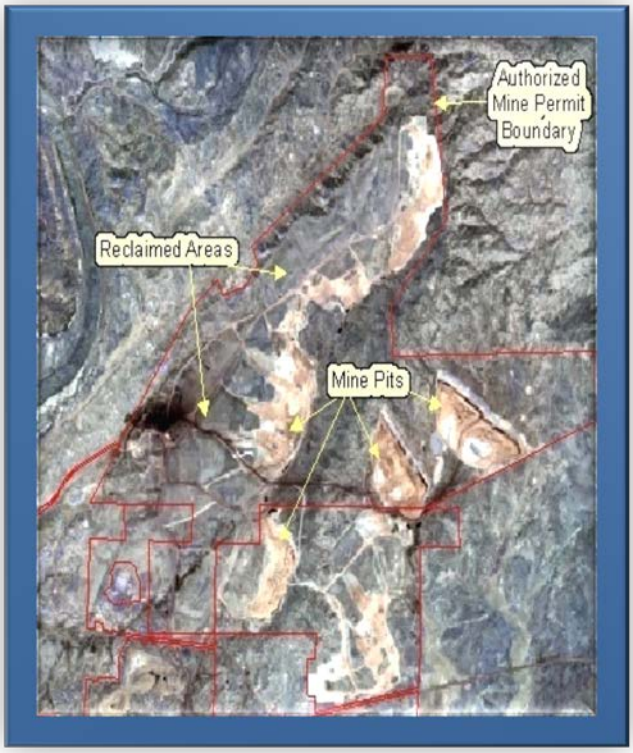

Coal Mining and Reclamation Geospatial Strategic Plan

February 2013

Western Interstate Energy Board

NAAMLP

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I. Executive Summary

The Office of Surface Mining Reclamation and Enforcement (OSM) must expand and modernize its use of geospatial technologies to meet current and future needs. The mining industry generates nearly all of its permitting and performance information in digital format, yet many Surface Mining Control and Reclamation Act of 1977 (SMCRA) regulatory programs have serious limitations in their ability to use this information in digital form. The public increasingly demands that mining and other environmental compliance information be available over the Internet in order for them to participate meaningfully in SMCRA programs. Given the complex challenges that OSM and its SMCRA partners face, it is critical to have actionable knowledge and true situational awareness for accurate and effective decision-making.

Implementation of geospatial technologies at the enterprise level will allow OSM and our SMCRA partners to realize significant operational efficiencies, make better decisions, and more effectively inform and involve the public in SMCRA-related decisions. The deployment of the strategies recommended in this document will result in a national SMCRA Geographic Information System (GIS) that will help reveal critical mining and environmental relationships and patterns that can be seen more clearly on a shared map. With this interactive national GIS map, data normally shown in spreadsheets, graphs, and narrative forms will begin to take shape and develop stronger significance. A GIS-based analysis capability will allow OSM and our SMCRA partners to more effectively examine national and local coal-mining and environmental implications.

The OSM Geospatial Team (the GeoTeam[1]) has developed the Geospatial Strategic Plan (GeoPlan) described in this document to recommend solutions that will: (1) modernize OSM's use and management of mine permitting and compliance information; (2) increase public access to and participation in SMCRA activities; and (3) facilitate data-sharing with our SMCRA partners and others with interest in mining and land-use decisions. This version of the GeoPlan, dated 2013, incorporates input from our stakeholders, **and is adopted as the Final GeoPlan**. For descriptions of activities that, with adequate resources, will lead to achieving the milestones recommended by the GeoTeam, see

[1]OSM's GeoTeam was formed on February 19, 2009, to formulate a geospatial strategy for consideration by OSM leadership. Team members were OSM's Western Region (WR) Technology Management Division's Bill Clark, Lou Hamm, and Dan Rivers; Mid-Continent Region's Len Meier; Appalachian Region's (AR's) Bill Card and Bob McKenzie; Headquarters Program Support Directorate's John Craynon; and Office of the Chief Information Officer's Bernie Gordon. Team contributors included AR's Earl Bandy and Mike Robinson, Headquarters PSD's Sarah Donnelly and Li-Tai Bilbao, and OCIO's Roy Morrison.

section VI of the document ("Next Steps") and the OSM annual Geospatial Work Plans. Since the initial drafting of this document, the GeoTeam has bisbanded and handed ownership of this document to the wider reaching GeoCommittee (formerly known as the National Coal Mining Geospatial Committee (NCMGC)) made up of OSM partners to include members of the Western Interstate Enegy Board (WIEB), the Interstate Mining Compact Commission (IMCC) and the National Association of Abandoned Mine Lands Programs (NAAMLP). The GeoCommittee has reviewed and approved the direction and intent of the GeoPlan as outlined further in this document.

The GeoTeam concluded that the benefits of implementing its recommended GeoPlan would be:

- *Better decision-making* based on location-based science and resulting in increased protection of the public and the environment;
- Greater *transparency*, more responsible stewardship, improved customer service, increased productivity, and greater efficiency;
- The provision of an effective tool for OSM to use in setting national goals and in tracking performance;
- The increased visibility of *critical relationships and patterns* (location-based analytics) which could then be seen more clearly on a map;
- Improved *analyses* and response to abandoned mine land problems;
- More effective use of *human resources*;
- Better focus and improved accuracy of State and Tribal *oversight evaluations*;
- *Improved* quality, quantity, and availability of coal-mining and reclamation *data*;
- The provision of data and an infrastructure that would allow OSM and its SMCRA partners to readily *address significant national issues* (e.g., oversight, climate change, and reforestation);
- An increased capacity for OSM to assist the *Secretary* of the Department of the Interior (DOI) in meeting *DOI initiatives*;
- An increased capacity for OSM to make information readily available, thereby facilitating *informed decisions* by others regarding land use, including such things as *infrastructure placement*;
- Improved *interagency coordination* with the Environmental Protection Agency, Army Corps of Engineers, and Fish and Wildlife Service, plus others not yet identified; and

- *Compliance* with the Federal Office of Management and Budget's (OMB's), as well as DOI's, guidelines and Presidential mandates.

II. Introduction

This document is a strategic plan for the acquisition, use, and management of coal-mining spatial data to modernize many information products within OSM and its SMCRA partners. When implemented, this plan will help OSM, States, and Tribes ensure their decision-making processes use the best scientific coal-mining data available and their regulatory activities are more transparent to the public. In addition, the implemented plan will improve interagency coordination on coal mine permitting, and provide improved information access to other government organizations, educational institutions, industry, and the public on coal mining and reclamation issues. The availability of such data will allow all interested parties to participate in more meaningful ways in OSM processes and activities; and provide government and industry with opportunities to share and use the data. Geospatial technology is an ever changing environment, and relies heavily on the availability of resources and opportunities to integrate technology and data. The GeoPlan outlines areas of focus for improvement. The Annual Work Plan, which is a separate document, takes these concepts or areas of focus and determines goals and milestones to bring these efforts to realization and completion.

A. What are geospatial data?

Geospatial data are data that are referenced to a location on or in relation to the surface of the earth. People frequently organize information within a geospatial context (e.g., where they live, where they work, the path they follow when they commute, etc.). In addition, people think in terms of spatial boundaries. Some examples here might be: *What is the population of this county? What is the average home price in this neighborhood? Where are the coal resources in this State? Where has mining occurred, and where is mining occurring? Where are the highest quality streams? How close is mining to my home or my kids' school?*

Geospatial data infers location. Location information can take many forms; including place names, street addresses, highway names and markers, latitude/longitude coordinates, and maps and images of places or resources of interest. The location must be structured, stored, and combined with other information resources, and it must be presented in such a way as to communicate to others both the

attribute (e.g., "Grand Central Station") and its location on the earth or in some other defined space. When location is processed with other data, such as the name of an individual, or information regarding a particular coal mine or the quality of a stream, it becomes geospatial information.

The ability to store and analyze information in its geospatial context opens up areas for new and innovative applications to support the Regulatory and Abandoned Mine Land (AML) programs under SMCRA. Geospatial computer applications have been used in SMCRA programs for over 20 years, but only at local and/or project scales. Recent developments in both geospatial technology and the information-technology universe (i.e., high-speed Internet connections and compact servers) make enterprise and federated geospatial applications not only possible but also commonplace in government and industry today (the utility industry being a good example). Implementing these geospatial concepts and supporting technology to their optimal use in OSM will require dedicated resources, but the potential benefits of integrating geospatial data and services into day-to-day operations are substantial and the consequences of failing to do so are significant.

B. Why are we doing this?

According to the Department of Energy/Energy Information Administration's recent "Annual Energy Outlook, 2009-2030," coal provides approximately a quarter of all energy supplies and 51 percent of electrical generation in the United States. Current projections indicate that the future demand for coal will continue to increase over the next 25 years (see figs. 1 and 2).

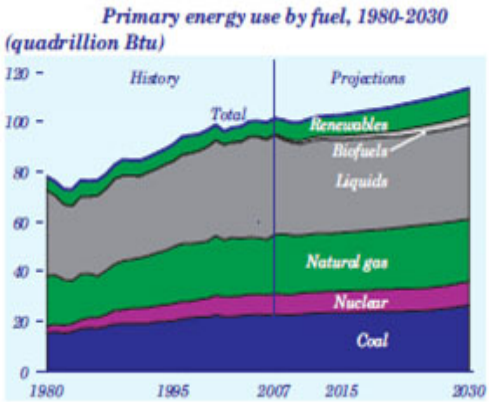

Figure 1.

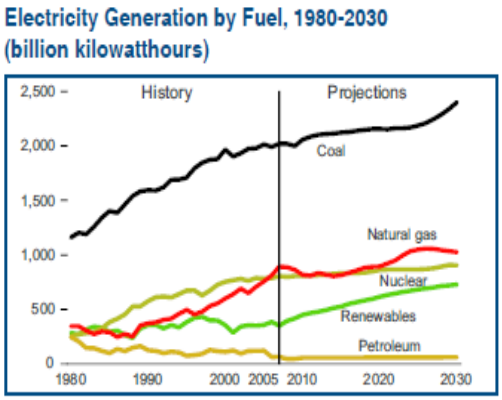

Figure 2.

The OSM Oversight Improvement Team, working to implement the Interagency Action Plan on Appalachian Surface Coal Mining, has issued a white paper entitled "Data and Technology." This paper states that:

> "Effective oversight of coal mining and reclamation requires the regular collection and analysis of pertinent, accurate, and usable data. OSM, States, Tribes, and the public need real-time information in an easy-to-use, technology based format. Improved data collection and analysis has significant benefits by making it easier to evaluate performance, spot trends, increase productivity of oversight staff, direct limited resources, and keep staff and the public better informed."

The white paper goes on to say:

> "OSM is pursuing development of a national . . . GIS to store, maintain, and analyze data and to report on the status of coal mining and reclamation activities. *A well-designed and maintained surface mining GIS will provide both regulators and the public with valuable information for administering regulatory programs.* Annual status reports from permittees would provide basic information for this GIS."

Implementing the GeoPlan will lead to the development of geospatial services in OSM that achieve the functions and purposes envisioned in the white paper.

Section 201 of SMCRA (30 U.S.C. 1211; "Creation of the Office") requires OSM to develop, maintain, and provide to the public good data in support of its programs. Specifically, it requires "[t]he Secretary [of the Interior], acting through the Office," to:

> "develop and maintain an Information and data Center on Surface Coal Mining, Reclamation, and Surface Impacts of Underground Mining, which will make such data available to the public and the Federal, regional, State, and local agencies conducting or concerned with land use planning and agencies concerned with surface and underground mining and reclamation operations" [SMCRA, sec. 201 (c)(8)].

In addition, Section 705 of SMCRA (30 U.S.C. 1295; "Grants to the States") authorizes OSM to assist the States/Tribes in developing their coal-mining data. Specifically, it authorizes the Secretary "to cooperate with and provide assistance to any State for the purpose of assisting it in the development, administration, and enforcement of its State programs. Such cooperation and assistance shall include":

> "[a]assistance in preparing and maintaining a continuing inventory of information on surface coal mining and reclamation operations for each State for the purposes of evaluating the effectiveness of the State programs. Such assistance shall include all Federal departments and agencies making available data relevant to surface coal mining and reclamation operations and to the development, administration, and enforcement of State programs concerning such operations" [SMCRA, secs. 705(b) and 705(b)(2)].

OSM and its SMCRA partners must concurrently perform their statutory duties (1) to ensure that the Nation's demand for coal can be met and (2) to protect the public and the environment from the effects of surface coal mining. Yet, the magnitude of the Nation's past and ongoing mining impacts and activities is not well documented; very little information is available digitally; and even less is geospatially referenced. Information on past mining and its potential effects on modern life are critical to making sound decisions that will sustain America's infrastructure.

The nature of coal-mining and related activities dictates that SMCRA-related decisions—some of them involving the potential for loss of life and property—must frequently be made quickly. Incorrect conclusions by OSM or our State/tribe partners may result in unnecessary environmental impacts. Geospatial technologies such as those proposed in this document have a well-established reputation for providing timely and accurate data to support sound decision-making, even under heightened conditions. In addition, geospatial technologies can lower risks in decision-making, improve responsiveness, and enhance predictive thinking to help prevent incidents such as those listed in appendix B to this document ("Real Life Examples of SMCRA-Related Incidents").

The establishment of this GeoPlan will allow OSM to comply with the Presidential Memorandum dated January 21, 2009, on Transparency and Open Government.[2] In particular, having geospatial data in a readily accessible format will allow OSM to efficiently provide the public and regulated community, as well as other State and Federal agencies, factual and real-time information upon which to base decisions. Further, access to this information will allow the public to participate more fully in the decision-making process to which the information relates. Finally, geospatial data will enhance collaboration among OSM, the States and Tribes, the regulatory community, environmental and citizens groups, other Federal agencies, and the public with respect to the implementation of SMCRA programs.

[2]Note: This is the first of the embedded hyperlinks that appear throughout this document and that are linked to other documents outside it. To reach such an outside document, please use your mouse to hover over any of these links. Hit Ctrl + click to follow the link to the document of interest.

The five major goals outlined in this GeoPlan—related to governance, business processes, data management, applications and technology, and education and outreach (see section IV of this document, "Goals," for detailed information regarding these)— support enterprise architecture efforts at the DOI bureau level, and government-wide geospatial information-management and strategic-planning efforts, in particular the Geospatial Platform.

The strategy proposed in the GeoPlan is in alignment with the Federal Office of Management and Budget's (OMB's) FY-2011 budget, which called for the transformation of Federal, State, local, and Tribal agencies for the purpose of increasing access to geospatial data.[3] In addition, implementing the GeoPlan would meet OSM's responsibilities under Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The NSDI," and OMB Circular A-16, "Coordination of Geographic Information and Related Spatial Data Activities". implementation would also meet requirements issued by the Federal Geographic Data Committee and will help to meet the requirements of the President's Executive Order of April 27, 2011 (Executive Order 13571) requiring Executive departments and agencies to, "Streamline service delivery and improve customer service."

C. Why are we doing this now?

The geospatial technology landscape has changed radically over the last few years. The software and hardware solutions have become more robust (i.e., vendors have released Web-based applications that can be published fast); geodata can be centrally managed in a secure fashion; access to and use of imagery resources has been simplified; and GIS can be extended to a mobile-computing workforce. The geospatial marketplace has experienced incredible growth that has been fed by the likes of Google Earth (released in 2005) and low-cost integrated Global Positioning System (GPS) devices. The public appears to have a large appetite for anything related to GPS and Google Earth/Microsoft Virtual Earth.

[3]With respect to geospatial platforms, the "Analytical Perspectives, Special Topics" section of OMB's FY-2011 budget proposal states that,

> "[i]n 2010 and 2011, Federal data managers for geospatial data will move to a portfolio management approach, creating a Geospatial Platform to support GeoOneStop, place-based initiatives, and other potential future programs. This transformation will be facilitated by improving the governance framework to address the requirements of State, local and tribal agencies, Administration policy, and agency mission objectives. Investments will be prioritized based on business needs. The Geospatial Platform will explore opportunities for increased collaboration with Data.gov, with an emphasis on reuse of architectural standards and technology, ultimately increasing access to geospatial data."

In July 2009, the U.S. Environmental Protection Agency launched MyEnvironment, which is a geospatially enabled website that uses a Virtual Earth mapping platform. MyEnvironment is designed to allow the public to obtain a granular level of environmental information pertaining to personally relevant locations, such as where they live, where their kids go to school, where they hope to retire, etc. Expectations are changing rapidly.

More and more, citizens expect government to provide data to them in their specific geographic context, and coal-mining data are no exception. Maryland Governor Martin O'Malley recently summarized these changing expectations perfectly when he said," . . . I'd like you to consider the answer to this question: why is it that virtually any display of GIS technology quickly inspires someone to ask the timeless question, 'Can you show me my house?'?"

Many of OSM's sister bureaus within DOI have public-facing Internet GIS mapping websites that allow the public to query and use government data otherwise inaccessible. Examples include:

- The department's Bureau of Land Management and U.S. Forest Service GeoCommunicator;
- The U.S. Geological Survey's (USGS's) The National Map;
- The USGS's The National Atlas;
- The USGS's Land Cover Institute;
- The USGS's Multi-Resolution Land Characteristics Consortium;
- The National Park Service's The National Park GIS; and
- The U.S. Fish and Wildlife Service's (USFWS's) U.S. Fish and Wildlife Service GIS.

A review of these websites reveals that many DOI bureaus are using geospatial data and technologies internally, as well as providing the public with easy access to geospatial data that assist them in using their services.

By adopting this GeoPlan, OSM takes advantage of the momentum created by the National Coal Mining Geospatial Committee (NCMGC). The NCMGC was established in late FY-2005 to promote the use of geospatial technology to help implement SMCRA. That committee was supported by OSM's Technical Innovation and Professional Services (TIPS) program and operated as a partnership between OSM and the States authorized to implement SMCRA. Committee members represented the geospatial

technology interests of the States, the Tribes, and OSM offices. SMCRA organizations with representation in the NCMGC include the Interstate Mining Compact Commission (IMCC), the National Association of Abandoned Mine Lands Programs (NAAMLP), and the Western Interstate Energy Board (WIEB).

The accomplishments of the original NCMGC continue to help our SMCRA partners realize the benefits of coal-mining spatial data in meeting programmatic information needs. Consequently, SMCRA programs are creating coal-mining spatial datasets from their paper files for use in SMCRA programmatic work, developing and sharing procedures and technology for building and using coal-mining spatial data, allocating available resources to build spatial information systems, and updating business practices and institutional relationships. These activities by our SMCRA partners collectively establish a Coal Mining Geospatial Data Framework upon which OSM can build a national Coal Mining Spatial Infrastructure. Approval of this GeoPlan will sustain and enhance the good works started by the original NCMGC by creating a framework that will guide the development of internal OSM geospatial systems, while continuing, as needed, the data standards and other activities the NCMGC initiated.

The GeoTeam conducted a strengths, weaknesses, opportunities, and threats (SWOT) analysis to fully evaluate what would be involved in developing OSM's Geospatial Services Program (GSP). This analysis involved reviewing the current state of affairs with respect to GSP and then identifying both internal and external factors that would be favorable and unfavorable in achieving the proposed future state. Figure 3 summarizes the findings of the SWOT analysis; appendix C to this document ("Strengths, Weaknesses, Opportunities, and Threats Analysis") provides a complete list of factors identified by the GeoTeam that made this effort timely and valuable.

***Figure 3.*—SWOT diagram for developing OSM's GSP.**

D. What will be accomplished?

The GeoPlan establishes a framework by which OSM can move into a geospatial future. That future, assuming dedicated resources and funding, will include:

- Establishing a geospatial governance structure that includes an OSM Geospatial Information Officer (GIO) and a State/Federal steering committee (GeoCommittee) who will collaborate on developing annual work plans and OSM's GSP;
- Developing geospatial processes to improve decision-making and to meet the business needs of the SMCRA programs;
- Providing standardized geospatial information necessary to implement the SMCRA programs and to make informed decisions;
- Providing standardized applications and Web services for the use of geospatial data and information related to coal mining and reclamation; and
- Providing education and outreach to stakeholders to ensure that the information and technologies developed are effectively used.

Essential to accomplishing all of these goals is the need to enhance existing partnerships among OSM, States, Tribes and other federal agencies. These partnerships are crucial in order to further the use of geospatial data and technologies. Toward this end, OSM will assist State and Tribal programs to develop and/or enhance geospatial information systems that provide coal-mining data to help implement SMCRA. OSM will share data with other federal agencies where data contributes to the environmental impact assessments necessary to accomplish Government Performance and Results Act (GPRA) goals.

E. What would be the consequences of failing to act?

The consequences of not approving and implementing this GeoPlan and fully applying geospatial technology solutions to SMCRA programs would include:

- An impaired ability to meet evolving regulatory-decision needs and to lower the risks of making those decisions using sound science and scientific processes (as directed by the March 9, 2009, Presidential Memorandum on Scientific Integrity);

- An impaired access to new climate data that will be generated by the DOI Climate Change Response Regional Science Centers;
- An impaired ability to share and use the best available coal-mining spatial data, which are critical to understanding and resolving environmental issues and supporting national initiatives (e.g., DOI's climate-change initiative);
- An impaired ability to coordinate permitting activities with other Federal agencies (interagency coordination) critical to the permitting and regulation of coal mining operations;
- A reduced ability to post coal-mining and related scientific and technological information online; thereby, making it "readily available to the public" (as directed by both the January 21, 2009, Presidential Memorandum on Transparency and Open Government and the Presidential Memorandum on Scientific Integrity);
- The failure to build on the momentum of current OSM and State geospatial efforts;
- The failure to take full advantage of technological advances that can increase productivity gains, enhance creative thinking, improve innovative problemsolving, and explore new opportunities; and
- The failure to achieve compliance with OMB and DOI guidelines and with Presidential mandates.

F. How would the GeoPlan help with return-on-investment?

Creating a unified strategy for acquiring, managing and delivering geospatial data throughout the SMCRA community provides the foundation for more efficient and effective implementation of SMCRA. It increases opportunities for bureau level return on investment analyses that consider all costs and benefits, not just those at the local level. The GeoPlan will help to ensure leveraging and resource sharing; thereby increasing both the efficiency and effectiveness of investments. As stated in the Federal Geographic Data Committee's Geospatial Platform Modernization Roadmap Version 4.0:

> "Geospatial assets are already an integral part of many government and private day-to-day operations. While the business needs of stakeholders vary, there are many instances where different operations require the use of similar assets. Because geospatial information often involves a significant investment of resources (i.e., human, financial, etc.), many governments already coordinate

their efforts to produce cost-savings, improve quality of services, and increase efficiency, although more could be done."

Under the basic premise —build it once, use it many times, OSM already realizes significant savings and operational efficiencies for geospatial software, training and standardized applications under the TIPS program. All OSM, state and tribal SMCRA offices utilize these enterprise licenses and standardized training. However, other aspects of geospatial services, particularly data acquisition, management and delivery to all potential users has, until this time, been outside the realm of TIPS operations. This GeoPlan provides the organizational structure and strategic direction needed to analyze how we create, manage, deliver and utilize geospatial data so that business decisions may be made at the bureau level, and specific return-on-investment analyses are considered in the decision making process.

III. Current State

OSM and our State and Tribal partners use geospatial information every day. However, there is little uniformity in terms of geospatial governance, business processes, data management, applications and technology, and education and outreach. This section will describe how OSM currently uses geospatial information and will demonstrate why current geospatial efforts need improvement.

A. Governance

Geospatial technologies are widely but unevenly used in OSM, as well as by our State and Tribal partners. Each OSM, State, and Tribal program determines how to use geospatial tools and how to secure and maintain its geospatial data. SMCRA managers recognize that geospatial information and technology are critical for more effective regulation and decision-making. There are many separate efforts acting as "cylinders of excellence," taking advantage of the power of GIS and related technologies (e.g., Global Positioning System [GPS], mobile computing, and remote sensing). However, prior to drafting this plan, there was no OSM executive sponsor for SMCRA geospatial services, nor was there an effective coordination mechanism or organization to identify high-priority requirements or data-sharing opportunities. After briefing the OSM Director on the earlier draft of this GeoPlan, he appointed the Western Region Director as the executive sponsor and named an interim GIO to ensure completion of this plan. Data standards are being developed, but are not yet implemented uniformly across OSM, the States, and the Tribes; as a consequence, data sharing and use across administrative

boundaries have been impeded. Existing coordination efforts tend to focus on technical solutions to local problems and information exchange, rather than on SMCRA-wide requirements and management and/or on future planning needs.

B. Business processes

Decisions related to mining and reclamation involve understanding complex interactions among land, water, air, people, and infrastructure. OSM's business processes for public involvement, permitting, inspection, enforcement, bond calculation, and bond release are conducted using work flows that largely rely on outdated technologies such as paper transaction records, and in some cases recording coal-mining features on paper maps. Most States and OSM offices now receive new mine data digitally; however, many times these data are not in standard and useable formats. In any case, even small amounts of digital data cannot be integrated into file cabinets full of legacy coal-mining data in paper permit documents. Our ability to make better decisions today or in the future is limited by our inability to integrate historical information with new information. Information on past mining and its potential effects on modern life are critical to making sound decisions, but this information must be put into a digital geospatial format that can be readily used by all.

In 2006, the DOI Geospatial Blueprint Team interviewed major mining and reclamation stakeholders, including OSM senior managers, throughout the Department. Based on these interviews, the team concluded that all three OSM regions are using the geospatial tools provided by TIPS to assist in complying with SMCRA duties. The interviews also revealed there is a need for national data sets for permits and location of mines; however, there is a lack of easy access to imaging data, and a backlog of legacy coal-mining data still requiring digitizing.

During recent years, OSM, State, and Tribal programs have individually developed a range of capabilities to use geospatial technology. Some OSM and State program offices have evolved state-of-the-art systems and skilled personnel to create, manage, and expand the geospatial infrastructure to meet SMCRA business needs for information products. Current recognized state SMCRA GIS resources are listed below with links to their websites:

Colorado Division of Reclamation Mining & Safety

Illinois Department of Natural Resources

Indiana Coal Mine Information System - Indiana Geological Survey

New Mexico Energy, Minerals and Natural Resources Department

Ohio Division of Mineral Resources Management-Coal Mining

Pennsylvania Department of Environmental Protection

Virginia Department of Mines, Minerals and Energy

Other program offices have very modest or no capabilities. Among the offices that produce datasets, there is no uniformity in generating and managing information so it can be effectively used by all parties.

OSM's current use of geospatial technologies is not in full compliance with OMB Circular No. A-16, "Coordination of Geographic Information and Related Spatial Data Activities," originally issued in 1953 and revised in 1967, 1990, and 2002. This circular includes requirements as follows:

- Every agency that collects, uses, or disseminates geographic information and/or carries out related spatial data activities must publish and implement a strategy for advancing geographic information and related spatial data activities appropriate to its mission;
- Each agency must submit an annual report to OMB that addresses achievements relative to strategies and includes spatial data assets within Exhibit 300s that require project and budget information;
- Each agency must collect, maintain, disseminate, and preserve spatial information in such away that the resulting data, information, or products can be readily shared with other Federal agencies and the public; it must also promote data integration among all sources;
- Each agency must fully fund its spatial efforts;
- Each agency must coordinate and work in partnership with Federal, State, Tribal, and local government agencies, academia, and the private sector; and
- Each agency must use spatial information to enhance electronic government initiatives, to make Federal spatial information and services more useful to citizens, to enhance operations, to support decision-making, and to enhance reporting to the public and to the Congress.

In brief, at this time, OSM does not meet most of these requirements.

C. Data management

SMCRA envisioned a significant role for OSM in managing information and data related to mining and reclamation. Mining-related data held by OSM and its State and Tribal partners are often difficult to find, access, and use both within and across administrative boundaries. Much of these data are still in the form of paper permit files containing maps and laboratory reports on geology and water quality. Much of the digital data are not indexed or sharable by others. Only a limited amount of data is available to the public, because most data are not readily available or linked via the Internet, but instead are generated on a project-by-project basis. There is no centralized acquisition process or repository for geospatial data. To access most mining data, the public must travel to regulatory offices or directly request information. Responses to such requests require tedious and costly manual review and identification of paper records. Many federal, state and tribal efforts are underway to move to a higher level of automation, digital records keeping and electronic permitting which will add transparency and availability in step with all current geospatial efforts.

Figure 4 depicts the current state of SMCRA mining data discovery, request, and delivery. SMCRA-related coal-mine data are scattered in various stovepipes owned and maintained by State, Tribal, and OSM offices. When an end-user—called a "Data requestor" in figure 4—needs data, he or she must conduct a manual search. This involves quite a bit of detective work, including searching Geospatial One-Stop (GOS) and other portals, searching for websites, sending e-mails, and making many phone calls to potential data owners. Finding the Authoritative Data Source (ADS) can be very difficult and frustrating. In rare instances, some of the data can be discoverable and available via the Internet. When data owners are found, in most cases they must be contacted and asked to send their data to the end user by some means (mostly by copying data to a DVD and shipping by mail). Locating the exact data requested can be time-consuming and expensive for both the data owner and the end user.

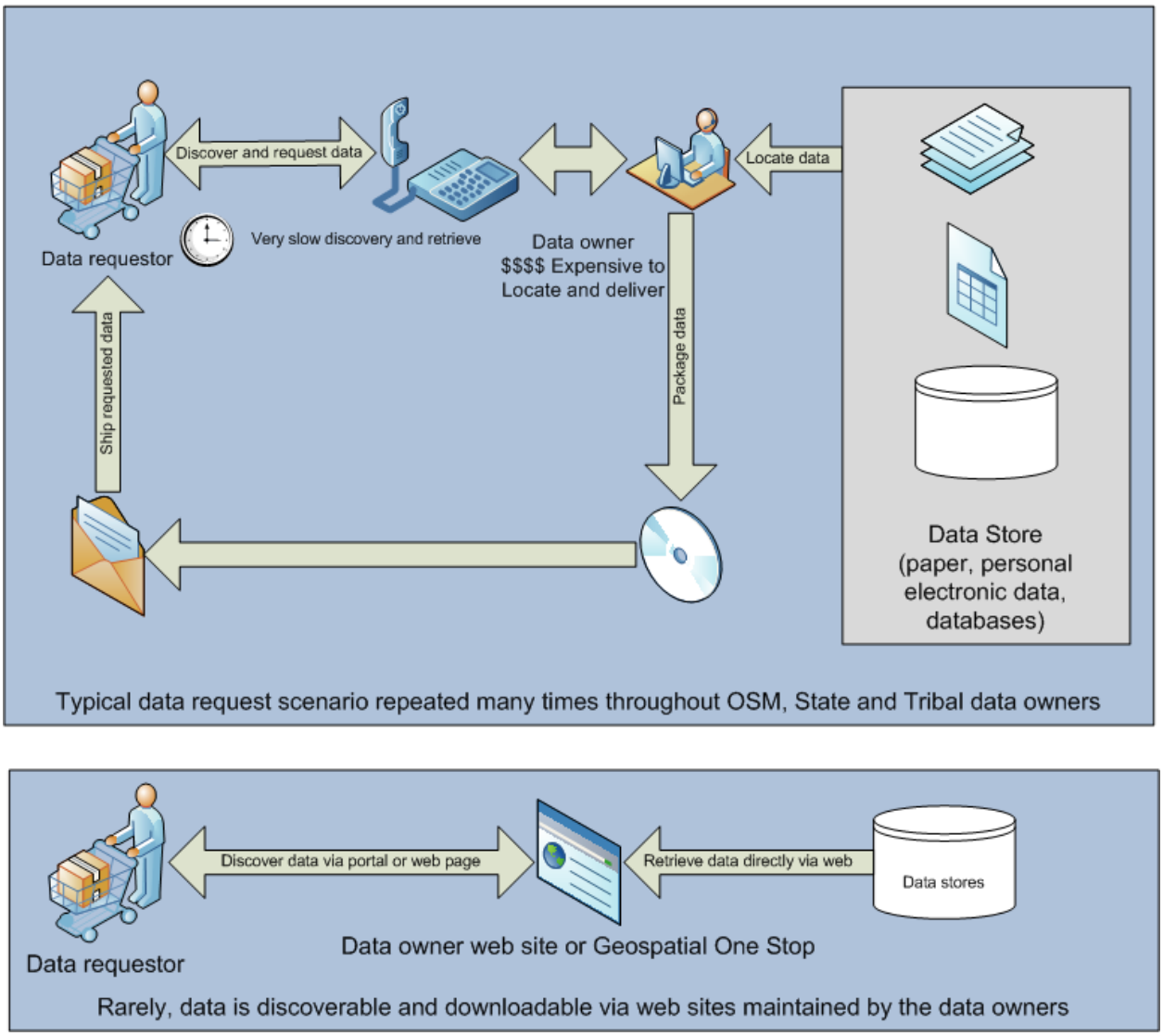

***Figure 4.*—Current state of SMCRA-related GIS data discovery, request, and delivery.**

Within OSM, data sharing among regions and field offices is often done using Microsoft SharePoint sites, FTP sites, or on CD, because the telecommunication infrastructure does not support effective field-office access to regional-office geospatial data servers. Some OSM, State, and Tribal offices maintain independent geospatial libraries that are not designed to be easily integrated. Further exacerbating the issue, network access to geospatial data is difficult and the quality of the data is not well known or communicated, because metadata are not always collected correctly or consistently.

OSM and its partners in the States and Tribes have begun to lay the groundwork for standardizing data by creating voluntary data standards for certain mining and related data sets. (see below in this section, under "Coal-Mining Geospatial Data Standards"). In addition, OSM has also begun working with three Federal agencies (Environmental Protection Agency, Army Corps of Engineers, and US Fish and Wildlife Service), three states (Virginia, West Virginia and Kentucky), IMCC and OSM's Tennessee office on a pilot project (Appalachian GeoMine Pilot Project) that will provide a mechanism for sharing coal mining and other resource data that are important for permitting and regulating coal mines and protecting the public and the environment during mining. The GeoMine Pilot Project will provide the GeoCommittee with valuable information regarding implementing such a system nationally.

D. Applications and technology

In this decade, there has been an increase in the availability of technology that can make decision processes more reliable, more transparent and more efficient. Where geospatial tools have been developed, they have often focused on supporting operations within an individual office, region, State, or Tribe rather than on addressing SMCRA business requirements as an enterprise. As with data; OSM, States, and Tribes have designed and maintained isolated (if first-rate) cylinder-of-excellence hardware and software solutions to meet their individual needs.

OSM, by means of the TIPS program, provides enterprise licensing for geospatial software and expert training on software use. TIPS geospatial software includes ArcGIS, Autodesk, ERDAS, and other tools are already available for SMCRA users.

E. Education and outreach

Over the 30+ years since SMCRA became law, OSM, along with our State and Tribal partners, has recruited, hired, and trained natural-resource specialists, engineers, and scientists to help implement the requirements of that law. These valuable staff members, who have gained critical knowledge of mining and environmental impacts throughout the years, are now retiring at an alarming rate. Their departure will increasingly represent a void in expertise and historical knowledge in OSM and its partner entities. Current employment patterns indicate a rapid and continuing turnover of younger State employees. This creates a critical need for a centralized information base that can be housed and used in systems such as GIS in order to transfer historical and real-time information without any adverse

impact to operational processes. Unless knowledge is institutionalized in spatial databases for use by others; the regulators, by being unaware of the location and nature of previous mining activities, may repeat mistakes made in the past. With the evolving dependence of the public and industry on social networking and the Internet, geospatial technologies must be implemented at the enterprise level to keep pace with customer demands.

Current OSM geospatial training is provided by way of the TIPS Training Program. Recent training surveys indicate that States, Tribes, and OSM offices are requesting more training that integrates multiple software applications to enable more complex and integrated analyses. The feeling across the board appears to be that integrated applications facilitate improved decision-making. For example, in response to customer requests, OSM developed a class for FY-2010 that combined ArcGIS and Autodesk products for both field and desktop applications. During recent National Technical Training Program (NTTP) Steering Committee meetings, committee members recognized that at least some future NTTP classes need to incorporate fundamental geographic information and/or address the importance of geospatial and other technology tools.

Communications and outreach today are generally oriented toward the technical community. Program managers and non-technical staff are often unaware of recent developments and advancements in the area of geospatial services.

F. Current efforts

As discussed below, OSM is involved in geospatial activities in several arenas, including the national TIPS program, the GeoCommittee (previously known as NCMGC), e-permitting, Coal Mining Geospatial Standards, and the GeoMine Pilot Project.

1. Technical Innovation and Professional Services

By means of departmental enterprise agreements and a shared licensing system, OSM's national TIPS Program delivers geospatial software, training, and expertise to SMCRA partners nationwide. The partnership includes State and Tribal offices along with OSM's offices. States and Tribes have used TIPS tools to develop their own geospatial applications and data sets.

2. E-Permitting

According to an IMCC survey (July 2009) and recent information, nine States are currently using a true E-Permitting system as part of their regulatory programs. These include Alabama, Colorado, Virginia, North Dakota, Kentucky, West Virginia, Utah, Montana, and New Mexico. Pennsylvania has a small pilot application for its blasting program. OSM's Knoxville Field Office is making significant progress in developing an E-Permitting system for its regulatory program. Other States have the beginnings of an E-Permitting system or intend to adopt such a system, including Alaska, Arkansas, Illinois, Indiana, Ohio, Pennsylvania, Oklahoma, Texas, and Wyoming. Recently, OSM and some western states and Tribes (MT, WY, CO, UT, ND, Navajo Nation and Crow Tribe) have agreed to consider developing a collaborative E-Permitting solution; a decision is expected to be reached in early 2012. OSM's TIPS program and regional technology-transfer programs have been instrumental in providing some tools and technology-transfer opportunities over the years.

3. GeoCommittee

In 2005, OSM and its SMCRA partners formed the National Coal Mining Geospatial Committee (NCMGC), now known as the GeoCommitte under the TIPS umbrella to promote the use of geospatial technology and data to help implement SMCRA. TIPS continues to provide support and resources to the committee. Through the NCMGC, OSM worked with the NAAMLP, the IMCC, and the WIEB to improve the sharing and better use of coal-mining data for SMCRA business processes. The NCMGC created a network of 42 SMCRA Geospatial Data Stewards among the States, the Tribes, and OSM offices. The NCMGC held two national meetings with these Data Stewards and twice conducted national SMCRA Geospatial Technology Development Status surveys to identify coal-mining spatial data needs and goals. The NCMGC created a Coal Mining Spatial Data Standards - American Society for Testing and Materials (ASTM) Task Group to develop voluntary spatial-data standards for coal mining. The NCMGC encouraged and supported the development of the first national datasets of coal-mining operations, sponsored advanced training of geospatial data stewards, conducted outreach at SMCRA-professional organizations, supported technical assistance to small program States, and encouraged the development of an OSM geospatial strategic plan to guide the development of bureau-level coal-mining geospatial capability.

In September 2011, the NCMGC was re-purposed and re-formed to guide implementation of this GeoPlan. The National Coal Mining Geospatial Committee's moniker has been changed to the OSM **GeoCommittee** and its first functions are to finalize this plan, develop a 2013 annual workplan, revitalize the Geospatial Data Stewards, and continue progress on the data standards effort.

4. The Coal Mining Geospatial Data Standards

The Coal Mining Spatial Data Standards' ASTM Task Group is developing voluntary standards for selected Title IV and Title V coal-mining spatial datasets approved by the Data Stewards. This work is being done as a collaborative effort, with Federal, State, industry, and public participation. Task Group members include volunteer Data Stewards from many SMCRA programs, as well as regulatory and GIS experts from EPA, MSHA, environmental community and the coal industry. Use of these standards by all OSM, State, and Tribal programs will facilitate data sharing and the delivery of information to the public and other agency stakeholders. Several standards are complete and additional ones are being developed.

5. Appalachian GeoMine Pilot Project (GeoMine Pilot Project)

The GeoMine Pilot Project is a major state and Federal geospatial collaborative effort sponsored by OSM. The GeoMine Pilot Project Team has made significant progress in both the data and technology phases of the project. The Data Phase team has engaged in geospatial information product discovery, inventory, and alignment with the goal of integrating existing geospatial data into common products. The data phase team has used the standards developed by the Coal Mining Spatial Data Standards Task Group to determine the data structure or schema for the common SMCRA information products.

A prototype Internet viewer and download application was developed to share these information products among the seven partner state and Federal agencies, and eventually the public. To date, 13 SMCRA permit-related information products have been defined and made available through the prototype Internet viewer. Cooperative Agreement grants awarded in FY2011 to Kentucky, Virginia, and West Virginia will facilitate the creation of additional SMCRA coal mining digital data for the GeoMine Pilot Project by the end of FY2012. Federal agency geospatial information product services have been incorporated into the viewer to add relevant Federal Clean Water Act permitting data locations, and to enhance the geospatial context as basemap geospatial data.

The Technology Phase team developed a Cloud Computing information technology solution that efficiently collects, organizes, and delivers geospatial data for the GeoMine Pilot Project. The benefits of the Cloud Computing environment include easy scalability and rapid elasticity of computer resources compared to conventional computer infrastructure. Capital investment in server hardware is unnecessary as the hardware is replaced by virtual server instances running in the Cloud and data are accessed by users through the Internet. This Internet-based data-sharing is improving coordination among the partner agencies and will result in better decision-making.

6. Coal-mining Geospatial Data Framework

In May 2008, the TIPS Steering Committee reviewed the progress of OSM's national geospatial activities:

> "The TIPS Steering Committee acknowledges that there is a need for the delivery of coal mining data in a national framework. This initiative is important enough to warrant a separately funded program under OSM. Until such time as the initiative becomes its own program, TIPS should continue to sponsor the initiative" (2008 TIPS Steering Committee Notes, p. 29).

In May 2009, the NCMGC reported to the TIPS Steering Committee on its progress to establish a Coal Mining Geospatial Data Framework. The NCMGC draft definition of what such a framework would amount to is consistent with that of the National Spatial Data Infrastructure (NSDI)[4]. NSDI defines a coal-mining geospatial data framework as:

> "[a] collaborative, SMCRA community-based effort in which commonly needed coal mining data themes are developed, maintained, and integrated by the * * * ADS within a geographic area. The framework is designed to facilitate production and use of coal mining geographic data, to reduce costs, and to improve service and decision-making. The framework is a way to share resources, improve communications, and increase efficiency."

According to NSDI, a geospatial data framework consists of:

- Data;
- Procedures and technology for building and using these; and
- Institutional relationships and business practices that support the framework environment.

[4]NSDI was created by E.O. 12906 and is under the control of the Federal Geographic Data Committee (FGDC).

By this definition, the NCMGC Coal Mining Geospatial Data Framework is already in the initial stages of development to support a national geospatial coal-mining and reclamation system.

IV. Future State: OSM's Geospatial Services Program

This section of the GeoPlan describes a future state of integrated geospatial services that will support SMCRA business requirements, improve efficiency, and maximize the use of specialized tools and technology at all levels within OSM and our SMCRA partners, the States and Tribes. The section begins with a statement of OSM's vision and mission with respect to geospatial services. It goes on to describe the close collaboration that we envision with our SMCRA partners in implementing the vision and mission, as well as the need we will face to align both with Federal geospatial and IT requirements (particularly the Geospatial Platform). This section then proposes a "future state," the description of which includes specifics on a proposed coal-mining geospatial infrastructure. Finally, it addresses OSM's five major goals—relating to governance, business processes, data management, applications and technology, and education and outreach—in proposing the GeoPlan. Accompanying the description of each goal, we give a list of high-level objectives that were developed to help meet the stated vision, mission, and goals.

The GeoPlan was conceived and developed based on input and insights from personnel across OSM and from many of our state SMCRA partners. It supports a geospatial services approach that will increase the value of geospatial investments for OSM and our partners. As currently conceived, these geospatial services will provide internal business solutions that support the information needs of SMCRA managers and staff, and those of our state, and tribal partners. The external geospatial services proposed will leverage existing technologies to provide the public with online, easily accessible coal-mining information.

In order to provide a sound foundation for future work, this final GeoPlan must meet the requirements of intended users in a collaborative environment. Hence, the GeoTeam recognizes that this "future-state" proposal will require continuous fine-tuning and adjustments over-time. These will be accommodated through the development and implementation of annual work plans, and through occasional revisions to this GeoPlan.

A. Vision

OSM's vision is to compile a robust and comprehensive coal-mining geospatial data source, thereby ensuring that mining and land-use decisions are transparent and based on the best available scientific data.

B. Mission

OSM's mission for this GeoPlan, by way of implementing its vision, is to establish a national coal-mining Geospatial Services Program (GSP) that will:

- Ensure transparency in regulatory decisions concerning coal mining;
- Enable OSM, State, and Tribal decision makers to be more effective and efficient;
- Facilitate public participation in more meaningful ways;
- Provide a collaborative vehicle to share coal-mining data;
- Better protect the public and the environment during mining;
- Help restore lands and waters damaged by past coal mining; and
- Facilitate improved land-use planning decisions.

C. Collaboration with partners

OSM management has already taken steps to ensure that our partners are engaged in preliminary dialogue. The national Steering Committees of TIPS and NTTP addressed the geospatial strategy at their 2009 meetings. The NCMGC engaged on this topic at their April 2009 meeting and provided input on the draft vision, mission, and goals. All of these committees represent various interests within OSM and our State and Tribal partners, including the IMCC, WIEB, and NAAMLP. The GeoPlan recommends an intensive collaborative approach with our partners as solutions are developed and deployed. Guiding this collaboration will be the new GeoCommittee which works actively with the OSM-GIO to ensure that the products of OSM's geospatial efforts are beneficial, and of highest quality, while minimizing costs to data providers.

D. Alignment with DOI and Federal requirements

The Federal Government and DOI are moving toward a Geospatial Platform concept to promote improved coordination and more effective use of geospatial information. The Geospatial Platform is envisioned to:

- Put issues and events in context of location, the surrounding environment, and the people affected.
- Understand complex issues and integrate multiple data elements through one map or view.
- Recognize trends and relationships that might otherwise be missed.
- Communicate clearly and effectively through visual means.
- Integrate disparate types of data (spreadsheets, financial data, monitoring results, etc.) from multiple organizations into quickly and easily understood formats.

The FY 2011 President's Budget included the following geospatial platform language:

> *"In 2010 and 2011, Federal data managers for geospatial data will move to a portfolio management approach, creating a Geospatial Platform to support GeoOneStop, place-based initiatives, and other potential future programs. This transformation will be facilitated by improving the governance framework to address the requirements of State, local and tribal agencies, Administration policy, and agency mission objectives. Investments will be prioritized based on business needs. The Geospatial Platform will explore opportunities for increased collaboration with Data.gov, with an emphasis on reuse of architectural standards and technology, ultimately increasing access to geospatial data."* President's Budget, Fiscal Year 2011, "Analytical Perspectives, Special Topics, Information Technology" (p. 325) (www.whitehouse.gov/omb/budget/fy2011/assets/topics.pdf)

The DOI Geospatial Platform foundational and planning documents are found at: http://resources.geoplatform.gov/documents. This GeoPlan is in alignment with the Federal and DOI strategies and visions as outlined in these documents.

The GeoPlan outlines five major goals to provide for a coal-mining geospatial Infrastructure. This infrastructure will align with government-wide geospatial information-management strategic planning

efforts, including those described in OMB Circular A-16, "Coordination of Geographic Information and Related Spatial Data Activities"; OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities"; OMB Circular A-130, "Management of Federal Information Resources"; PL 107-347, E-Government Act of 2002; Federal Enterprise Architecture (FEA) Reference Models; OMB Memorandum M-06-07, "Designation of a Senior Agency Official for Geospatial Information"; and the Modernization Roadmap for the Geospatial Platform.

E. Future state: Coal-Mining Geospatial Infrastructure

The target state is a Coal-Mining Geospatial Infrastructure that will build on past accomplishments described in section IV of this document under "Current Efforts." The infrastructure will consist of geospatial knowledge products supported by a coalmining geospatial data framework.

Geospatial knowledge products.—Knowledge products are geospatial services and applications that provide knowledge to individuals, in this case, about SMCRA related information. The knowledge products will contain the data and business logic that provide solutions to meet information needs. Internal knowledge products will support the requirements of OSM managers and staff while external knowledge products will provide the public and other SMCRA agencies with online, easily accessible coal-mining information.

External.—External knowledge products are supported and made available via the GeoMine federated GIS. GeoMine is a cloud-based system comprised of various data, geoprocessing systems and their associated infrastructure. The sources of these data are the ADSs; be they external SMCRA agencies, other Federal agencies, or OSM. The data remains the property of the ADS; GeoMine will federate it to produce the knowledge products. The data are federated into common schemas in the underlying geodatabases using automation tools. In some cases, information services from third-parties will be incorporated into knowledge products without federation – this is the case with stand-alone data that cannot be combined with like data from commercial sources.

These knowledge products support many aspects of SMCRA and the public need for government information sharing.

System design will meet the requirements of the Federal Services Oriented Architecture (SOA)[5]. Figure 5 shows the envisioned future state of OSM's SMCRA-related Geospatial Data Infrastructure.

Internal.—Services and specialized applications will be developed that support routine SMCRA business processes for Titles IV and V. For example, a GeoDashboard will be developed to help OSM Program Managers monitor, in real time, the activity status of mining operations in their areas of responsibility (e.g., prioritizing and monitoring oversight inspection, locating and determining the magnitude of mining-related impacts that have occurred offsite from a mined area, and locating areas whose release from bond has not been timely). GeoMine will also be available to OSM staff with additional tools for SMCRA use.

Coalmining Geospatial Data Framework (CMDF).—This framework will consist of geospatial data, a compilation of procedures and technology for building and using them, and descriptions of institutional relationships and business practices. OSM, State, and Tribal offices, as the ADSs for the CMDF, would continue to maintain ownership of its own geospatial data. Data will be stored and maintained on the ADSs' own systems, supporting their own business processes. It is recognized that digitizing and managing geospatial data will be a major cost.

When possible, to augment its own display of coal-mining data, the FedGIS will incorporate geospatial services into the Coal Mining Geospatial Infrastructure (CMGI) by reference, citing other sources such as imagery from a national image server, AML data from OSM's Abandoned Mine Land Inventory System, or underground mine map locations from the National Mine Map Repository (NMMR). Users, be they external or OSM, will discover data and knowledge products via metadata searches on Data.gov and the National Map. Various discovery and acquisition methods of use will be possible including web mapping applications, REST and SOAP Geodata services, OGC web services, and kml (Google Earth).

[5]The Federal SOA is a method of building business applications that utilizes common services to support business functions.

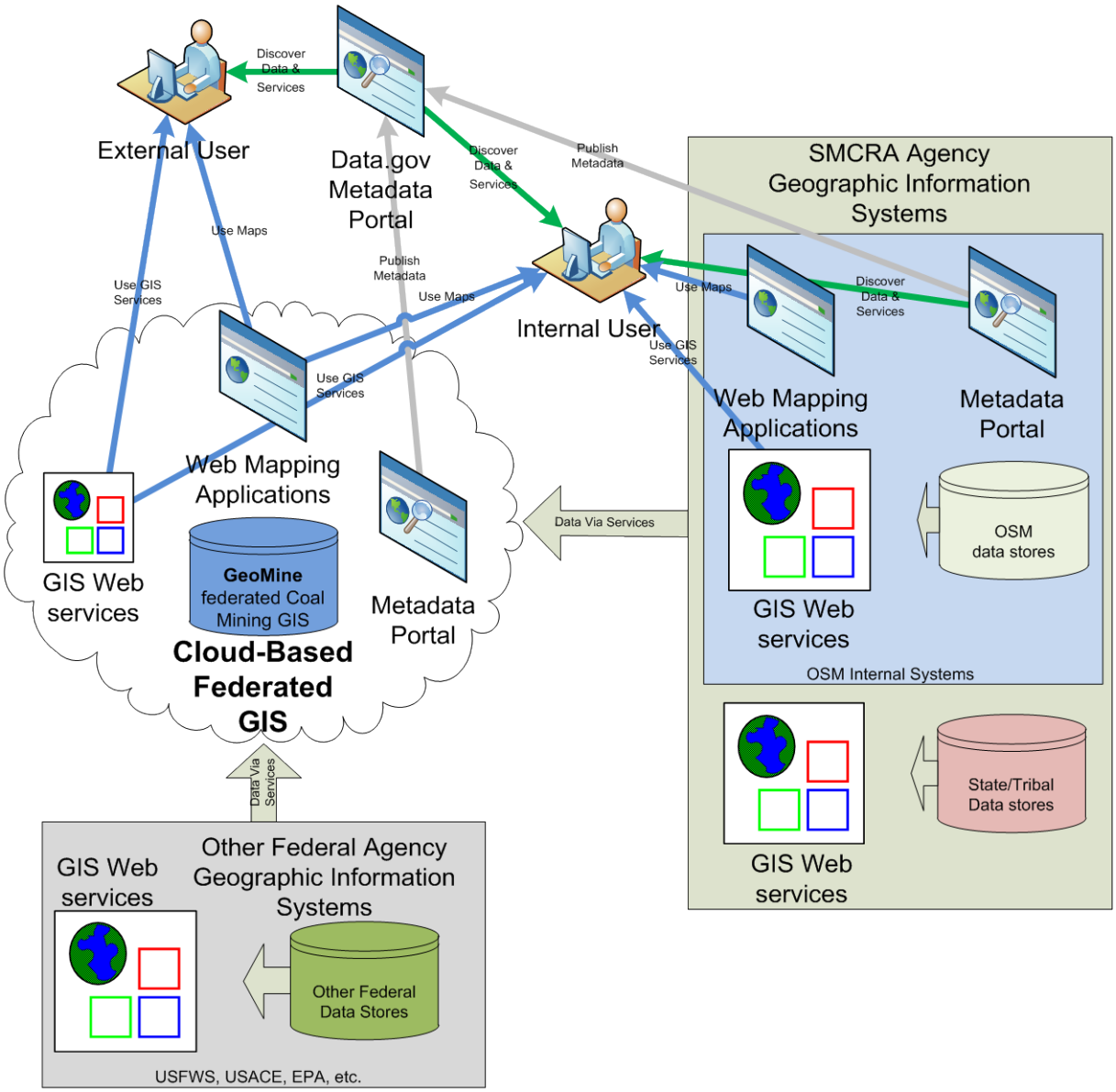

***Figure 5.*—Future state of OSM's SMCRA-related Geospatial Data Infrastructure.**

F. Goals

This section outlines the GeoPlan's five goals and associated objectives; when achieved, these goals will implement the vision and mission of the GeoPlan. The timeframe of five years has been allotted for meeting the goals and objectives. The CMGI will evolve and develop in concert with other technological and information resources both in and outside of OSM.

Meeting the goals discussed below will help OSM carry out the requirements of the Federal Segment Architecture Methodology (FSAM), which provides a repeatable, proven, and Federally endorsed

process for defining and transitioning geospatial capabilities. The DOI and OSM Enterprise Architecture efforts—and in particular the documentation of business processes as well as the information and technology requirements to support those processes—are critical to understanding the role of geospatial data in the work of OSM.

1. Goal 1: Governance

The first of the GeoPlan's five goals is to establish an effective geospatial governance structure for setting priorities for investments, coordinating efforts, aligning OSM and departmental strategies, providing policy and oversight to assure progress in achieving goals, securing necessary resources, and coordinating services.

a. Future state

The governance structure for geospatial activities will provide guidance and coordination in setting priorities and pursuing investments. This will include an executive sponsor along with a GIO. (In 2010, the OSM Director assigned the Western Regional Director as the executive sponsor and the Western Region, Technology Management Division Chief as the interim GIO). The sponsor, the GIO, and a Federal/state SMCRA Geospatial Steering Committee (GeoCommitee), in turn, will develop a policy framework, consistent with FSAM that clearly defines roles, responsibilities, and processes to manage and support the program, prioritize investments, and oversee progress toward strategic goals. The GeoCommittee will include representatives from those organizations represented on the old NCMGC. Initially, ad-hock project teams will be established to conduct the start-up program work and to manage specific projects. In out-years, full time staff may be needed to administer the function.

Trends in geospatial technologies and SMCRA geospatial activities will be continuously examined; likewise, decisions will be coordinated in a strategic partnership with states and tribes, who will be represented in the GeoCommittee membership.

b. Objectives

1.1 Clarify and communicate roles and responsibilities of all OSM offices to support the use of geospatial data and technologies.

1.2 Implement a geospatial strategic planning process, including a communication plan, to set, in partnership with the States and Tribes, the future direction and priorities for OSM's GSP.

1.3 Adopt geospatial policies and standards to facilitate the use of geospatial data and technologies across OSM, the States, and the Tribes.

1.4 Enhance and maintain partnerships within OSM and among OSM, State, and Tribal and other partners to support the use of geospatial data and technologies.

1.5 Ensure that OSM geospatial activities support and contribute to the government-wide Geospatial Platform.

2. Goal 2: Business processes

The second GeoPlan goal is to ensure (1) that common, unified geospatial processes are in place to improve decision-making and meet the business needs of OSM and our partner States and Tribes and (2) that these geospatial processes support the geospatial aspects of OSM's oversight plans and climate-change mitigation and adaptation needs.

a. Future state

State, Tribal, and OSM offices will collaborate in the creation, use, and sharing of standardized coal-mining geospatial data created or acquired in the SMCRA business processes. Geospatial data, including mine permitting data, submitted by mining companies will flow directly into regulatory authority (RA) geographic information systems, and OSM will access these data to support program monitoring and oversight needs. Data important to coal mine permitting and enforcement held by other state and Federal agencies is also available to all relevant parties so that permitting decisions are coordinated and based on consistent and up-to-date information. The State, Tribal, OSM, or other agency office creating pertinent spatial data will be recognized as the owner of those data (authoritative data source or ADS) for its own geographic area.

SMCRA RA and AML reclamation programs use geospatial tools and information whenever appropriate to conduct business processes. Climate-change data and decision-support tools generated by the DOI Climate Science Centers are available to RAs to improve permitting and bond-release decisions. Many tools are used universally by State, Tribal, and OSM offices, because their common application provides

a basis for consistent and effective decisions regarding coal-mining and reclamation processes. Offices are free to develop new and better tools and are encouraged to collaborate with others in both the testing and the sharing of such automated tools, particularly when these are found to be more effective than past practices. Analyses and decisions will be transparent to the public, and public participation will be optimized as envisioned by the framers of SMCRA.

b. Objectives

2.1 Increase awareness and appreciation of the value of coal-mining spatial data in addressing regulatory issues.

2.2 Help State, Tribal, and OSM Program Managers understand how coal-mining geospatial data can support specific SMCRA business processes.

2.3 Explore and encourage increased utilization and integration of coal-mining geospatial systems within the SMCRA community.

2.4 Ensure that the CMGI supports OSM management in projecting and reporting annual performance measures and in fulfilling its oversight obligations.

2.5 Ensure that the CMGI supports RAs climate-change adaptation and mitigation needs.

3. Goal 3: Data management

The third GeoPlan goal is to provide OSM staff, partners, and the public with standardized geospatial information needed to carry out SMCRA business processes and make informed decisions.

a. Future state

All OSM offices, partners, and the public will know the extent and quality of the geospatial data available for implementing SMCRA. They will be able to readily locate and access the data, Web services, and metadata they need using enterprise-wide indices, registries, and catalogs. Data standards will be readily accessible and maintained. Data created in SMCRA programs will meet the ASTM Coal Mine Standards and FGDC standards. Data stewards will take ownership of and responsibility for the standards, their quality, guidelines related to them, and the maintenance of their designated data. OSM headquarters, regional, and field offices will maintain their unique data by means of Web services, at the same time they are using enterprise systems to access and share standard baseline data among organizations. Climate-change data developed by the DOI Climate Science Centers will be easily

discovered and acquired through standard processes. SMCRA partners will minimize purchase and licensing costs (1) through enterprise agreements, thereby preventing duplicate data purchases, and (2) by leveraging data acquisitions.

b. Objectives

3.1 Provide for the submission of regulatory (permitting and inspection-and-enforcement) information, including required reports and bond-release information, that meets established standards and that is submitted in a digital form appropriate for incorporation into GIS.

3.2 Provide for the submission of AML project-design drawings that meet established standards and that are submitted in a digital form appropriate for incorporation into GIS.

3.3 Develop and report geospatially enabled data so that they meet established standards.

3.4 Make readily available all data needed by SMCRA programs to conduct their business, including data created under SMCRA and data created and maintained by others (EPA, the mining industry, the USGS, the U.S. Department of Agriculture, the U.S. Census Bureau, DOI's Fish and Wildlife Service, and Climate Science Centers, etc.).

3.5 Provide coal-mine and related information that has public value to the public with appropriate quality assurance, and provide metadata on a platform that the public finds easy to use.

4. Goal 4: Applications and technology

The fourth GeoPlan goal is to provide OSM staff, partners, and the public with standardized applications and Web services, thereby allowing them to collect, maintain, use, and publish geospatial data in support of SMCRA business requirements. The objective here will be to establish and maintain an open and robust network architecture that facilitates such applications and services.

a. Future state

The CMGI will provide to OSM managers and staff all available OSM and State/Tribal Web services, thereby delivering needed information along with a query capability. OSM staff, partners, and the

public will be able to access and use the Web to collect, maintain, use, and publish geospatial data and services. OSM's policy for implementing and supporting national applications can be scaled downward to accommodate internal projects and to speak to specialized applications and Web services that have reduced and/or different requirements, scope, and complexity. Geospatial applications and Web services will be developed and managed to eliminate duplication and to leverage other development work within OSM and with our partners. OSM will maintain an efficient number of internal data servers to effectively deliver data and applications to all users. The bureau will also provide integrated applications, by means of Web services, that include links to State and Tribal websites and that provide mining-related geospatial information to all SMCRA partners and the public. The expectation is that SMCRA partners will use geospatial technology routinely in many aspects of their work.

b. Objectives

4.1 Provide OSM, State, and Tribal staff with access to computing resources and with network capacity to support the collection, use, management, and distribution of geospatial data.

4.2 Ensure secure geospatial data and applications, at the same time allowing appropriate exchanges of data with partners and stakeholders.

4.3 Design, develop, and deploy the CMGI, including geospatial services, the FedGIS, and CMDF, thereby furnishing direct support for State and Tribal geospatial systems and databases.

5. Goal 5: Education and outreach

The final GeoPlan goal is to educate regulators, reclamation professionals, and the public in the effective use of coal-mine geospatial information and technologies.

a. Future state

To assist them with their program activities, OSM, State, and Tribal staff will have knowledge of and access to a wide range of training opportunities and technical assistance, both of which will focus on the use of geospatial tools and technology advancements. Regulatory and AML staff will know how and where to acquire geospatial data that supports SMCRA business processes. Managers will have the information they require in order to build and maintain a workforce that is proficient in supporting and

using geospatial applications. Mechanisms are in place to educate staff, partners, and the public with respect to OSM's geospatial assets and how to use them.

b. Objectives

5.1 Enhance OSM's TIPS and NTTP to ensure that OSM, State, and Tribal SMCRA-program employees receive the training and support needed to use geospatial services in their daily work.

5.2 Provide managers with information they need to build and maintain a geospatially enabled workforce.

5.3 Ensure that resources are available to fulfill OSM's geospatial training and outreach needs.

5.4 Conduct outreach to all stakeholders to raise awareness of the availability and appropriate uses of coal-mine geospatial data and mapping products.

V. Summary and Analysis

Nearly every aspect of surface coal-mining and reclamation activities is inherently geospatial. Geospatial terms and references describing locations, areas, maps, and plans appear more than 300 times in SMCRA. In addition, SMCRA includes explicit requirements for OSM to maintain and provide data and to assist the States and Tribes in doing the same. The geospatial technology landscape has changed radically over the last few years. Expectations have also been changing rapidly. More and more, citizens expect government to provide data related to their specific geographic location; surface coal-mining data is no exception. Maryland Governor Martin O'Malley summarized these changing expectations when he said: "* * * I'd like you to consider the answer to this question: why is it that virtually any display of GIS technology quickly inspires someone to ask the timeless question, 'Can you show me my house?'?" Coalfield citizens have asked, "What's under my house?" and "What's near my child's school?" "Is my water safe?" "Is my property safe?" A national mining and reclamation geospatial information system could answer many of these fundamental questions.

Moreover, as Appendix D of this document ("OSM Annual Performance Measures and GIS Possibilities") indicates, there are 25 current SMCRA-related performance measures, 10 of which could be dramatically

and more accurately reported using a GIS.[6] Seven of the other fifteen measures have a high potential for a GIS to assist in reporting.

OSM's national TIPS program has set the stage by delivering geospatial software, training, and expertise to SMCRA partners nationwide, through the Department's Enterprise agreements and a shared licensing scheme. TIPS has provided a standard set of software and hardware tools that is almost universally used throughout the SMCRA programs. In addition, through the use of these TIPS tools, the States and Tribes have begun to develop their own geospatial applications and data sets. OSM has already begun to meet some of the objectives suggested in this GeoPlan by supporting and developing geospatial technologies through the TIPS program. By means of the efforts of the NCMGC, OSM has also led the effort to develop a common set of coal-mining geospatial data standards. These activities have provided OSM and our SMCRA partners with the standardized tools and skills to effectively and efficiently use geospatial data and technology.

Geospatial technologies are widely but unevenly used in OSM, and by our State, Tribal and other Federal agency partners. With the implementation of this strategic plan, OSM and its SMCRA partners are modernizing and enhancing the implementation of SMCRA through the coordinated integration of geospatial data and information, as well as the technologies related to them. OSM leadership has implemented the recommended governance structure. OSM must now develop a geospatial approach that incorporates this strategic plan, annual budgets, and the other requirements described herein. Execution of these will allow OSM to fully meet the President's goals for transparency, public participation, and collaboration, as well as the various mandates for the use of geospatial data.

The overall timeframe for accomplishing most of the goals and objectives in this GeoPlan is five years. The DOI and OSM Enterprise Architecture efforts—and in particular the documentation of business processes and information, as well as the meeting of technology requirements in support of these—are critical to understanding the role of geospatial data in the work of the SMCRA programs. This approach will evolve and develop in concert with other information resources both in and outside of OSM.

[6]Examples include the percentage and location of active coal-mining sites that are free of offsite impacts; the number and location of acreage released from Phase I and II Performance Bonds; and the number and location of trees planted on such acreages.

VI. Next Steps

Implementing this GeoPlan will inventory and organize the many resources available and activities currently underway within OSM and by our partners. It will leverage those resources and identify additional resources needed to meet the stated vision, mission, and goals. Details about the timing and sequence for the various activities will be identified in goal-specific, and/or annual work plans. With a formalized plan in place, the support of OSM's leadership secured, resources assigned, and this document as a guide; OSM and its partners can start to realize the full benefits of developing a coordinated and integrated set of geospatial services.

We recognize that OSM does not have additional resources to immediately fully fund the recommendations envisioned in the GeoPlan. We will reassign personnel and reallocate funds, to the extent practicable, using available resources to implement this strategy. Proposals for additional resources may be identified in annual work plans.

As discussed earlier in this document, OSM began working with selected State and Federal partners in February 2010 on the GeoMine Pilot Project. The progress made through the pilot project has already taught us much about the opportunities and obstacles of such an ambitious effort. The results will be documented in a final report in March 2013, and will guide OSM and our partners in further activities related to implementation and possible revisions to this strategic plan.

Appendices

Appendix A. Acronyms

ADS – Authoritative Data Source

AMLIS – Abandoned Mine Land Inventory System

ASTM International – Formerly known as American Society for Testing and Materials

BLM – Bureau of Land Management

CMGI – Coal Mining Geospatial Infrastructure

CMGF -- Coal Mining Geospatial Data Framework

COOP – Continuity of Operations Plan

DOI – Department of the Interior

EPA – Environmental Protection Agency

FedGIS – Federated Coal Mine GIS

FOIA – Freedom of Information Act

FSAM – Federal Segment Architecture Methodology

GeoCommittee – Geospatial Steering Committee

GeoPlan – this Geospatial Strategic Plan

GeoTeam – OSM's Geospatial Team

Appalachian GeoMine Pilot Project - an OSM-led, state and Federal collaborative effort to develop geospatial data sharing through use of an Internet accessible, Cloud-based mapping and data download application. The goal is to facilitate the query, analysis and display of geospatial information related to coal mining and reclamation in the states of Kentucky, Tennessee, Virginia, and West Virginia.

GIO – Geospatial Information Officer

GIS – Geographic Information System

GOS – Geospatial One-Stop

GSP - OSM's Geospatial Services Program

IMCC – Interstate Mining Compact Commission

NAAMLP – National Association of Abandoned Mine Land Programs

NCMGC – The National Coal Mining Geospatial Committee

NMMR – National Mine Map Repository

NRDC – Natural Resources Defense Council

NSDI – National Spatial Data Infrastructure

NTTP – National Technical Training Program

OMB – Office of Management and Budget

OSM – Office of Surface Mining Reclamation and Enforcement

RA – Regulatory Authority

SDI – Spatial Data Infrastructure

SOA – Services Oriented Infrastructure

SMCRA – Surface Mining Control and Reclamation Act of 1977

SWOT – Strengths, Weaknesses, Opportunities and Threats

TIPS – Technical Innovation and Professional Services

WIEB – Western Interstate Energy Board

Appendix B. Real-Life Examples of SMCRA-Related Incidents

Below are examples of real life SMCRA related incidents where geospatial information could have improved responsiveness, or lessened or prevented the impacts:

- In Sullivan County, Indiana, surface miners went home one night after completing their shift. When they returned the next day the entire mine pit was flooded by water infiltrating from an underground mine. Only the top of drill was sticking out of the water. The mining company never reopened the pit and the state wound up reclaiming it in the 90's as an AML/Bond Forfeiture project. If geospatial information on the locations of underground mines had been available at that time, both the miner and regulators would have been able to make more informed decisions regarding citing and permitting the surface mine to minimize risks and costs to all parties.

- On the west side of Springfield, Illinois forty subsidence events caused severe damage to 200 homes located over an abandoned underground coal mine. School children and district officials in Benld, Illinois are still impacted from the destruction of the 7-year old Benld Elementary School which was unknowingly built over an abandoned underground coal mine. A Geographic Information System (GIS) showing the locations of past mining could have assisted local planners to adjust the location of the school, thus preventing the damage.

- An active underground coal mine operating from Pennsylvania was penetrated without warning by natural gas developers drilling in West Virginia. Drillers, mine operators, and regulators all lacked the ability to share and review mining data across state lines. A comprehensive, standardized and accessible GIS would have enabled regulators to identify the potential conflicts and require amendments to the mining or drilling plan.

- The Quecreek Mine in Somerset County, Pennsylvania mined into abandoned underground workings flooding the active underground mine with 50 million gallons of mine water and trapping nine miners for four days. Online access to a library of geo-referenced historical underground mine maps could have prevented this accident.

- In Inez, Kentucky, a 72-acre coal slurry impoundment suddenly collapsed into a known abandoned underground mine releasing 250 million gallons of water and 150,000 cubic yards of coal mine waste through the underground workings to emerge at two separate mine entrances two miles apart in two separate watersheds. This incident contaminated 75 miles of streams with black coal waste and causing fish kills on the Tug Fork of the Big Sandy River. The protective barrier between the boundaries of the underground mine and

the coal waste impoundment were far thinner than mine operators or regulators realized. Had regulators and the mining company had access to a library of geo-referenced historical underground mine maps this impoundment failure could have been prevented. If not prevented then availability of geospatial data would have allowed a more focused and effective response to the disaster.

- A coal operation in the State of Washington was mining outside of its permit area for several months before a satellite image revealed the transgression into surrounding unspoiled land. Use of real-time access to remote sensing data would have allowed identification of the problem much sooner, minimizing environmental damage.

- A gas well driller near Delbarton, West Virginia, unknowingly intersected flooded workings of an abandoned underground coal mine. Injection of a large volume of air under high pressure from the drill rig pressurized the flooded mine, forcing mine water through the loose soil and rock seals at the portals that caused a blowout that closed a state highway. If the mine had not been inundated with water, a buildup of lethal concentrations of hazardous mine gases such as methane, carbon monoxide, carbon dioxide or hydrogen sulfide could have been forced out of the mine by the same pressurization mechanism. If fugitive methane had been forced to the surface at explosive levels and contacted an ignition source in either of the two occupied dwellings on the mine bench near the underground portals, the resulting catastrophe could have cost lives as well as property. Online access to a library of geo-referenced historical underground mine maps could have prevented the blowout that shut a state highway down.

- Recreational users of abandoned mine lands are injured or die in accidents every year as a result of unreclaimed and undocumented hazards such as open pits and shafts. Widespread access by agencies and the public to geospatial Abandoned Mine Lands (AML) information could save lives and minimize the risk of accidents.

Appendix C. Strengths, Weaknesses, Opportunities, and Threats Analysis

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

What we assessed: Creation of a robust and comprehensive coal mining geographic information system to ensure that mining and land use decisions are transparent and based on the best available scientific data.

Strengths

- Compliance to **SMCRA**, **30 U.S.C. 1211 (Sec. 201)(c)(8)** which requires *The Secretary to ".. develop and maintain an Information and Data Center on Surface Coal Mining, Reclamation, and Surface Impacts of Underground Mining…".*
- Sharing of coal mining spatial data among States to investigate and resolve coal mining underground mining and hydrologic issues at state boundaries.
- Leverages current OSM initiatives such as: e-Permitting, Remote Sensing, Mine Map Repository, and mobile computing.
- Makes available advances in computing and networking, geospatial applications and processing of large and complex geospatial data files critical to our business and OSM's mission.
- All 3 OSM regions are using geospatial tools and knowledge gained from instructor-led training classes that TIPS has been providing over the years to assist them in their SMCRA duties.
- The National Coal Mining Geospatial Committee (NCMGC), with members from OSM and the States, representing coal mining geospatial interests of IMCC, WIEB, and NAAMLP, has been promoting the use of geospatial technology for SMCRA business purposes since May, 2005.
- Under the NCMGC, the Coal Mining Spatial Data Standards ASTM Task Group developed spatial data standards of coal surface and coal underground mining boundaries for use by all SMCRA entities. The Task Group now has 10 Title 5 and 4 Title 4 datasets for which standards are to be developed in the near future.
- Designating RAs as Authoritative Data Sources and adoption of these spatial data standards by Geospatial Data Stewards will accelerate standardized management and sharing of coal mining spatial data among all SMCRA partners.
- We have demonstrated the ability to harvest selected data from State data systems while at the same time preserving the autonomy of those State systems.
- The NCMGC has established a national network of 42 SMCRA Geospatial Data Stewards, one in every participating SMCRA office and has held two national meetings of data stewards to coordinate national geospatial activities.
- The NCMGC serves as a forum for the exchange of ideas among SMCRA organizations about using geospatial technology in coal mining and identify geospatial technology needs and goals.
- The NCMGC has provided advanced geospatial vendor training opportunities to Data Stewards to establish and further develop coal mining geospatial data infrastructures within SMCRA organizations.
- The NCMGC has been conducting outreach by giving presentations at SMCRA professional organization meetings.
- Successful completion of prototype infrastructure in 2008 to collect and assimilate coal mining spatial data of permit boundaries from OSM offices inside WAN and two state offices outside WAN.
- Through its activities, the NCMGC has established a Framework upon which can be built a National Coal Mining Spatial Data Infrastructure.
- Federal Collaborations: USGS, BLM, FWS, DOE, EPA, FGDC, and MSHA.
- Industry, State & Tribe Collaborations: NMA, NCMCG, IMCC, WEIB, NAAMLP, State Coal Associations.
- Existing workforce of TIPS trained natural resource specialists, engineers, and scientists that help implement SMCRA.
- Leverage existing DOI BPA/enterprise agreements with software vendors and TIPS license servers to acquire and operate necessary software simultaneously at multiple locations.
- Geospatial software and data structures compatible with modern, industry standard software and programming standards, readily usable in TIPS scientific software, can be integrated for information products
- Geospatial IT requirements are compatible with standard existing hardware and software

Weaknesses

- Decisions to invest in geospatial data and services will continue to be made locally at the individual State, OSM or Tribal office levels without knowledge of how the investments relate to national strategies and/or the investments by others.
- No current funding commitment to geospatial resources and infrastructure which is the future of land and resource management.
- Lack of senior executive management support to champion use of geospatial technology that can enhance the ability to address critical decision-making in permitting and inspecting active mines and reclaiming abandoned mines.
- Data standards not implemented uniformly across OSM, States and Tribes, impeding data sharing and use across administrative boundaries.
- No appointed OSM Executive Sponsor and GIO for Geospatial Services.
- Lack of commitment by some RAs to digitize legacy coal mining data from paper permit applications, reducing the quantity and quality of data available for use.

- Structure for the utilization of geospatial data, information and technologies will not be productively used within day-to-day OSM business processes to improve decision making and meet core business needs of the SMCRA programs.
- Lack of dedicated human resources to plan, coordinate, and implement geospatial activities.
- Resistance by some RAs to accept responsibility as Authoritative Data Source for its geographic area.
- Reluctance by some RAs to provide adequate personnel, advanced geospatial data management training, and resources.
- Information (i.e. paper maps) on past mining and its potential effects on modern life will not be in a digital geospatial format to be used by all.
- Smaller, less capable program States will require greater assistance from OSM than larger program States to maintain a stable geospatial infrastructure and workforce.
- A standard model of GIS implementation among all programs is not feasible. System implementation will be affected by RA capabilities
- OSM funding and funding to State programs through grants may have to be increased.

Opportunities

- Improve effectiveness of decision-making.
- Better quality regulatory work products.
- Reduce burden of regulatory compliance on industry by reusing coal mining data.
- Increase public safety through information on active and historical coal mine site features.
- Reduce future costs to society associated with present and past coal mining.
- Greater retention in geographic databases of institutional knowledge from retiring workforce of coal mining impacts.
- Leverage electronic permitting applications to deliver coal mining spatial data from industry in digital format, reducing data entry costs.
- Automation quality control measures to improve the quality of coal mining data submitted by industry.
- Improved quality of field activities using mobile GIS.
- Verifiable, standardized data collected from RA about its activities.
- Support national reporting to Congress by OSM of mining and reclamation status.
- Standardized applications and web services available to use geospatial data and information related to coal mining and reclamation across OSM business processes.
- National Coal Mining Spatial Data Infrastructure available for evolving dependence of the public and industry on social networking and the Internet.
- Expanded collaboration with other federal, State and Tribal partners.

Threats

- Retiring workforce of natural resource specialists, engineers, and scientists to help implement SMCRA. New employees coming in expect to be applying modern tools.
- Magnitude of the nation's past and ongoing mining impacts and activities are not well documented, and very little information is available digitally for these specialists or for the public.

- Substitution of unreliable or inferior data sources and services by other DOI bureaus competing for funding if OSM does not develop its own program.
- Lack of sustainable funding of resources and infrastructure to make this vision a reality.
- Compliance and responsibilities under Executive Order 12906, OMB Circulars A-16, A-119, A-130, OMB M-06-07, E-Gov Act of 2002, FEA, Federal Geospatial LoB.
- Limited number of highly qualified bureau personnel having high quality geospatial skills and depth of programmatic experience.
- Loss of dedicated funds and resources to other DOI bureaus through consolidation efforts under CPIC.
- IT consolidation resulting in lack of reliable, direct access to hardware, software, data, or services when needed.
- IT security issues.

Appendix D. OSM Annual Performance Measures and GIS Possibilities

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
AML	1A	Number of Federal, private and Tribal land and surface water acres reclaimed or mitigated from the effects of natural resource degradation from past mining.	9,909	6,900	Y	Acres	Calculate the number of acres. Map the acres of reclaimed/mitigated lands at national, state and local levels.
AML	1B	Number of Federal, private and Tribal land and surface water acres reclaimed or mitigated from the effects of natural resource degradation from past mining. (Federal Programs & Tribes)	249	125	Y	Acres	Calculate the number of acres. Map the acres of reclaimed/mitigated lands at national, state and local levels.
?	2A	Number of active partnering and leveraging agreements.	18	15	P		Calculate the number of partners and agreements. Map the locations of partners at national, state and local levels.

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
?	2B	The amount of increased funds derived from active partnering and leveraging agreements.	6,098,316	3,750,000	P	$	Map the funding levels on national map at the national, state and local level, e.g., color code the funding levels.
AML	3A	Number of people with reduced exposure potential to safety risks from abandoned mine lands.	255,640	160,000	Y	Count	Calculate the number of people with reduced safety risks. Map the location of AML sites (e.g., improve AMLIS to show polygons) Map the location of people with reduced safety risks at national, state and local levels. (using GIS and population maps)

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
AML	3B	Number of people with reduced exposure potential to safety risks from abandoned mine lands. (Federal Programs & Tribes)	206	2,400	Y	Count	Calculate the number of people with reduced safety risks. Map the location of AML sites (e.g., improve AMLIS to show polygons) Map the location of people with reduced safety risks at national, state and local levels. (using GIS and population maps)
AML	4	Number of people directly affected (emergencies abated).	68,764	8,300	Y	Count	Calculate the number of people directly affected by AML emergencies that have been abated. Map the location of AML emergency sites (e.g., improve AMLIS to show polygons) Map the location of people directly affected by AML emergencies at national, state and local levels.

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
AML	5A	Percentage of declared emergencies abated within 6 months.	100%	95%	P	Percent	Calculate percentage of emergencies abated over time. Map location of declared emergencies at national, state and local levels.
AML	5B	Percentage of declared emergencies abated within 6 months (Federal Programs & Tribes).	100%	95%	P	Percent	Calculate percentage of emergencies abated over time. Map location of declared emergencies at national, state and local levels.
AML	6A	Provide appropriate grant funding within 60 days of a complete grant application for **abandoned mine lands grants**.	100%	90%	N	Date	
Reg	6B	Provide appropriate grant funding within 60 days of a complete grant application for **regulatory grants**.	100%	90%	N	Date	

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
Reg	7	Percent of active coal mining sites that are free of off-site impacts	88%	93%	Y	Percent	Map the location of sites that are free of off-site impacts and location of sites that are not at national, state and local levels.
Reg	8	Number of acres released from Phase I & II Performance Bonds	89,047	80,000	Y	Acres	Calculate the number of acres for each phase. Map the acres for each phase at national, state and local levels.
Reg	9	Number of acres where reclamation goals are achieved as evidenced by release from Phase III Performance Bonds	48,828	50,000	Y	Acres	Calculate the number of acres for Phase III. Map the acres for Phase III at national, state and local levels.
Reg	10	Completion of the technical review of Federal/Indian Land permit actions within 90 days.	90%	80%	P	Percent	Map the location of the technical review conducted at the national, state, local, and project levels.

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
Tech Transfer	11	Customer service rate in the quality of technical assistance.	96%	95%	P		Calculate the customer service rate. Map the location of the project where OSM provided technical assistance. GIS information could provide summary information at the national, state, local, and project levels, e.g., polygon of the project, permit, etc.
Tech Transfer	12	Percent satisfaction with the scientific and technical products and assistance.	92%	94%	P		Calculate the percent satisfaction of customers. Map the location of the project where OSM provided technical assistance, if appropriate. GIS information could provide summary information at the national, state, local, and project levels, e.g., polygon of the project, permit, etc.

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
Tech Transfer	13A	Customer effectiveness rate in the quality of technical training – NTTP.	96%	93%	N		
Tech Transfer	13B	Number of students trained – NTTP.	1,426	1,200	N		
Reg	14	Customer satisfaction in the quality and timeliness of AVS provided services.	98%	95%	N		
Tech Transfer	15	Customer satisfaction rate for TIPS training.	97%	90%	N		
Reg	16	Increase the number of permits reporting by e-filing.	73%	75%	N		
AML	17	AML Fee Collection rate.	99.9%	99%	N		

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
Reg	18A	Increase the number of trees planted in FY 2010 by xx% over the numbers of trees planted in FY 2008.	---	---	Y	Count	Map the general location and number of trees. GIS information could provide summary information at the national, state, local, and project levels, e.g., polygons, as appropriate.
Reg	18B	Increase the acreage of trees planted on Forestry Reclamation Approach (FRA) compliant spoil.	---	---	Y	Acres	Calculate the acres of trees planted. Map the acres of trees planted, e.g., appropriate polygons. GIS information could provide summary information at the national, state, local, and project levels, e.g., polygons, as appropriate.

Total=Y 10

Program	Performance Measure Number	Measure Description	2008 Actual	2009 Target (President's Budget)	Could GIS be used? Y=Yes (strong case) N=No P=perceived benefit is medium to low	Units for Measure	A GIS could:
Total=N	8						
Total=P	7						
Grand Total	**25**						