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Oil and gas drilling is one of the issues addressed by the WSGS energy impact map. Courtesy photo.

Map shows energy impacts

With energy development here to stay, the Governor's Planning Office identified an acute need for a resource that would allow interested stakeholders to view and begin to evaluate potential impacts of resource extraction. The result? An interactive, GIS-based map with information about topics ranging from land ownership to worker's compensation claims.

What began as the brainchild of the WSGS, Game and Fish Department, Oil and Gas Conservation Commission, State Historic Preservation Office, and Governor's Planning Office evolved into a collaborative effort between 18 state agencies, federal agencies, NGOs, and corporations. Created by Dave Lucke, a GIS specialist at the WSGS, the Energy Development Impact Map (available on CD) allows users to examine the seven areas of Wyoming most likely to feel the effects of energy development: the Powder River Basin; Wind River Basin; Pinedale

Anticline; Jonah Field; Moxa arch area; Atlantic Rim; and Continental Divide area.

The map CD contains instructions, the ArcReader software necessary to use the map, metadata, and the map itself. After installing ArcReader and opening the map, users may select and activate specific information layers from more than 20 categories and 100 subcategories of data. For example, a user could activate the layers depicting well locations, archaeological sites, and building permit data, and examine them in the Atlantic Rim area. The identify feature of ArcReader allows the user to click on a specific data point, such as a gas well or sage grouse lek, and bring up a table containing more detailed information about the point.

Since the map's initial release in February of 2006, demand for it has remained

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WSGS models produced water quality

As coalbed natural gas (CBNG) development expands north and west in Wyoming's Powder River Basin (PRB), CBNG operations will probably produce greater quantities of water than in the past, exacerbating already-serious concerns over produced water. To give CBNG operators, regulators, water users, and other stakeholders a better grasp of water issues in a particular area before development occurs, the WSGS is working with other state and federal agencies to create an interactive model of water quality as it relates to coal seams in the basin.

Funded by the Wyoming Water Development Commission, the model and associated database allow users to predict the quality of water produced during exploitation of a specific coal seam and identify areas where implementation of water quality mitigation plans may be necessary. The extraction of adsorbed natural gas from coal beds in the PRB initially produces large quantities of variable-quality groundwater. When discharged directly onto the ground, some of this water adversely affects soils and may inhibit plant growth, causing problems for the agricultural community.

A model of the northern half of the PRB has been complete and available online since 2003. This model took three years to develop. The WSGS and its partners are currently assembling the database and model for the southern half of the PRB,

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FutureGen project bypasses Wyoming

The Wyoming State Geological Survey served as the lead state agency in the preparation of the FutureGen facility host site proposal. FutureGen is a government/industry alliance organized to design, build, and operate a near zero emission, coal-fueled power plant. The plant will produce electricity and hydrogen from coal while capturing carbon dioxide and permanently storing it in a deep geologic formation. The preparation of this proposal represented a model of interagency cooperation, with many state agencies contributing to the effort in a very short and intense time period.

The 275-megawatt plant will serve as a prototype plant employing cutting-edge technology and will provide a large-scale laboratory for testing new technologies for clean power and carbon dioxide capture. The FutureGen Alliance intends to build and operate the cleanest coal-fueled power plant in the world.

In cooperation with the FutureGen Alliance, the United States Department of Energy (DOE) developed a series of criteria upon which to base facility site selection. Three types of criteria - qualifying, scoring, and best value - were included in the Request for Proposal (RFP) issued on March 7, 2006. The deadline for proposal submission was May 4, 2006.

Twelve host site proposals from seven states were submitted to the Alliance by the deadline. Four were located in Illinois, two in Texas, two in Ohio, and one each in Kentucky, North Dakota, West Virginia, and Wyoming. After reviewing the proposals for qualifying and scoring criteria, the Alliance sent a three-person team to visit all twelve proposed sites. Prior to the site visits, the team had no knowledge of whether a site had qualified. Information gathered during the site visits was used to inform the Alliance's consideration of the best value criteria.



Like this California solar facility, the FutureGen power plant will generate "clean power." Courtesy photo.

Four sites failed to meet all of the qualifying criteria: North Dakota; West Virginia; Wyoming; and one site in Ohio. Ultimately, the Alliance placed two sites in Illinois and two sites in Texas on the candidate list for further evaluation.

— Kathy Walker

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New interactive coal resource available

First developed and made accessible by the University of Wyoming Science and Math Teaching Center (SMTC) ten years ago, the Wyoming Coal Web site has recently been updated, redesigned, and put back online. Last year, the Wyoming State Geological Survey (WSGS) took responsibility for the site and, in cooperation with the SMTC, updated content, added more data, and gave it a new look.

This Web site serves students of all ages and others interested in Wyoming coal, offering a large range of information on coal origin and formation, coal mining, coal transportation, and uses of coal. The WSGS also established an interactive database with this site so that whenever new data is added to the WSGS database, the Web site updates automatically. The Web site consists of seven sections: Origin of Coal; Mining of Coal; Transportation; Using Coal; Wyoming Coal; Coal Library; and Field Trip.

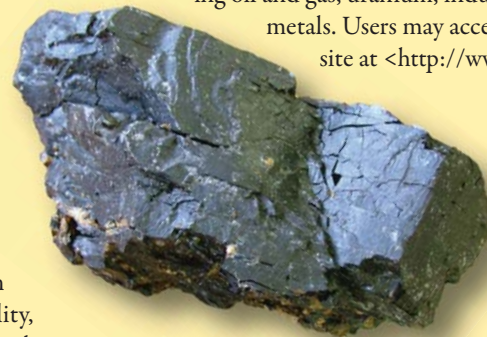
The Origin of Coal section provides an in-depth look at the science of coalification, from peat-forming wetlands to coal transformation. The Mining Coal section describes modern mining methods and operations, while the Transportation section explains the loading, moving, and unloading of coal via rail. The Wyoming Coal section describes coal fields, coal-bearing geologic units, coal quality, unique coal seams, coal mines, and coalbed natural gas develop-

ment in Wyoming. The Using Coal section lists coal customers, coal prices, and a variety of different uses for coal.

Housing the data the Web site is built on, the Coal Library includes the interactive coal mine database, an image and video bank, a glossary, and information on several miscellaneous topics related to coal geology. The interactive coal database can show production data from 1868 (pertaining to the first mine in the state) to 2005. Data from the first half of 2006 will be available in March of 2007. Finally, the Field Trip section allows the user to take a guided or self-guided tour through the site.

The Wyoming Coal Web site will serve as a template for WSGS educational Web sites dealing with other potential topics, including oil and gas, uranium, industrial minerals, and precious metals. Users may access the Wyoming Coal Web site at <<http://www.wsgs.uwyo.edu/coalweb/>>.

— Scott Quillinan



Coal.



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steady. The WSGS has distributed more than 250 CDs to interested parties in fields ranging from geology to travel and tourism, and continuously updates the map with new data. While the map is not intended to function as an analytical tool, it can certainly serve as a jumping-off point for analysis and discussion. CDs are available free of charge: to request one, please contact the WSGS sales desk at (307) 766-2286 ext. 224.

— Meg Ewald

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and will integrate models of the two halves to provide seamless coverage of the entire basin.

So far, the project has identified and modeled 32 distinct coal seam horizons; from this data, users can generate geologic columns and cross-sections anywhere in the area covered by the model. In addition to providing a more complete picture of coal distribution in the basin, the project has helped standardize coal nomenclature and avoid confusion arising from inaccurately-named coals.

Previously, what one person called the “Big George Coal” might in fact have been a completely different coal, with a completely different set of associated water quality data. The model allows users to positively identify coals and predict produced water quality. It also gives CBNG operators a better idea of the depth of particular coal seams, and will help them target coals effectively.

Users may access the Interactive Geologic, Hydrologic, and Water Quality Database and Model for the Northern Powder River Basin at <http://ims.wrds.uwyo.edu/prb/index.html>.

— Meg Ewald

Geologist celebrates 30 years

Regional Geology/Mineral Resources Manager Alan Ver Ploeg celebrated 30 years with the WSGS this year, receiving a commemorative plaque at this year's annual holiday party.

Born in Sully, Iowa, Ver Ploeg earned a Bachelor's degree and a Master's degree in geology at Iowa State University, where he also forged a Wyoming connection by attending the school's geology field camp near Shell.

After a 10-month stint as a petroleum geologist in Louisiana, Ver Ploeg relocated to Rawlins, where he worked as a geologist for the BLM. Ver Ploeg joined the WSGS in 1976 as the head of the Oil and Gas section, a position he occupied for 10 years. In 1986, Ver Ploeg began leading the geologic mapping section.

During his years with the WSGS, Ver Ploeg authored or co-authored more than 120 maps, reports, and other publications pertaining to Wyoming geology, and has contributed significantly to the federally-funded STATEMAP mapping effort in Wyoming.

Ver Ploeg said he considers his mapping of the southern Bighorn Mountains one of his most noteworthy and interesting



State Geologist Ron Surdam (Santa) presents Alan Ver Ploeg with a certificate commemorating his 30 years of service as a geologist for the State of Wyoming.

accomplishments. This project involved a lot of fieldwork and allowed Ver Ploeg to experience the region's spectacular geology and rich history.

"My favorite part of my job is being able to get outdoors to do fieldwork and geologic mapping. There aren't many careers in geology that allow people to do that anymore," he said. Ver Ploeg mapped approximately 684 square miles (12 7.5-minute quadrangles), much of which had not been mapped since the late 1800s to early 1900s.

A member of the Wyoming State Historical Society, Ver Ploeg numbers the Civil War and the history of the American West among his interests. He collects old western photographs and maps, reports of early geologic explorations, and classic geologic publications on Wyoming and the West. An avid UW sports fan, Ver Ploeg can often be found cheering the Cowboys at home basketball games.

— Meg Ewald for the staff

Agencies study CBNG

Since the late 1990s, the effects of extensive coalbed natural gas (CBNG) development have caused public concern. To help address some of this concern, the WSGS entered into two cooperative agreements with other agencies to monitor and analyze impacts of CBNG development on groundwater resources in the Powder River Basin (PRB) of northeastern Wyoming.

The first project, a \$60,000 cooperative effort between the WSGS and the BLM, will monitor groundwater on a basin-wide scale. WSGS geohydrologists Keith Clarey and Jim Stafford are working to compile and analyze BLM monitoring well data collected from 1993 to 2006, including information on well construction and completion, water levels, water quality, and wellhead gas pressure. Clarey and Stafford will then discuss the drawdown effects of pumping groundwater from

various coal zones, and compare these effects to impacts predicted by previous reports and groundwater modeling efforts.

This analysis will help more clearly define the impact of CBNG development on groundwater resources in the PRB. The final project report will be complete by September of 2007, and will be available as a WSGS Open File Report.

The WSGS will also collaborate with the Wyoming State Engineer's Office to conduct an aquifer impact analysis of regional groundwater declines caused by CBNG development in the PRB. With a total budget of \$200,000, the two agencies will prepare potentiometric surface contour maps using available well data, create a groundwater model, and analyze the quantitative impacts of CBNG-related groundwater pumping.

— Keith Clarey for the staff



A produced water retention pond from a coalbed natural gas field south of Gillette has transformed this part of the Powder River Basin. Courtesy photo.

Publications address energy development

Recently, the WSGS released five new publications that address different challenges related to energy development in Wyoming; one provides a general overview of Wyoming's role as a major energy exporter; three relate to coalbed natural gas (CBNG) development in Wyoming; and one deals with anomalously pressured gas accumulations.

In response to the current energy boom, the WSGS prepared a presentation (available on CD) designed for other state agencies that places the boom in a global context, highlighting the emerging global energy economy and the sustainable nature of demand for Wyoming's resources.

Two of the CBNG publications relate directly to produced water issues in the Powder River Basin (PRB). The first, titled Western Resources Project Final Report – Produced Groundwater Associated with Coalbed Natural Gas Production in the Powder River Basin, is a compilation of six peer-reviewed papers addressing different issues related to produced water in the PRB. The second publication, part of the new WSGS series Challenges in Geologic Resource Development created to tackle development-related topics, evaluates the feasibility of building desalination plants

in the PRB to treat CBNG produced water. Titled Powder River Basin Desalination Project Feasibility, the report was released in June of 2006.

The third CBNG publication, titled Coalbed Natural Gas Conference: I – Research, Monitoring, and Applications, is the proceedings of a conference on CBNG held at the University of Wyoming in August of 2004, and includes papers that address a range of topics related to CBNG development.

First in the WSGS exploration memoir series, A New Approach to Exploring for Anomalously Pressured Gas Accumulations describes vastly improved techniques for evaluating gas distribution in the subsurface.

All of these resources are available from the WSGS sales department. Interested parties may contact the sales manager at (307) 766-2286 ext. 224.

— Meg Ewald

