The State of Missouri

Geosciences Technical Resource Assessment Tool (GeoSTRAT)

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Category:

Digital Government: Government to Business (G to B)

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Executive Summary

The Missouri Geological Survey (MGS) as a division within the Missouri Department of Natural Resources (MoDNR) serves its customers and state citizens by supplying geoscience information to support stewardship of water, land and mineral resources. MGS produces geologic maps and provides technical assistance regarding the state's geological setting.

The Geosciences Technical Resource Assessment Tool (GeoSTRAT) is an interactive public mapping application, built using ESRI ArcGIS and Google Earth Enterprise technologies. This project was a joint development effort between MGS and Missouri's Office of Administration, Information Technology Services Division (OA-ITSD) to make geologic and hydrologic data available to citizens, planners, industry, academia and others online 24/7.

Users can visually travel anywhere in Missouri to see aerial views of the landscape and navigate and explore the surface as if standing on the ground through the use of Google Earth Enterprise's 3-D globe services. Sinkholes, mines, springs, wells, cave density and many other features can be located by selecting these data layers to display on the interactive map.   GeoSTRAT is currently used in disciplines such as hazards assessment, environmental consulting and engineering, local and regional planning and insurance assessment.   Having this data at one's fingertips, instead of stored on shelves, in cabinets and only available during conventional workday hours provides users critical information around the clock. The data can be downloaded in formats compatible with a variety of free and commercial mapping software. GeoSTRAT has been featured as the lead article on Geology.com and AmericanGeosciences.org

Business Problem and Solution

Business Problem

Throughout MGS's 160 history, thousands of geologic maps have been produced and related data collected to enable users to apply earth science data to real-world issues. Requestors of this information had to contact MGS to order information in various formats or travel to the MGS location in Rolla, Missouri to search files and work with staff to research or re-produce paper copies.   As an example, MGS previously produced the Missouri Environmental Geology Atlas (MEGA) CD-ROM to provide users access to some of the statewide geographic information system (GIS) layers that are now available in GeoSTRAT. Users were additionally provided a manual with instructions for use as well as free software to enable viewing. The price of the MEGA CD was $45.

Solving this business problem by changing the traditional approaches of providing access to geo-specific data sets and geoscience research was MGS's vision behind this project.

Solution

GeoSTRAT (http://dnr.mo.gov/geostrat/) is the next generation application from MGS to provide a "one-stop shop" for this pertinent geoscience information in a 21st century format that is accessible to citizens, city planners, industry representatives, academia and others free of charge 24/7.

As examples of the potential impact this data being available online, numerous data layers now available online through GeoSTRAT were used to aid planners in properly locating sites for landfills for debris removal following the historic tornado that devastated Joplin, Missouri in 2011. Having immediate access to abandoned mine and sinkhole locations that could collapse in the event of a natural disaster resulting in potential human safety incidents as well as potential environmental contamination can now be provided around the clock.

Elements of the Solution

GeoSTRAT is a Java based web application that incorporates Java Script API's, ESRI ArcGis geo-data components, and Google Earth Enterprise/Earth Fusion technologies

Development activities conducted by OA-ITSD and its Office of Geospatial Information (OGI) included:

- Conversion of 30 data layers to layer package and keyhole markup language (KML) format files for download capability and use with desktop software programs.
- Publishing a Google Earth Enterprise 3D globe to be used as a backdrop for the GeoSTRAT data layers.
- Development of a front end public facing web map viewer using Google Map API's. The geospatial data that is served atop the globe is powered by API's to allow users to turn layers on/off, view attributes, zoom to specific places, and interact with the map.
- Development of processes to add new and updated data regularly.

The project development personnel cost was $16,941 with 416.25 staff hours allocated over the 4 month project duration. Since the launch date of 1/31/2014, GeoSTRAT has averaged over 2300 site visits and 2100 data layer downloads per month.

In an effort to engage users and stakeholders from the very beginning of the project, MGS requested subsets of users from multiple industries to act as application testers during the development phase. Feedback regarding additional data layers to be added, additional application functionality and suggested improvements to the user experience were all taken as inputs into the final product.

Significance of Business Process Improvements

The significance of GeoSTRAT in business process improvement has been the integration of digital tools with basic geologic procedures such as data collection, monitoring and mapping.   Users and other interested parties now have an application available that gives them unprecedented access to MGS data and information with various means for its organization, visualization and interpretation.

The application is actively aiding users in geological mapping, groundwater monitoring, environmental site assessments, feasibility studies, design of groundwater monitoring networks, classroom studies and many other projects. As a testament to the business process improvements the application has made for its users, the following feedback was collected by MGS staff.

- Nancy Dickens of TetraTech – a leading provider of consulting, engineering and program management with 300 offices worldwide – "I'm really impressed. GeoSTRAT is the best I've seen from any state".
- Lindsey R. Henry, President of Midwest Environmental Consultants -- "GeoSTRAT has compiled many different types of information, some of which we did not know was available. This information is literally at our fingertips".

- Kenny Hemmen, Project Manager for GEOTECHNOLOGY, INC-- "GeoSTRAT improves our work efficiency by providing improved access to numerous types of geologic information in one user friendly online tool. The improved efficiency lowers the overall costs to obtain the applicable geologic information".
- Lindsay James, a registered geologist and project manager for Blackstone Environmental in St. Louis, MO – "GeoSTRAT has proven invaluable in a wide variety of projects for us, everything from environmental site assessments to accurately costing drilling services, to conducting even more complex hydrogeological site investigations".
- Dr. Doug Gouzie, Professor of Geology at Missouri State University – "GeoSTRAT so far has been used for 1) Historic dye traces in Missouri (both faculty and grad students) 2) Sinkhole Locations (faculty) 3) Basemap geologic data for an undergrad mapping project (faculty and students). As word continues to spread, increasing use will be made of this great tool".

<u>Application Features:</u>

GeoSTRAT is a mobile responsive public facing application that allows users to load ESRI generated GIS data layers quickly over Missouri's 3-D photographic landscape that features horizontal positioning and navigation with search and zoom capabilities specific to an address or location. Users have data layer visibility options and attribute display for the geographic and geologic information that is of the greatest interest to them. Additional detail information is available via call out windows through integration with an electronic content management system for documentation in PDF format such as well information records. Data layer packages are also available for download to use with GIS software for customized map design and data interpretation.

With the 3D visualization component being the cornerstone of the application, engineers and consultants conducting environmental or engineering reviews now have the opportunity to better access and detail the geologic and hydrologic conditions of an area of interest. This can quickly give them a general perception of groundwater contamination potential or engineering structural issues based on geology or hydrology than can direct them to a more detailed investigation. Insurance companies can better define policies based on understanding of geologic hazards by accessing data through media they are familiar with.

Benefits of the Project

GeoSTRAT benefits a variety of users and interests by allowing powerful but simple visualization of 50+ geological data sets such as Ground Water Depth, Groundwater Elevation, Depth to Bedrock, Sinkhole locations and many more.   Whether you're a history buff searching for information about a limestone surface mine used to build the state's original interstate highway system or just curious of your surroundings, a wealth of information is available using GeoSTRAT. Specifically, MGS customers and stakeholders such as environmental consultants, engineers, insurance companies and academia (5th grade to post graduate studies) benefit through the availability of MGS's most popular and pertinent data in a usable, familiar and downloadable format,

By providing the ability to overlay MGS's existing data layers on a 3-D Google Earth aerial image, GeoSTRAT is an example of using innovative technology to directly benefit users with more useful and accessible information.   Specific feedback to MGS includes:

- No longer are direct inquiries to MoDNR/MGS necessarily needed to view department documents and paper files.
- GeoSTRAT is heavily used in assisting with Phase I Environmental Site assessments, which are often used to access environmental conditions of real estate property transactions.
- The Certified Well data layer has been an excellent screening tool for site assessments because the existence of monitoring wells on or near a property can indicate the past or current existence of contamination.
- Background documents can more quickly be researched by using GeoSTRAT to detail well identification and ownership.

The mission of the Missouri Department of Natural Resources is to protect the state's air, land and water; preserve its unique natural and historic places; and provide recreational and learning opportunities for everyone. GeoSTRAT directly aligns with multiple facets of this mission while also benefiting the department's constituents and customers in their own missions and causes by providing access to important and useful data assets than can be accessed easily in the home, office, field or classroom.

As shown below, GeoSTRAT is also providing direct financial benefits not only to its direct customers but also to those its customers serve.

- Jason Smith, President of Environmental Works, Inc (EWI) – "EWI currently uses GeoSTRAT and MEGA-CD previously since 2005. GeoSTRAT is a very valuable tool for accessing possible sensitive environmental receptors when completing site risk assessment in Missouri. Not only does it save time because it is an "all-in-one" resource, but it allows more targeted site reconnaissance

saving time in the field as well. Depending on the complexity and remoteness of a project site, we estimate GeoSTRAT saves our client a few hundred to a few thousand dollars in research time per assessment and results in more complete risk assessments".

- Jeffrey Binder, Associate Geologist at Burns & McDonnell – "GeoSTRAT provides a good and cost effective starting point for geologic information for the State of Missouri. As extensive and site specific research and review of data is needed to gain a higher resolution understanding of the conditions, GeoSTRAT is a great starting point".

- Lindsey R Henry, President of Midwest Environmental Consultants – "We use to have to either call and order the information we needed or travel to Rolla to search files and pay for paper copies. Now we can get the information electronically which is cheaper and much easier to store and recover".

- Lindsay James, a registered geologist and project manager with Blackstone Environmental --"GeoSTRAT enables us to more efficiently plan drilling work and to provide more realistic drilling estimates to our clients". Citing one specific project in which GeoSTRAT was used to create cross sections of the project site, James noted that having this information readily available helped streamline the project from its initial budgeting stage to preparing the job's final report. "Without GeoSTRAT, we likely would have incurred additional expense to extract rock core and to characterize the rock".

Innovation Approach

GeoSTRAT's innovative approach began with input from various teams including application development, geospatial specialists, MGS scientists and personnel from various areas of study within the user community. By researching and implementing the integration capabilities of the needed web based tools to seamlessly present the data in a single searchable format, GeoSTRAT is the central portal of Missouri's geologic past and present while allowing this data to be distributed in a free and open manner.

Utilizing Esri tools to generate the data layers in a format that Google Earth uses in the exchange of geographic information while applying Google Earth API's to easily view this data within a custom browser experience, users now have a widely distributed virtual alternative for discovery and exploration when actual field experience is impractical or cost prohibitive.