

FGDC CAP Category 2 - Framework Client Development Project:  
Integrated Mapping and Analysis Tool (IMAT) Client  
Interim Report  
1 November 2006

**Agreement Number:** 06HQAG0116

**Organization:** Image Matters LLC Headquarters  
201 Loudoun Street SW  
Leesburg, VA 20175  
<http://www.imagemattersllc.com>

**Project Leader:** Dr. Jeff Ehman  
812.325.7937  
[jeffe@imagemattersllc.com](mailto:jeffe@imagemattersllc.com)

**Collaborating Organizations:** POC: Tom Moore, Technical Coordinator  
Western Regional Air Partnership (WRAP)  
c/o Western Governors' Association  
1515 Cleveland Place, Suite 200  
Denver, CO 80202  
[www.wrapair.org](http://www.wrapair.org)

POC: Shawn McClure, TSS Administrator  
Cooperative Institute for Research in the Atmosphere (CIRA)  
Colorado State University Foothills Campus  
Fort Collins, CO 80523-1375  
[www.cira.colostate.edu](http://www.cira.colostate.edu)

## Project Narrative

In collaboration with WRAP and CIRA, we have been building the Integrated Mapping and Analysis Tool (IMAT) as a data exploration, visualization, and analysis capability for the WRAP Technical Support System (TSS). The WRAP consists of local, state, federal, tribal governmental participants as well as representation from industry, the scientific community, and various public interest groups. The focus of the TSS is to provide States and Tribes the technical information required for constructing their Implementation Plans for meeting Regional Haze Rule requirements of the Clean Air Act.

When complete, the IMAT will provide users access to geospatial data from multiple sources in varying projections and formats. IMAT supports interactive display of maps using Web Mapping Services (WMS) standards, query and display of geospatial feature information using Web Feature Service (WFS) standards, data registry support using Catalog Service for the Web (CSW) and Federal Geospatial Data Consortium (FGDC) standards, and custom feature analysis and reporting. This project involves multi-agency participants and several distributed data sources that must be integrated into coherent, actionable information views and reports. Please refer to the *draft* Specification Sheet for a brief description of the IMAT product, attached as the last page of this report

A preliminary version of the software is operational and can be accessed as a stand-alone page at <http://victor.cira.colostate.edu/imat/>. As of the date of this report, the only functional component that has not been finalized is the WMS reprojection capability. Collaborative challenges that remain include working with CIRA to ensuring that the code-base, API, and documentation is user-friendly so as to facilitate imbedding select IMAT components into web pages with programmatic control. A comprehensive Configuration and Use document will be made available when the development is finalized and testing is complete.

## Status of data access activities

WRAP's emissions and modeling data constitute the bulk of the data for display, query, and analysis using the IMAT. Currently the IMAT makes accessible 375 layers of these air quality themes. The framework data theme accessed for this project, for use in providing context and spatial constraints for analytical tools, is Government Unit Boundaries (GUBS). Our intention is to use authoritative sources of GUBS data wherever possible, and to obtain that information through WFS. The IMAT, as applied to the WRAP TSS, presently utilizes two US Counties and US States GUBS layers that are a part of the US Bureau of Census's Cartographic Boundary File (CBF) data set. Characteristics of these data sets are presented in the following table:

Name	Source	Number Features	Spatial Extent	File Size
Counties	Bureau of Census	3489	US States + Puerto Rico (Bbox: -179.15 W, 179.78 E, 71.35 N, 17.88 S)	12.5 MB
States	Bureau of Census	273	Same as above	1.3 MB

Our plan is to expand to include other relevant Census CBF data, including: American Indian Areas/Alaska Native Areas/Hawaiian Home Lands, Alaska Native Regional Corporations,

American Indian Tribal Subdivisions, Core Based Statistical Areas, Combined Statistical Areas, and Metropolitan Divisions. When Census stands up their WFS with data (GML) that is formatted according to the GUBS Framework data standard, then we will access their data. In the interim, we have stood up our own WFS to serve the CBF data.

### **Status of Framework Client Development**

The software development phase of project is nearly complete. The client software is evaluated and tested at 3 levels: by Image Matters staff, by the TSS project team (including WRAP and CIRA POC's listed on page 1), and then a subset of the intended users. We are currently planning for the packaging, delivery, and promotion of the IMAT open source components. We are tentatively targeting the 2007 NSGIC Midyear Conference, March 25-29, 2007, in Annapolis, Maryland.

### **Project management**

After the software development is finalized, and testing is complete, we will prepare for a freely-available offering. We anticipate this process to be complete by the end of the calendar year, however, our work on the TSS is projected to continue at least until the end of 2007. As mentioned, the software development phase lacks only the WMS reprojection function. Other near-term activities include working with CIRA to ensure that selected IMAT components can be easily integrated into existing web pages, and completing documentation once testing is complete. We are carefully working through licensing, labeling, and packaging considerations, giving the mix of open source software (e.g., geotools), new code (funded through WRAP and CAP), and proprietary Image Matters code used in the IMAT.

### **Feedback on Cooperative Agreements Program**

Without the CAP grant funds for the development of the IMAT, WRAP would not have been able to produce the mapping functionality made available through the TSS. Image Matters was able to make effective use of the funds as a supplement to the funds available through WRAP. The monthly CAP teleconferences were useful in gaining insight regarding standards status, adoption/support by various internet mapping software packages, and CAP participants' experience in developing compliant systems. Although it was not essential for moving forward, one aspect of the collaborative CAP process should be pointed out. In the early phases of our development effort, when attempting to use the services of other CAP participants for developing or testing our service or client component, we found that in several cases that either the GUBS standard was not being followed exactly or adherence to some other specification critical to our effort (e.g., logical operations for WFS through the OGC Filter) was lacking. This precluded us from being able to fully leverage and build upon work of other CAP participants. Our intention is to document and make available our products such that others, including the 2007 CAP grantees, can leverage and build upon our efforts.

# DRAFT -Integrated Mapping and Analysis Tool Specification Sheet - DRAFT

## Overview

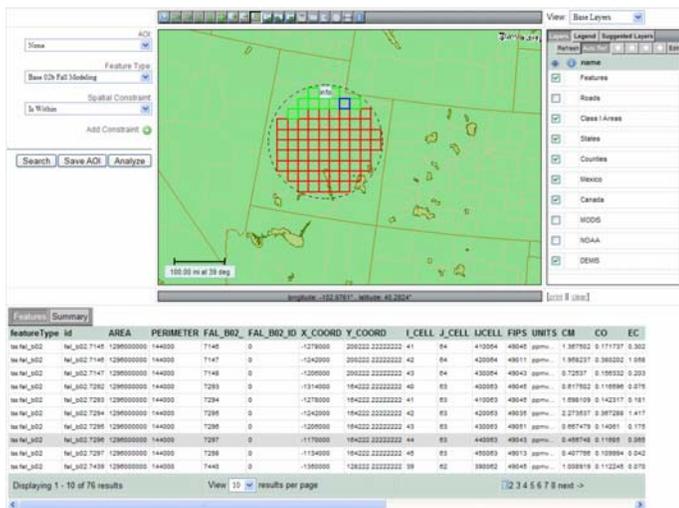
- ❖ IMAT is an application suite providing GIS functionality using open standards and cutting edge technologies
- ❖ Tools for discovering, viewing, analyzing and reporting on multi-source geospatial data
- ❖ Powered by userSmarts® GX

## GIS Integration

- ❖ Client-side manipulation and control of geospatial data and views enables fast response and dynamic user interactions for a positive user experience
- ❖ Connects to multiple types and instances of OGC Web Services as facades to “back office” GIS systems and data: Web Mapping Services, Web Feature Services, Catalog Service for the Web, Web Processing Services
- ❖ Compatible with ESRI ArcIMS/ArcSDE WMS and WFS connectors, GeoServer WMS and WFS, and others!

## Map Support

- ❖ Easy-to-use map controls
- ❖ Support for multiple layers from multiple servers at once
- ❖ Interactive zooming and panning capabilities
- ❖ Dynamic layer controls for controlling visibility, opacity, and configurable layer-specific properties
- ❖ Support for multiple coordinate reference systems and projections
- ❖ Real-time cursor coordinates display
- ❖ Smart scale bar with configurable units

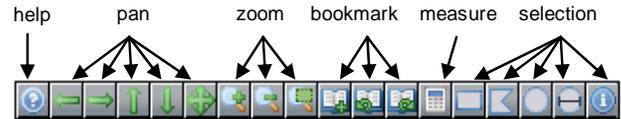


## Map, Layer Control, and Feature Control Components

- ❖ Smart layer management for high performance access to multiple remote Web Map Servers and other data sources
- ❖ Bookmarks allow multiple map states to be saved and instantaneously restored
- ❖ Provides tools for drawing geometric primitives useful in selecting regions of the map to drive data queries
- ❖ Distance measuring capabilities supporting multiple user-drawn segments with per-segment and cumulative

calculations, configurable units, and multiple projection systems

- ❖ Support for browser rendering technologies such as Vector Markup Language (VML) and Scalable Vector Graphics (SVG)
- ❖ Customizable and configurable tools: create your own tool and dynamically (at runtime) add it to the map



IMAT Map Toolbar Controls

## Feature Support

- ❖ Provides query capabilities to discover geospatial features using Web Feature Service standards
- ❖ Offers components for displaying feature information in tabular form and on the map
- ❖ Supports querying and accessing features from a variety of sources and in different projections

## Analysis and Reporting

- ❖ Provides summary reports about feature properties: minimum and maximum values, sums, area-weighted sums, area-weighted means, and number of sources
- ❖ Offers dynamic, feature-specific user controls for configuring analysis functionality

## Data Management

- ❖ Uses Federal Geospatial Data Consortium (FGDC) digital geospatial content standards for describing data
- ❖ Provides discovery and examination of metadata within the system using Catalog Service for the Web (CSW) services

## userSmarts® GX

- ❖ An open framework for constructing and deploying dynamic Web-based decision support and portal systems
- ❖ Provides a multi-layered framework to simplify AJAX application development
- ❖ Plug-in model simplifies application development, promotes customizable functionality, and supports code reuse.
- ❖ Easy to embed into existing Web pages and browser-based applications

### Image Matters LLC Headquarters

201 Loudoun Street SW  
Leesburg, Virginia, 20175

Phone: 703.669.5510  
Fax: 703.669.5515

<http://www.imagemattersllc.com>

### Image Matters LLC Mid-West Operations

4899 North Old State Rd 37  
Bloomington, IN 47408

Phone: 812.325.7937  
Fax: 812.334.0625