Mobile GIS Applications in US Surface Coal Mining Reclamation

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US Office of Surface Mining

- Bureau in Dept. of Interior created through 1977 Surface Mining Control and Reclamation Act (SMCRA)
- Only regulatory bureau in DOI
- Oversight and regulation of active surface coal mining
- Abandoned Mine Land reclamation
What Is Technical Innovation and Professional Services (TIPS) in OSM?

A 20-year tenure program that provides the following services to bureau and State/Tribal stakeholders:

- Training
- Software and hardware (ArcGIS 90 seats, ArcPAD 143 copies, Trimble)
- Research and development
- Technical assistance
What is TIPS Mobile GIS?

- TIPS-supplied computing tablet or handheld device in the field (Trimble GeoXT, Xplore tablet)
- TIPS-supplied Mobile GIS software on-board (143 copies ArcPAD 7)
- Displays background imagery
- GPS – enabled
- Viral technology
TIPS Mobile GIS Initiative History

- Initial Pilot program working with OSM and States:
  - ArcPAD software with WRCC, OSM-AFO, OK, WV

- Year 2 included additional states/OSM offices in pilot

- Year 3 ArcPAD6/Terrasync 2.2 software and GeoXT and new Xplore Tablet computers to program ($209K)

- Year 4 roll out ArcPAD7, GPSCorrect, TerraSync 2.5 and collect and analyze feedback from prototype efforts
TIPS MC
Options
Mobile GIS in Support of Bond Release

- Navigation to sampling sites or plots
- On-the-ground real-time acreage calculation/verification
- Mapping of bond increment areas
- Linking digital photos to site features
- Satellite or aerial imagery field use
- “Ballpark” contour elevation verification
- Boundary mapping and verification
- Hydrologic feature mapping (i.e. channels, stream reach, watershed areas)
Jurisdictional Boundary Check with GPS/Mobile Computer Proof-of-Concept

- Navigate to area of interest
- Verification of boundary locations along areas with different status (i.e. Pre-law vs. Interim)
- Shapefile of Jurisdictional boundaries used as background to real-time corrected GPS
- Range of offset from boundary < 1’ to 12.9’
- Most < 7’
IKONOS Imagery as Mr. SID Background in ArcPAD

Road Corridors
Reclaimed Slopes Elevation Comparison Results with ArcPad/GPS

- Point 1: Permit Elevation 7560, ArcPad Elevation 7561.1
- Point 2: Permit Elevation 7580, ArcPad Elevation 7580.7
- Point 3: Permit Elevation 7597.1, ArcPad Elevation 7600
Selecting Target Bond Increment
Slope Verification

Measure Tool
Topsoil Depth Verification – Prime Farmland

ArcPAD tracklogs show areas of inspection
Topsoil Stockpile Footprints in ArcPAD
Uranium Waste Locations and Depth
Uranium Radiation Activity Map

Mabel New-Superior: Radiation Reduction after Cleanup

Clean Up Survey
Micro-R/hr @ 1 m ht.
- 10 - 22
- 33 - 37
- 38 - 51
- 52 - 63
- 64 - 79
- 80 - 118
- 119 - 450

Statistics
Clean up Data:
2,500 observations
15 - 100 micro-R/hr
Mean = 50 micro-R/hr
Std. Dev. = 23 micro-R/hr

Pre-Reclamation Data:
1,040 observations
22 - 2,100 micro-R/hr
Mean = 216 micro-R/hr
Std. Dev. = 230 micro-R/hr
Mean lowered by 77%
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Questions?