



USGS-BLM COALBED GAS COOP IN THE POWDER RIVER BASIN: A SUCCESS STORY

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IN THE BEGINNING.....

BLM WRMG NEEDED COLLECTION OF RELIABLE CBG DATA IN THE PRB

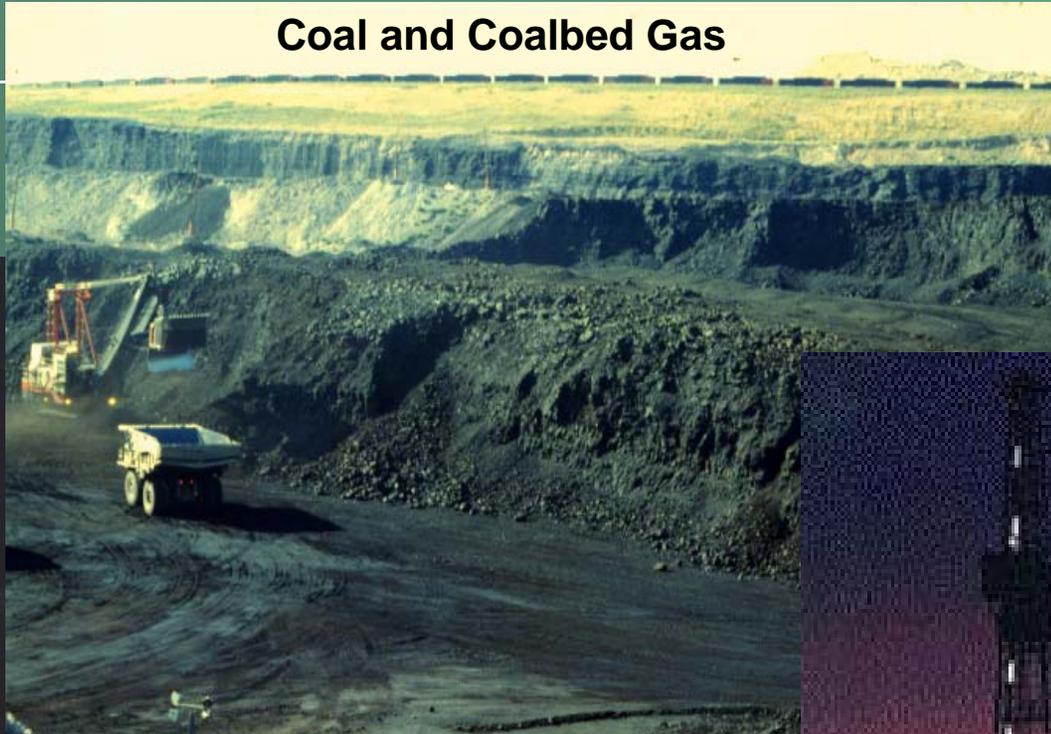
USGS POSSESSED COAL RESOURCE ASSESSMENT, COAL STRATIGRAPHY-GEOLOGY, AND COAL QUALITY DATA



USGS Energy Resources Program



Coal and Coalbed Gas



Gas Hydrates

**Oil and
Natural Gas**



INTERAGENCY SCIENCE PARTNERSHIP - begun FY99

- TO PROVIDE BLM
TIMELY AND RELIABLE
DATA
- TO COLLECT NEW DATA
FOR ASSESSING AND
MANAGING CBG
RESOURCES IN THE PRB
- TO COLLABORATE
WITH PRB GAS
OPERATORS IN
COLLECTING DATA



COLLECTION OF NEW DATA

- USGS-BLM WRMG ESTABLISHED A COAL CORING COOP PROGRAM WITH GAS OPERATORS TO MAXIMIZE RESOURCES
- CORING PERMITTED COLLECTION OF GAS DESORPTION, ADSORPTION ISOTHERMS, GAS COMPOSITION, AND COAL LITHOLOGY, DENSITY, PERMEABILITY, AND QUALITY DATA
- CO-PRODUCED WATER CHEMISTRY DATA WERE COLLECTED IN COOP WITH GAS OPERATORS

TO DATE:

- CORED 38 CBG WELLS IN WY PRB
- DESORBED GAS FROM COAL CORES IN 886 CANISTERS TOTALING 2,516 FT IN WY PRB
- 73 ADSORPTION ISOTHERMS ANALYSIS IN WY PRB
- >100 GAS COMPOSITION ANALYSIS IN WY PRB

TO DATE (con't):

- DESCRIBED COAL LITHOLOGY FOR A TOTAL THICKNESS OF 1,673 FT IN WY PRB
- PERFORMED 9 COAL - PORE PERMEABILITY TESTS IN WY PRB
- ANALYZED 838 COAL QUALITY SAMPLES IN WY PRB
- ANALYZED >200 SAMPLES FOR WATER COMPOSITION FROM CBM WELLS IN WY PRB

BLM DATA APPLICATIONS AND BENEFITS

- GROUNDWATER MODELING
- RECOVERABLE GAS RESERVE ESTIMATES FOR RESOURCE MANAGEMENT PLANNING AND PRB EIS
- DRAINAGE/DEPLETION OF PUBLIC CBG RESOURCES
- PRIORITIZING APD APPROVAL
- RESOURCE CONSERVATION (UNITIZATION)



BLM APPLICATIONS

BENEFITS (con't)

- RESOLVING CONFLICTS BETWEEN CBG PRODUCTION AND COAL MINING
- ADDRESSING DRAINAGE PROTECTION ISSUES
- SUPPORT COAL LEASING AND MINE DEVELOPMENT ADJOINING CBM LEASES
- COAL RESERVOIR ANALYSIS, CHARACTERIZATION, AND MODELING

USGS DATA APPLICATIONS AND BENEFITS

- DETERMINE ORIGIN OF THE CBG
- STUDY THE ORIGIN AND EVOLUTION OF THE PRODUCED WATER
- CBG RESOURCE ASSESSMENT INFO (PETROLEUM SYSTEM DETERMINATION) FOR EPCA
- CBG SATURATION ANALYSIS



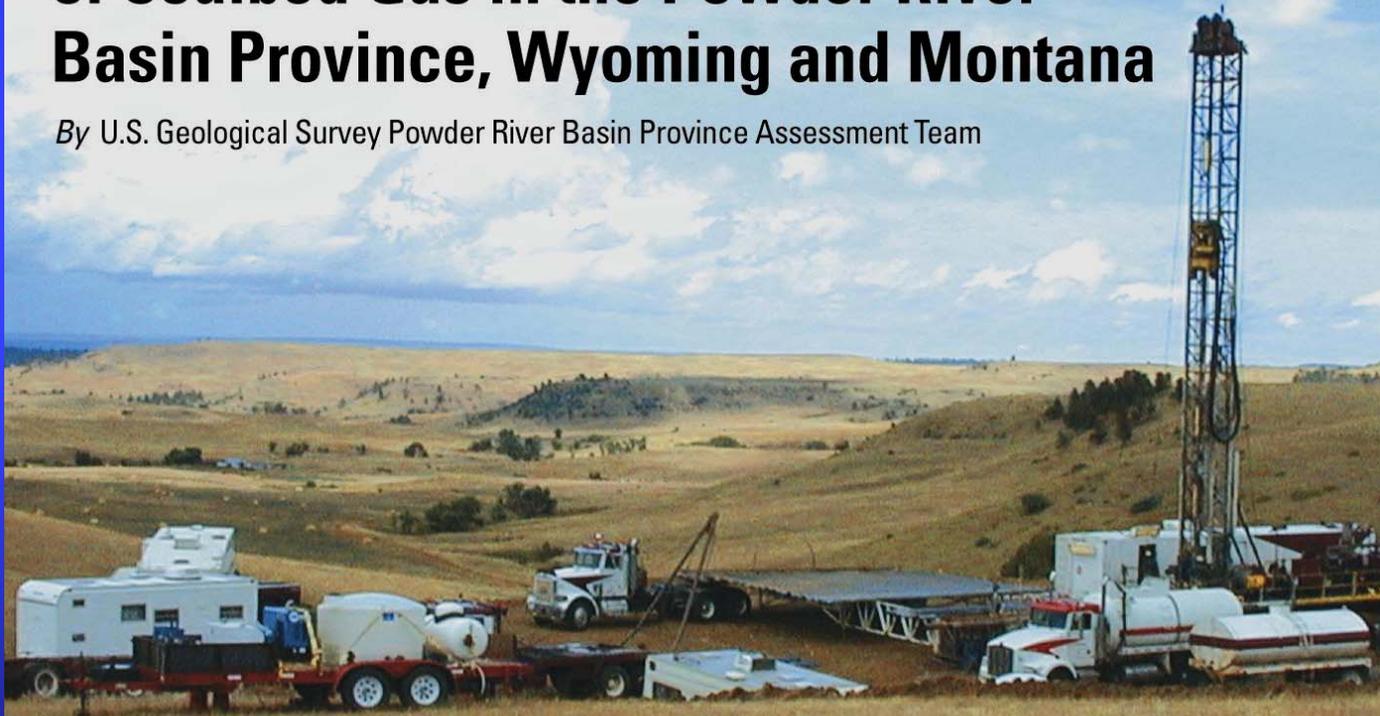
USGS BENEFITS (con't)

- OCCURRENCE AND DISTRIBUTION OF ECONOMICALLY MINABLE COAL
- POTENTIAL OF CO₂ SEQUESTRATION USING CO₂ AND CH₄ ADSORPTION ISOTHERMS DATA
- USING GAS DESORPTION DATA TO PREDICT CBG PRODUCTION

National Assessment of Oil and Gas Project:

Total Petroleum System and Assessment of Coalbed Gas in the Powder River Basin Province, Wyoming and Montana

By U.S. Geological Survey Powder River Basin Province Assessment Team



FUNDING - OE

USGS - ERP		BLM - WRMG
\$163,000	FY 2001	\$59,998
\$135,000	FY 2002	\$135,700
\$94,580	FY 2003	\$50,000

OTHER IN-KIND FUNDING

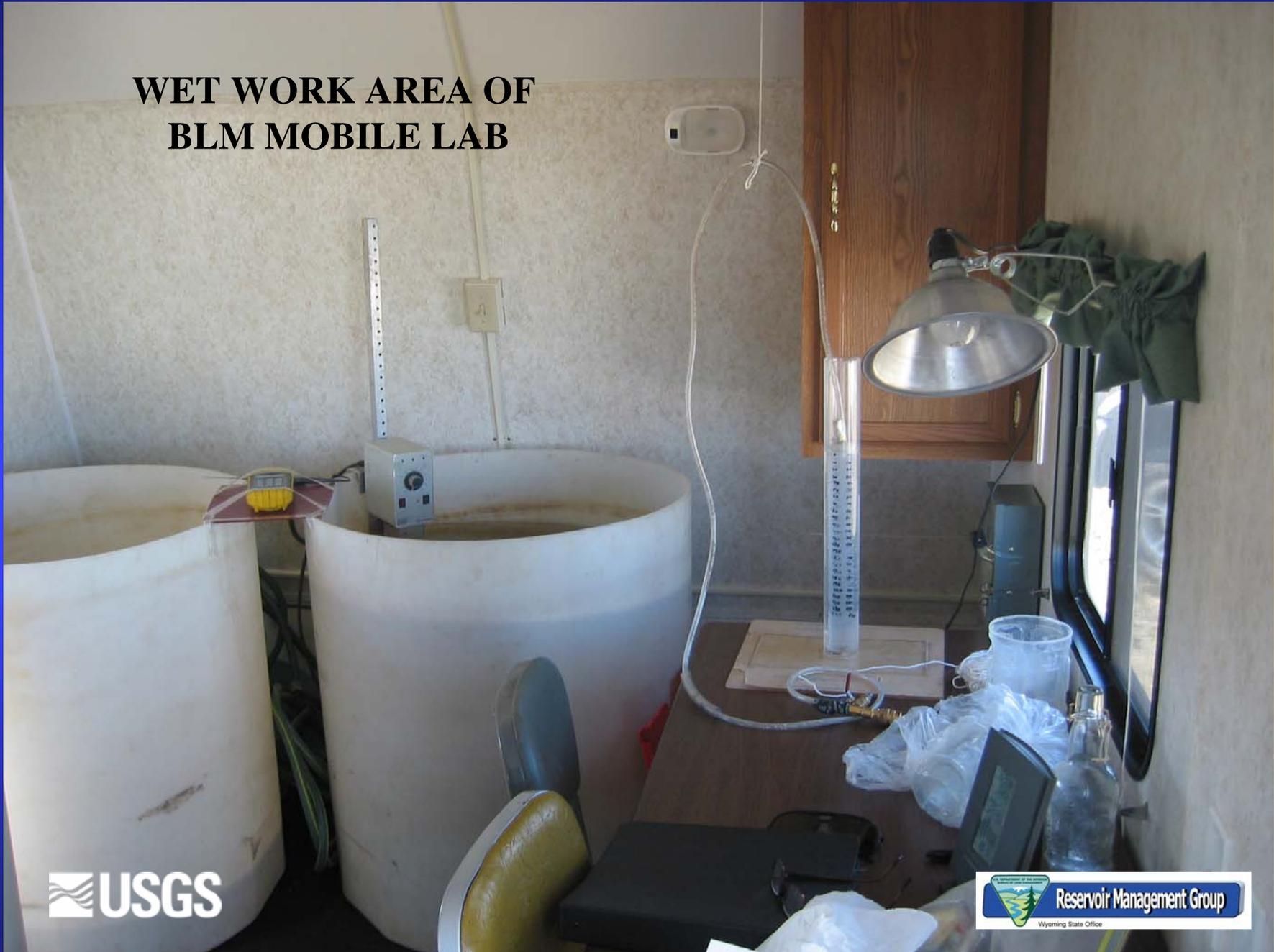
- USGS SALARIES FOR PROFESSIONAL GEOLOGISTS, CONTRACTORS, AND STUDENTS
- USGS CRISP/BLM FUNDING FOR PRODUCED WATER STUDIES
- BLM SALARIES FOR PROFESSIONAL GEOLOGISTS, ENGINEERS, AND TECHNICIANS
- BLM TRAILER WET LAB



THIRD GENERATION BLM MOBILE CBG LAB



WET WORK AREA OF BLM MOBILE LAB



MEETING/WORK ROOM OF BLM MOBILE LAB



USGS STUDIES OF CBG PRODUCED WATER, POWDER RIVER BASIN, WY

CHEMICAL AND ISOTOPIC COMPOSITION OF CBM WATERS

- GOALS** {
- EXAMINE COMPOSITION VARIATION
 - DETERMINE ORIGIN AND EVOLUTION OF WATER
 - RELATE DATA TO PRODUCTION HISTORY OF GAS AND WATER
 - PROVIDE DATA ON CBM WATER FOR WATER MANAGEMENT STRATEGIES
- STATUS** {
- 200+ CBM WATER SAMPLES COLLECTED ACROSS BASIN FROM CBM WELLS OF 18 GAS OPERATORS
- VALUE** {
- DATA USED IN BLM EIS AND BY STATE AGENCIES
 - DATA AIDS IN UNDERSTANDING AND PREDICTING TRENDS IN WATER COMPOSITION AND HYDROLOGY



WATER MANAGEMENT STRATEGIES IN THE PRB



CBG produced water is disposed of under National Pollutant Discharge Elimination System (NPDES)

↑
Early CBG development saw direct discharge of water to surface—current trend is discharge into storage and/or infiltration impoundments →

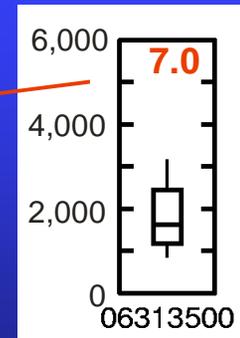
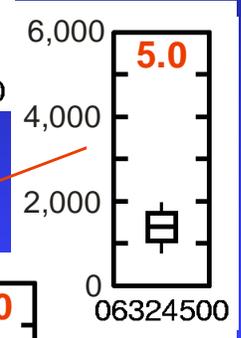
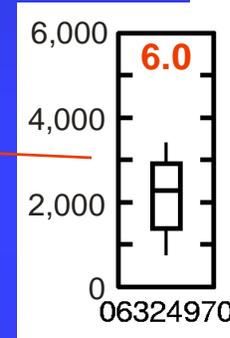
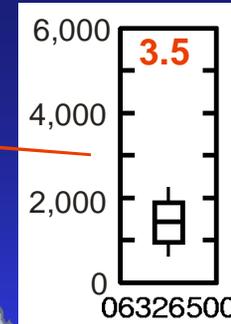
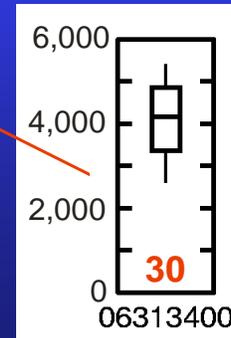
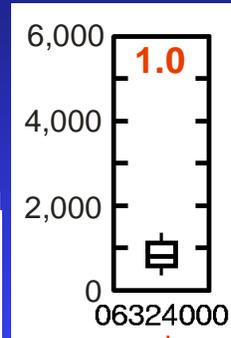
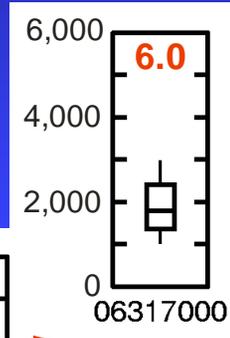
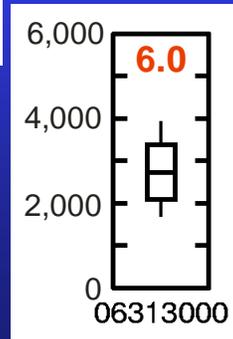
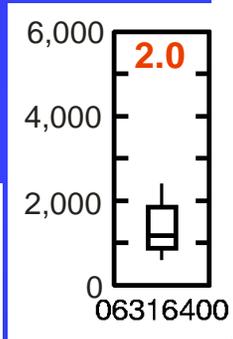
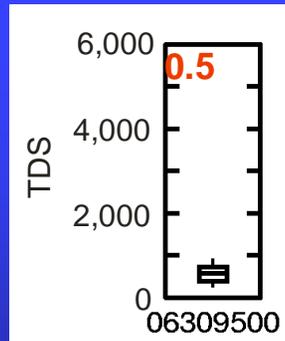


COMPONENTS OF CBG PRODUCED WATER

- Dissolved inorganic species
 - Major ions—Na, K, Ca, Mg, HCO_3 , Cl, SO_4
 - Minor species— NH_4 , B, Li
- Dissolved metals
 - Fe, Ba, Mn, Se, Zn, Cu, Cd, Mo, Cr, As
- Dissolved organic species
 - Phenols and volatile aromatic compounds
- Dissolved and dispersed hydrocarbons
 - Condensates and oil
- Dissolved and sorbed radionuclides
- Drilling and workover additives

TDS and SAR in Powder River and tributaries

Numbers in red
are SAR values



FUTURE USGS/BLM COOPS OUTSIDE THE POWDER RIVER BASIN

- **EXPANSION OF USGS-WRMG COOP
CBM WORK IN THE GREEN RIVER,
RED DESERT, AND OTHER BASINS
IN WY**
- **GEOLOGICAL ANALYSIS AND GIS-BASED
MODELING COALBED NATURAL GAS
RESERVOIRS – APPLICATIONS OF SCIENCE**
- **INTERNATIONAL (E.G. INDONESIA) CBG
WORKSHOP OF USGS/BLM**

Scientific Inventory of
Onshore Federal Lands' Oil and Gas
Resources and Reserves
and the
Extent and Nature of Restrictions or
Impediments to their Development

The Paradox/San Juan, Uinta/Piceance,
Greater Green River, and Powder River Basins
and the Montana Thrust Belt

In Compliance with the Energy Policy and Conservation Act
Amendments of 2000, P.L. 106-469 §604

Prepared
by the
United States
Departments
of the
Interior,
Agriculture,
and Energy



USGS

USDA



January 2003

OTHER COOPERATIVE WORK

EPCA

AK – gas hydrates,
coalbed gas

Geothermal



CONCLUSIONS

- USGS ERP-BLM WRMG COOP SERVES WELL AS A MODEL FOR FUTURE INTERAGENCY COLLABORATIONS
- A MODEL TO MAXIMIZE SCIENTIFIC/ RESEARCH BENEFITS TO BOTH ORGANIZATION
- A MODEL TO MAXIMIZE HUMAN AND BUDGET RESOURCES

Thank You

<http://energy.usgs.gov>

