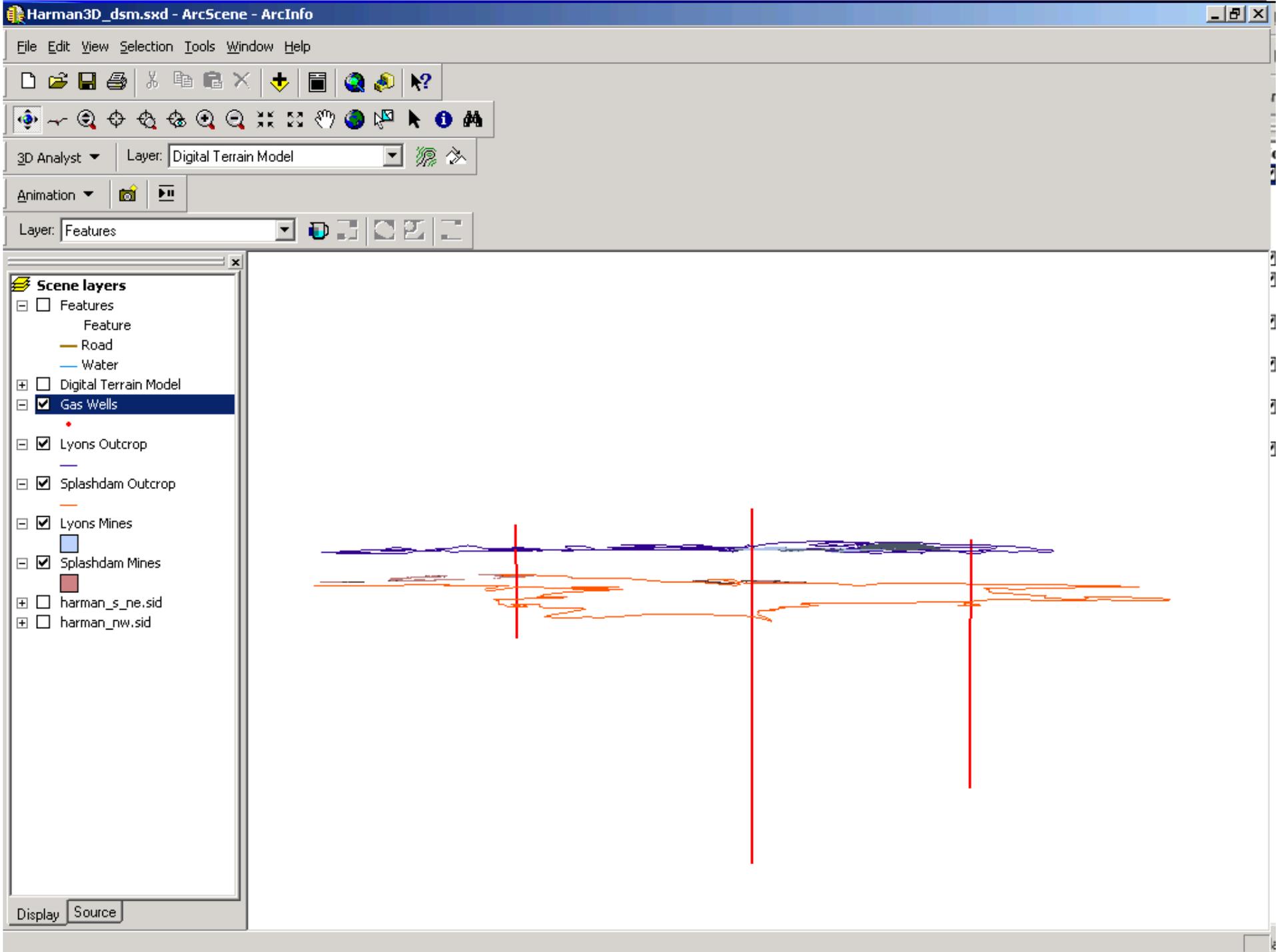
- 3-dimensional models of the 54 mineable coal beds in the Southwest Virginia coalfields will be generated
- \* Demo of 3-d model prototype





- Scene layers
  - Features
    - Feature
      - Road
      - Water
  - Digital Terrain Model
  - Gas Wells
    - .
  - Lyons Outcrop
    -
  - Splashdam Outcrop
    -
  - Lyons Mines
    -
  - Splashdam Mines
    -
  - harman\_s\_ne.sid
  - harman\_nw.sid

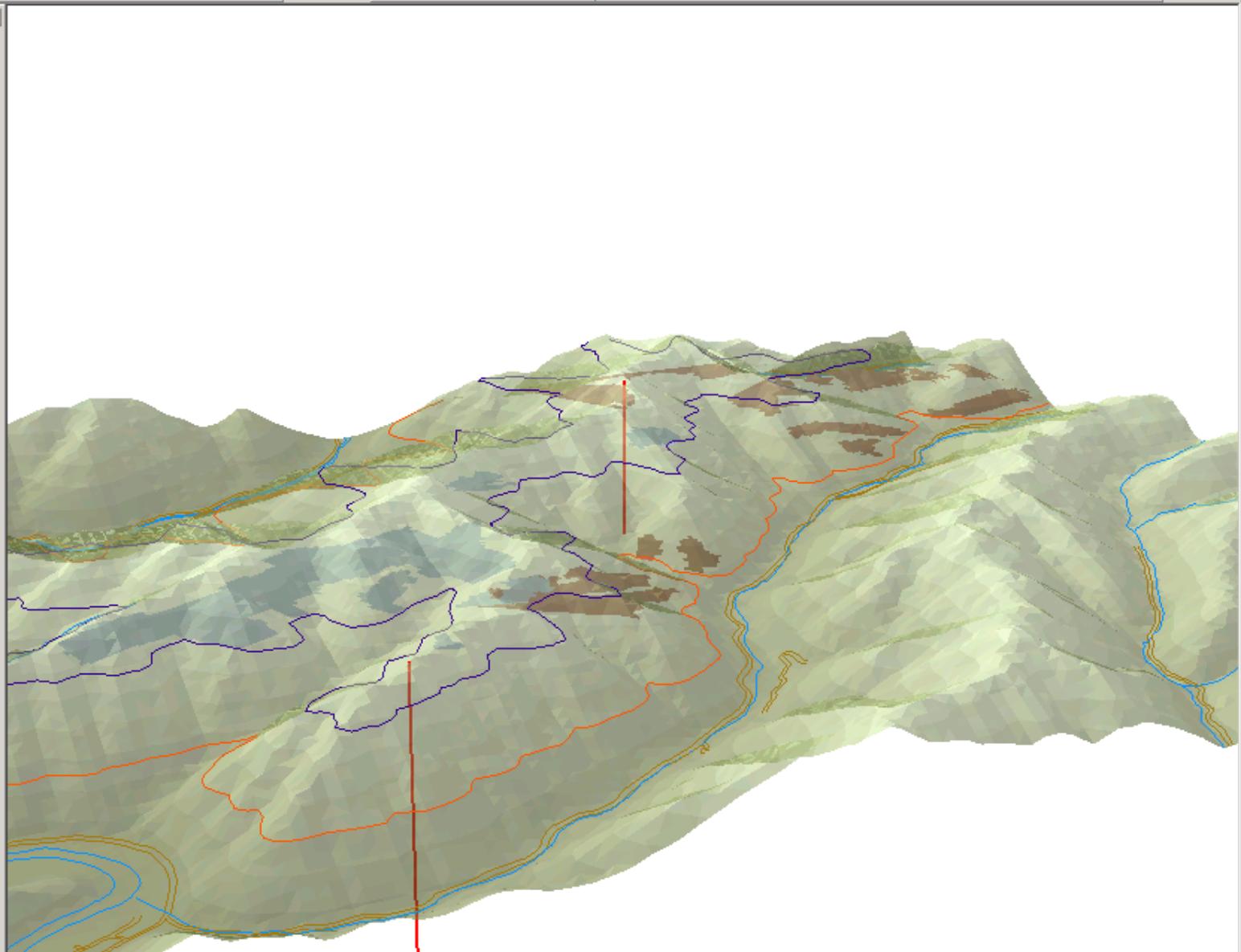
Display Source



**Scene layers**

- Features
  - Feature
    - Road
    - Water
- Digital Terrain Model
- Gas Wells
  -
- Lyons Outcrop
  -
- Splashdam Outcrop
  -
- Lyons Mines
  -
- Splashdam Mines
  -

Display Source



# Summary

- Questions?