Site Selection for Aerial Inspections of Surface Mines in Pennsylvania

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Problem

- State Mine Inspectors need an efficient way to select surface mine facilities for aerial inspections and coordinate helicopter flight schedules.

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Solution

- Create a workflow using GIS so these “non-traditional GIS-users” can select sites and schedule flights in an efficient manner.

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Background

- Over 1,100 active surface mine facilities in Pennsylvania
- Federal Law requires state regulators:
  - One “Complete” inspection per quarter
    - Requires on-ground inspections
  - Two “Partial” inspections per quarter
    - Were also being conducted on the ground
    - Can be conducted from aerial observations

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Active Mine Site

Treatment Ponds

Background

- Currently, 2 inspections per day with an inspector on the ground.
- Cost-benefit analysis, 60 inspections per day for helicopter aerial inspections to be cost-effective.

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Background

- In previous projects involving helicopter inspections, inspectors spent a lot of hours:
  - Combing spreadsheets and reports to determine inspection needs of sites
  - Flipping through paper topo maps to determine sites near each other
  - Calling around to other offices to coordinate flights with other inspectors

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Background

- Flaws in old workflow lead to:
  - Missed opportunities to inspect overlapping sites
  - Less efficient scheduling of flight time
  - Miscommunication in coordination

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New Workflow

- Tasked with creating a GIS project to streamline this part of the project
- Utilize ArcGIS, python scripting, and MS Office to improve efficiency
- Needs to be <u>user-friendly</u> so “non-traditionally GIS-using” field inspectors can use it

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New Workflow

- Start with good data input into our inspection tracking oracle database, e.F.a.c.t.s.
- Query developed that nightly would export a table for each inspection area
  - Site latitude & longitude
  - Quarterly inspections done to date
  - Name & other site permit information

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New Workflow

- Inspectors launch a Python script from their desktops
  - Creates a shapefile from table
  - Opens an ArcMap project

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New Workflow

- ArcMap project displays:
  - Surface mine facilities based on inspection history/needs
  - Airports location for take-off and landing
  - Municipal boundaries, topographic map, and aerial photography backgrounds
- Simplified custom toolbar with only needed tools

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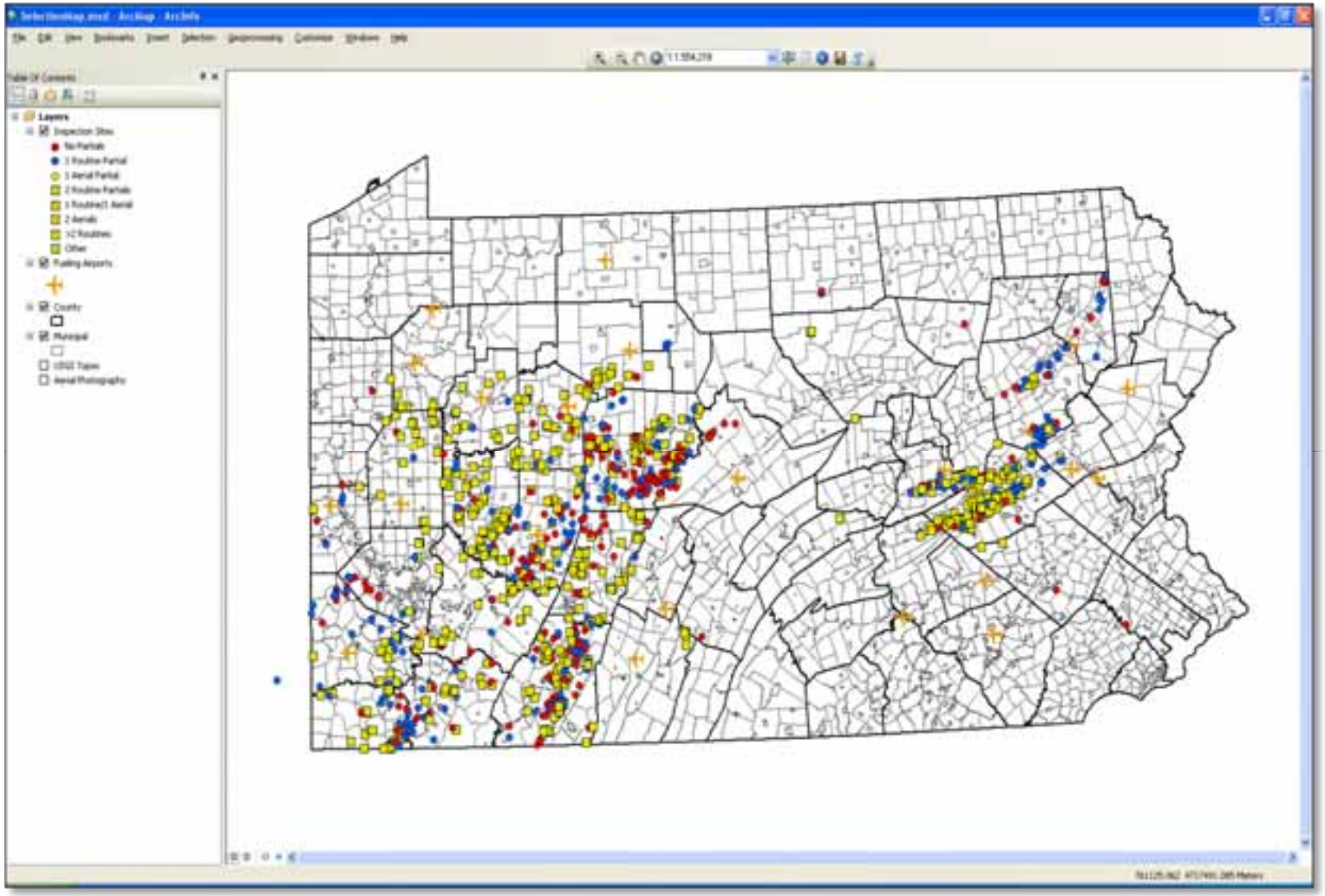
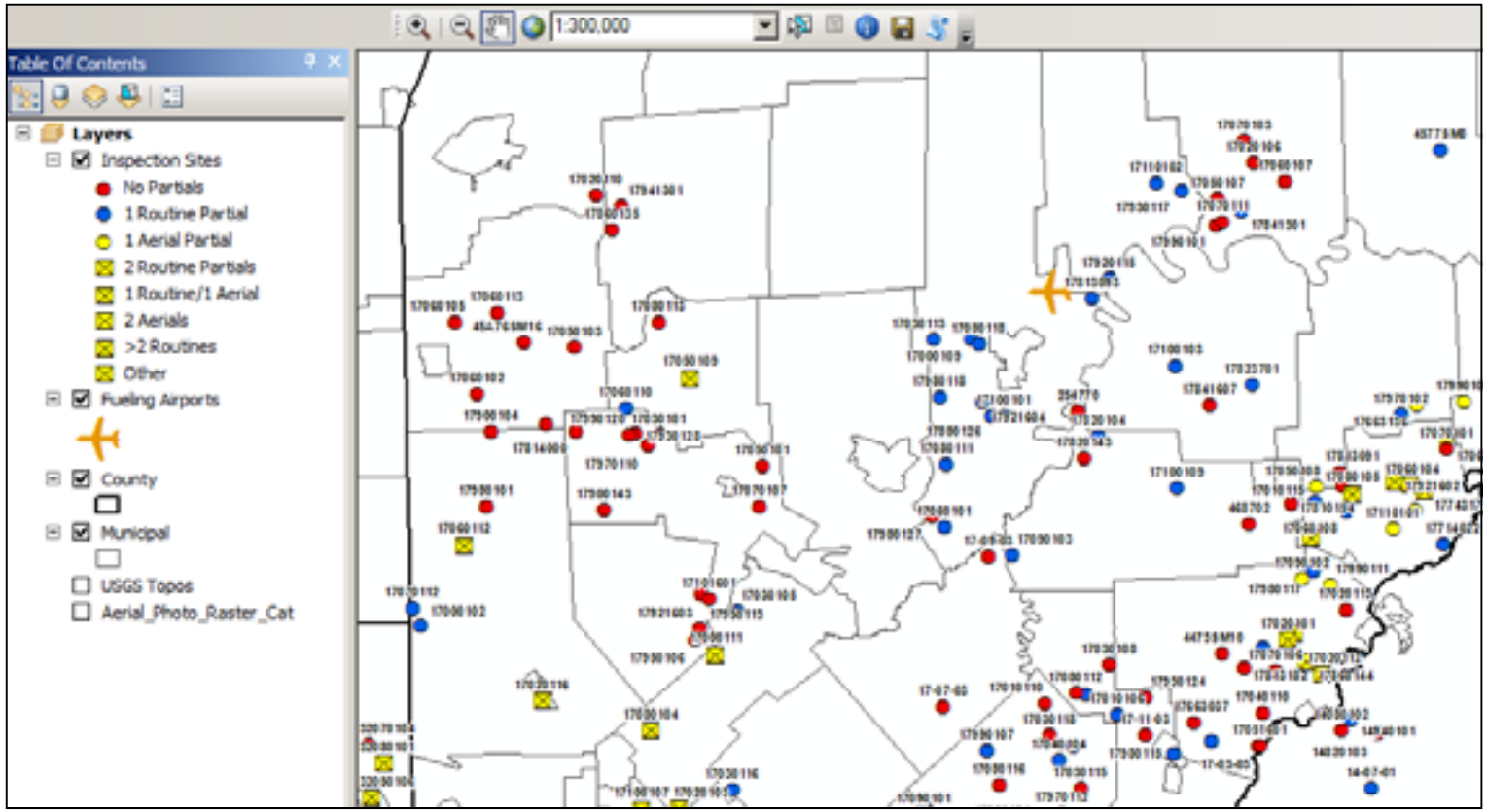
New Workflow



New Workflow

- Inspectors can now <u>visualize:</u>
  - What sites need inspected
  - Distance to other sites



New Workflow

- Inspector selects sites in most need
- Then selects sites near first group up to target number that can benefit from aerial inspection
- Runs a python script tool from toolbar

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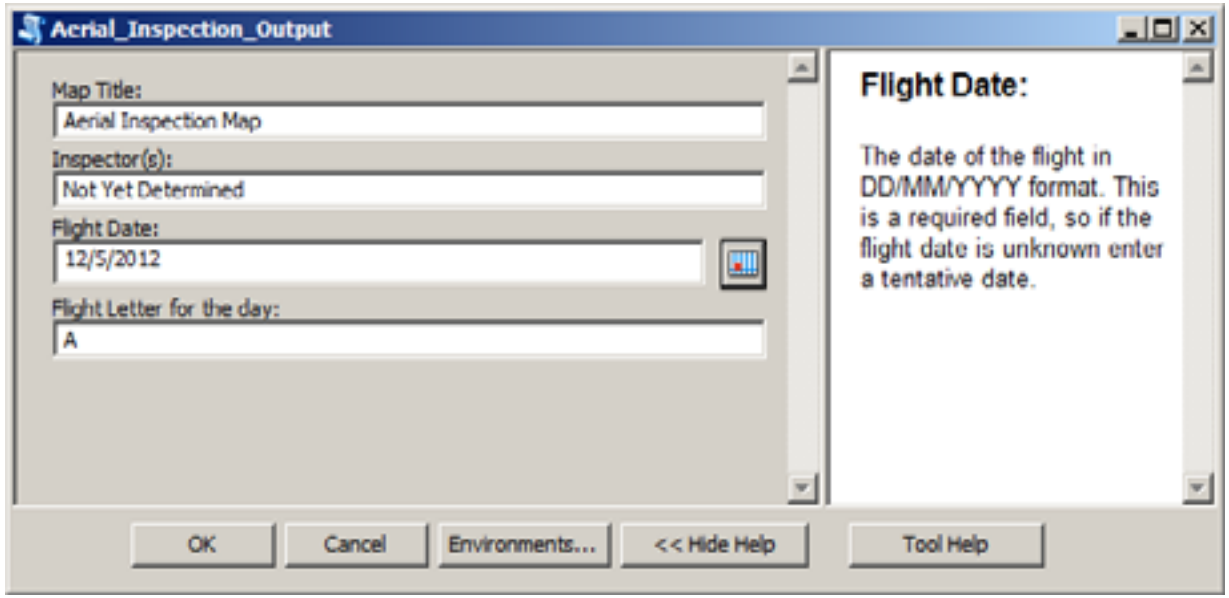
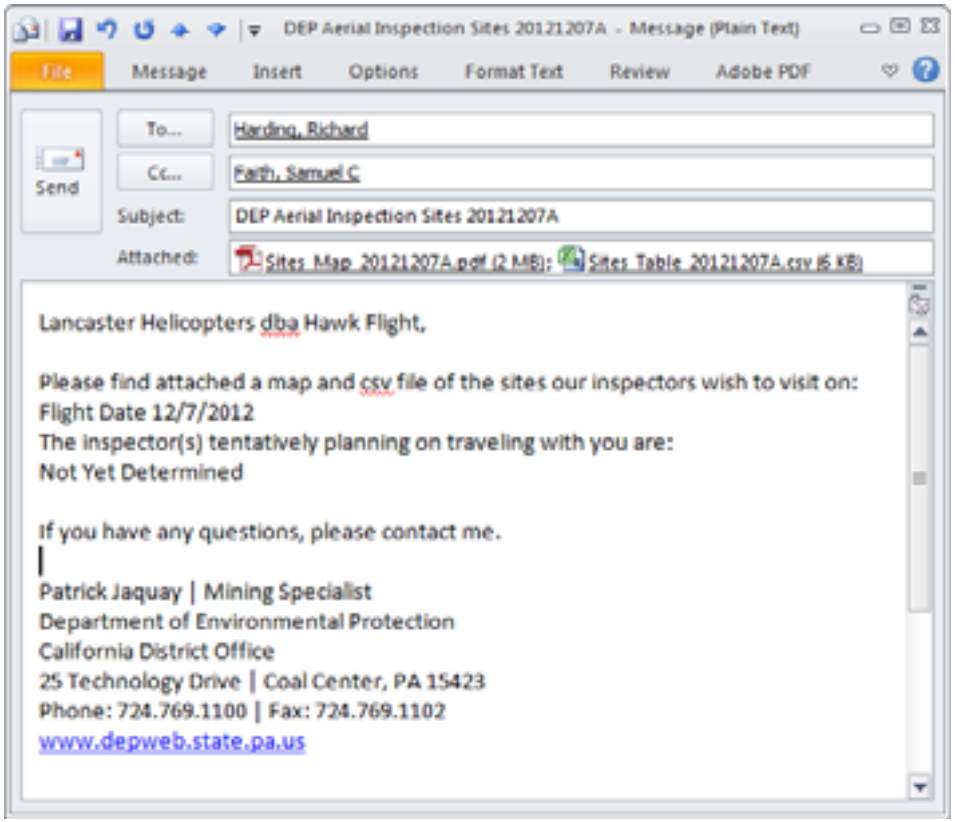
New Workflow

- Python script tool
  - Input Inspector Name and flight date
  - Uses arcpy.mapping module to export PDF map
  - Exports csv file of selected sites
  - Generates draft e-mail with attachments



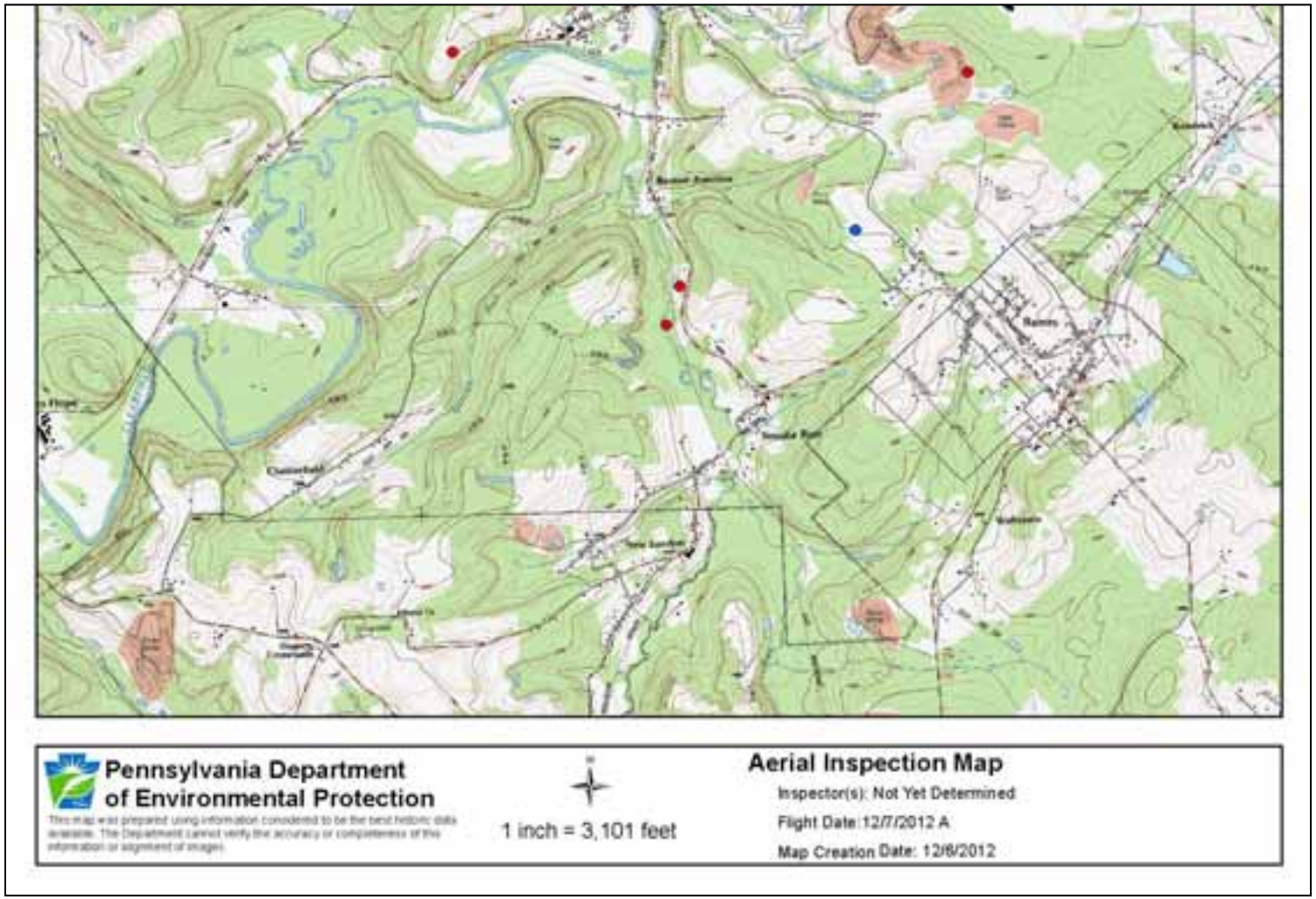
New Workflow

- Email created in Outlook drafts folder
  - Reviewed by Inspector, before sending
  - Recipients, attachments, and message body automatically populated



New Workflow

- Used by inspector for reference during flight



New Workflow

- csv file used by pilot to prepare flight plan
- Pilot verifies scheduled flight in Outlook calendar
- Calendar available to all parties to plan subsequent flights

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Results – GIS Project

- Enables “non-traditional GIS-users” to select sites and schedule flights in an efficient manner
  - Freeing up time to focus more on problem remedy instead of flight planning
  - Clear communications: no canceled flights due to miscommunication
  - More efficient use of flight time: more inspections per flight than previous projects

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Results – Inspection Project

- Slightly exceeding 60 inspections a day
  - 10 flights per quarter
  - ~200 inspections per month
  - **Saving Money!**
- Enables inspectors to more readily meet federal inspection requirements
  - Freeing up time to focus more on problem remedy instead of inspection quotas

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Bell Jet Ranger

Unstable Slope

Active Pit

Active Pit

Treatment Ponds

Thank You!

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