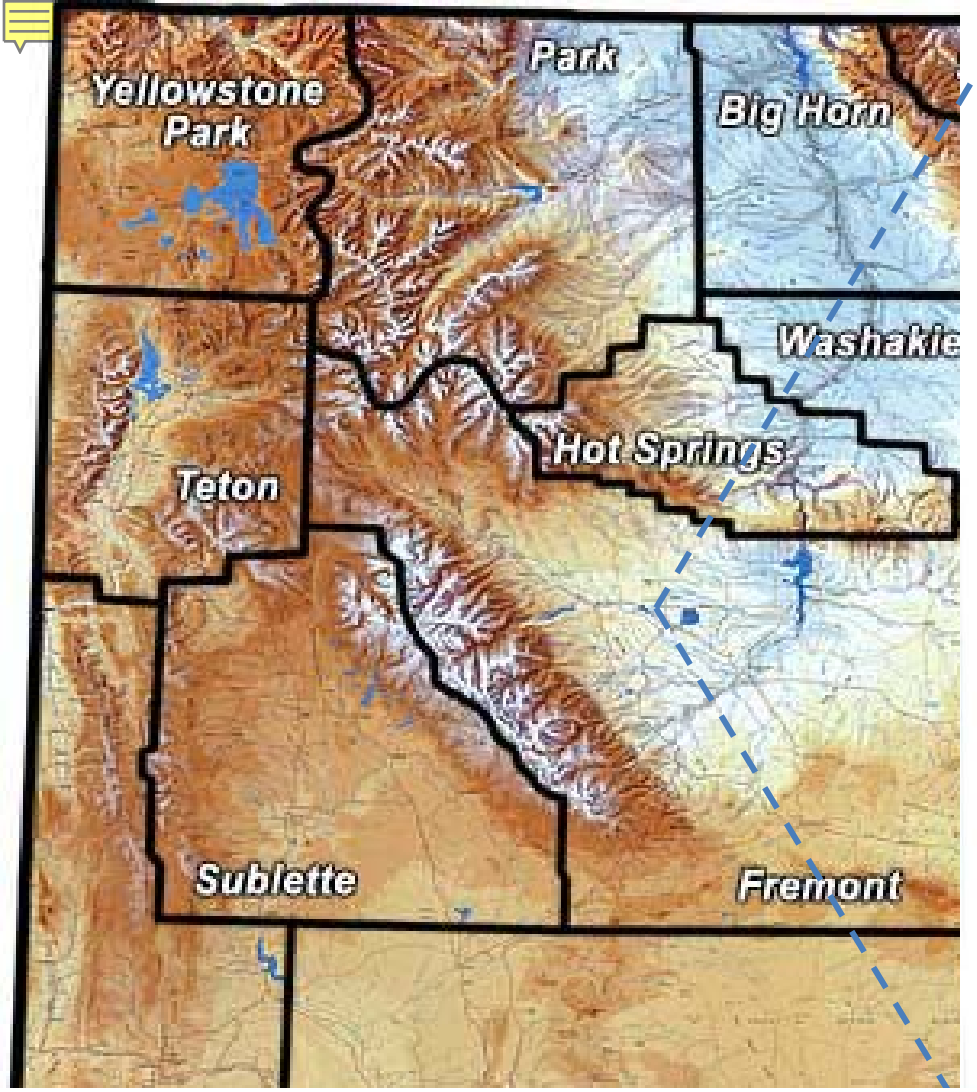
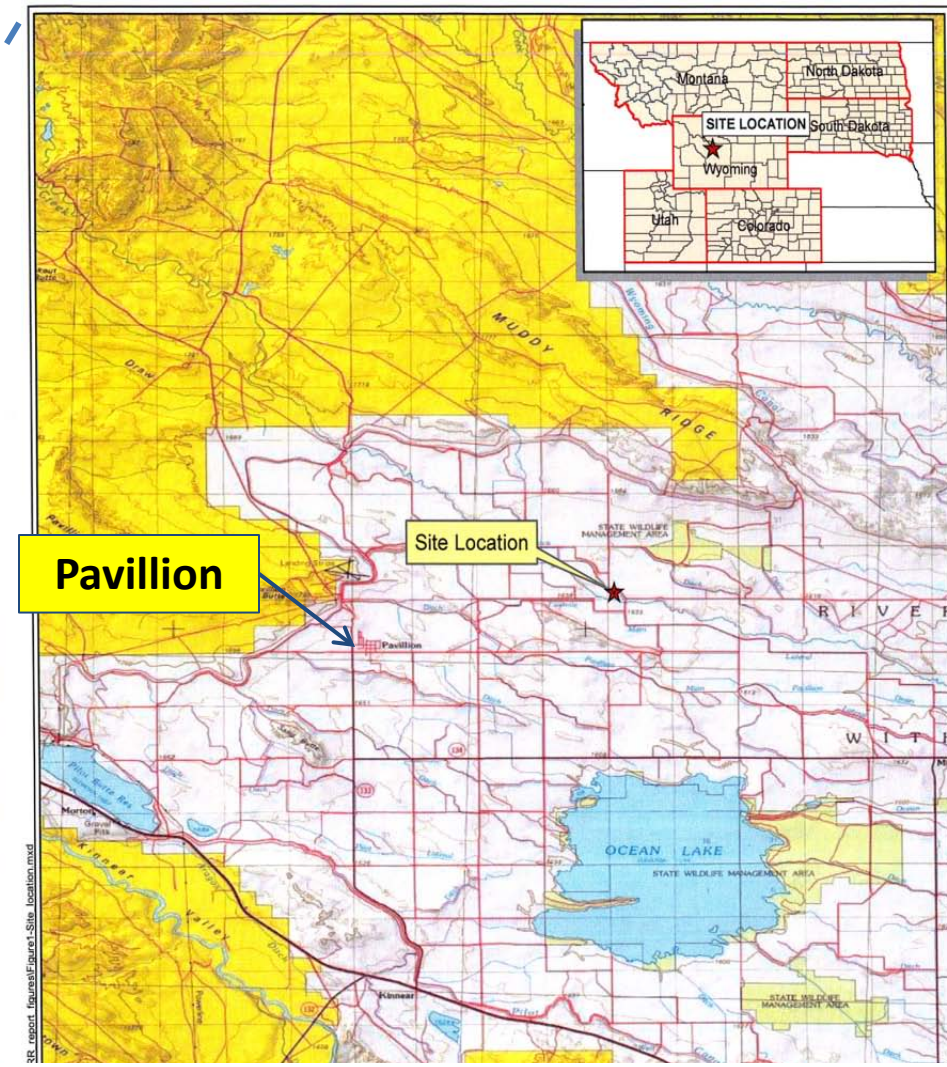




IOGCC Annual Meeting – Public Lands

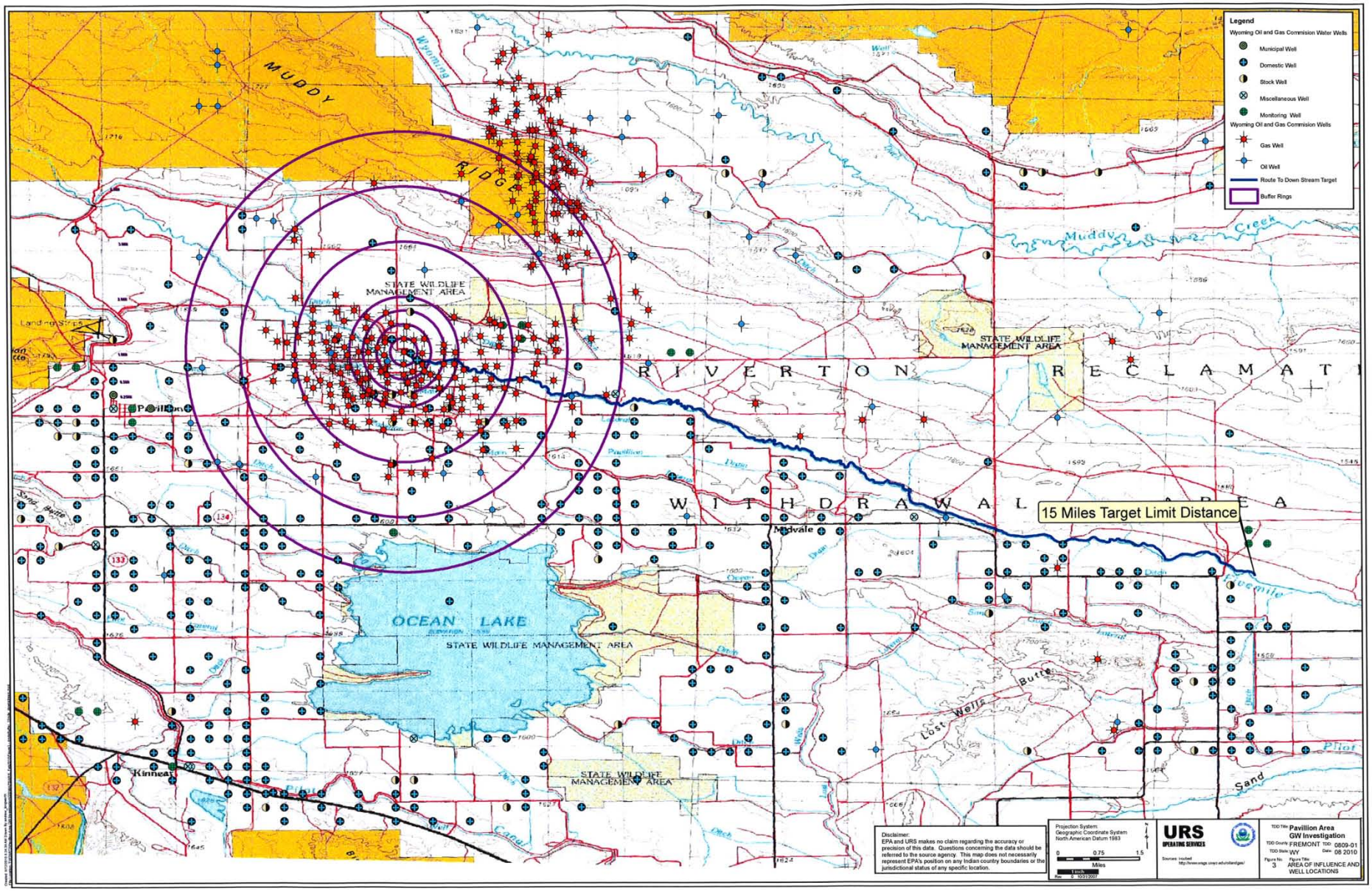
Tucson, Arizona November 16, 2010

Pavillion, Wyoming – A Perspective on the EPA Groundwater Testing Results

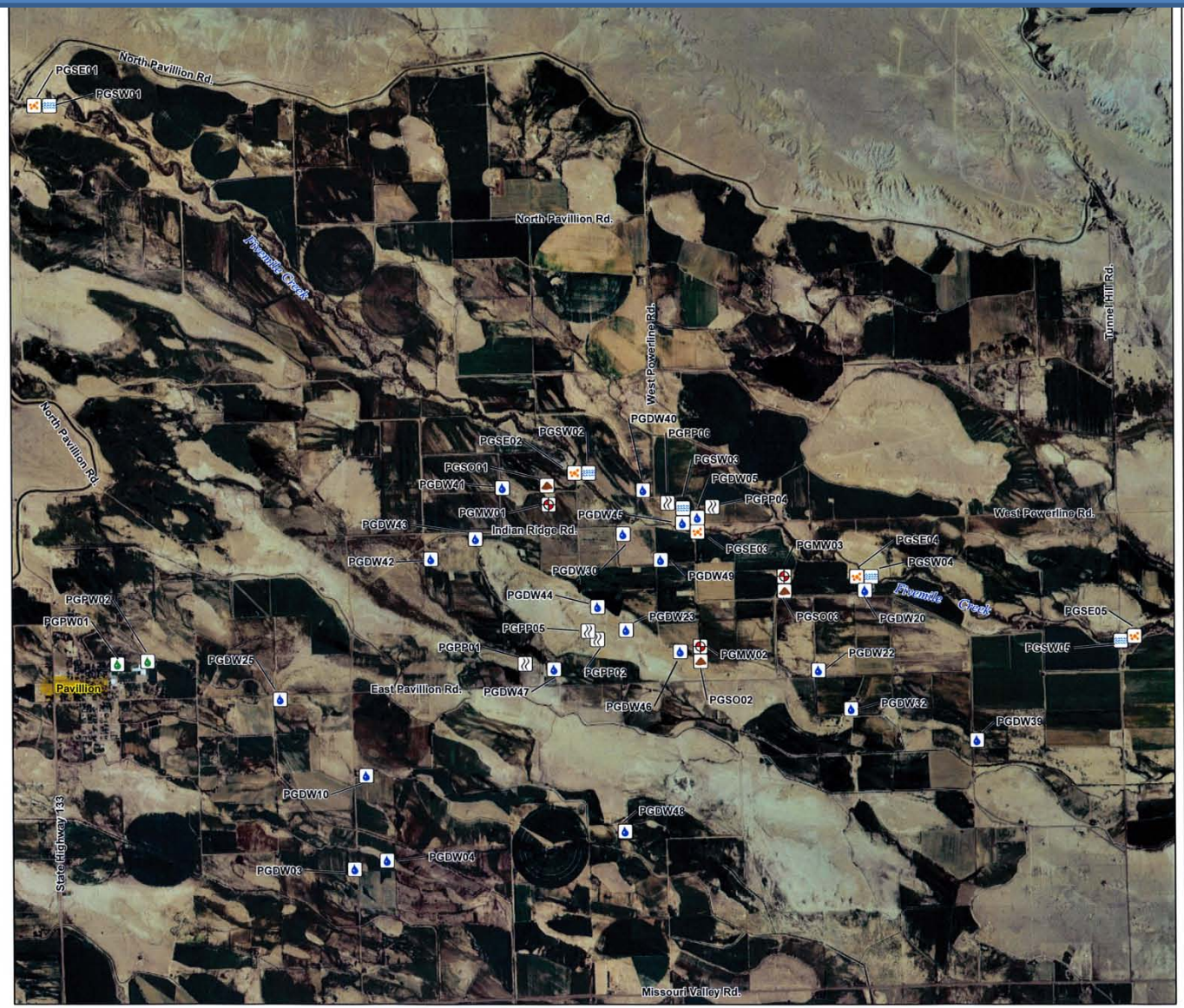
Thomas E. Doll
Wyoming State Oil and Gas Supervisor

Wyoming Oil and Gas Conservation Commission

Thomas E. Doll
State Oil and Gas Supervisor



In January, 2010 EPA tested 17 private wells, 4 stock/irrigation wells, 2 municipal wells, surface water and sediment from Five Mile Creek, 3 shallow groundwater monitoring wells and soils and production fluids from 4 natural gas well – 41 locations total, over 300 different constituents analyzed.



Pavillion Ground Water Investigation Phase 2 Sample Locations

Sample Locations

- Monitoring Well
- Domestic Well
- Public Well
- Surface Water
- Sediment
- Soil
- Gas/Product

0 0.5 1 Miles

0 0.5 1 Kilometers

N

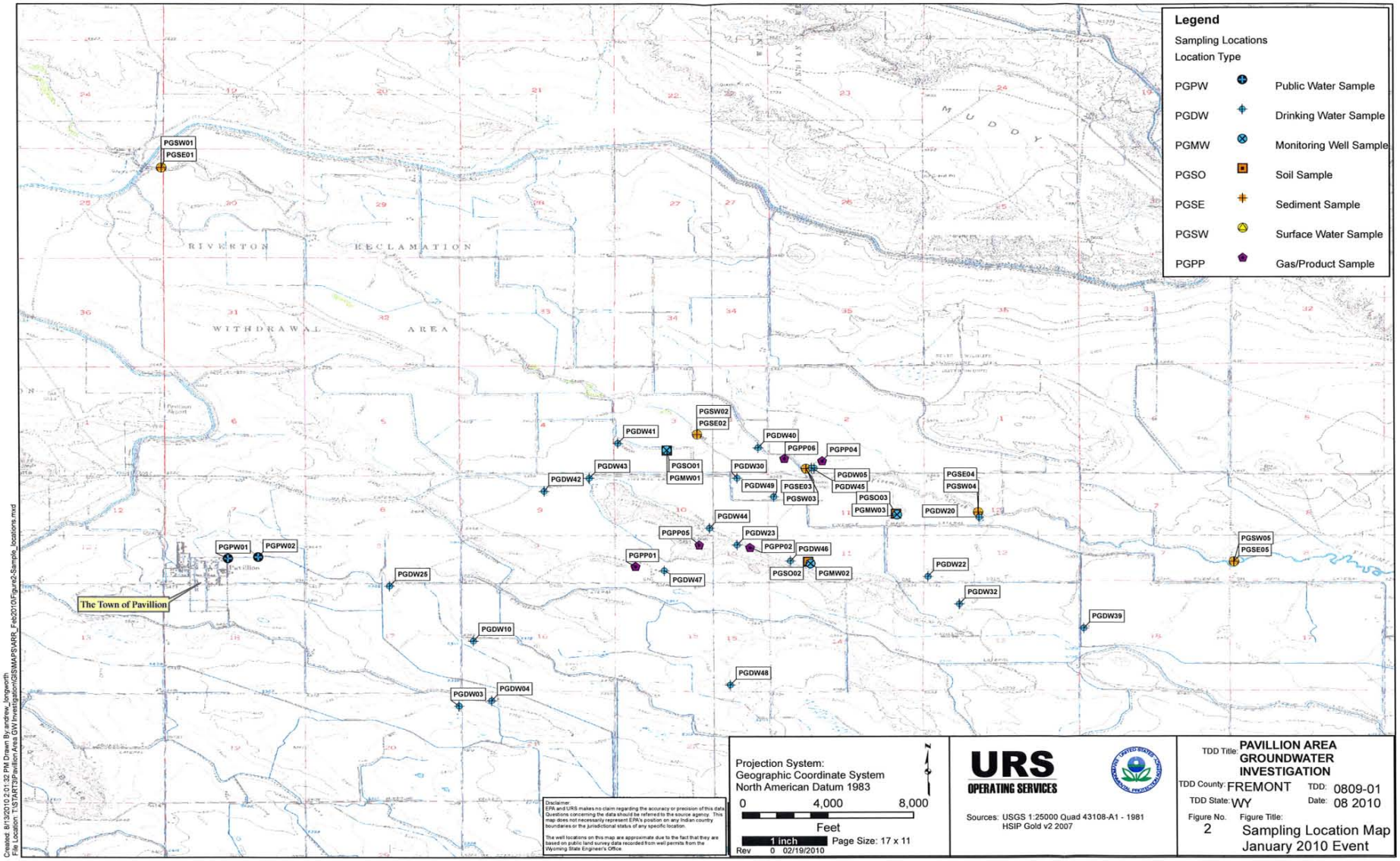
Date: April 14, 2010

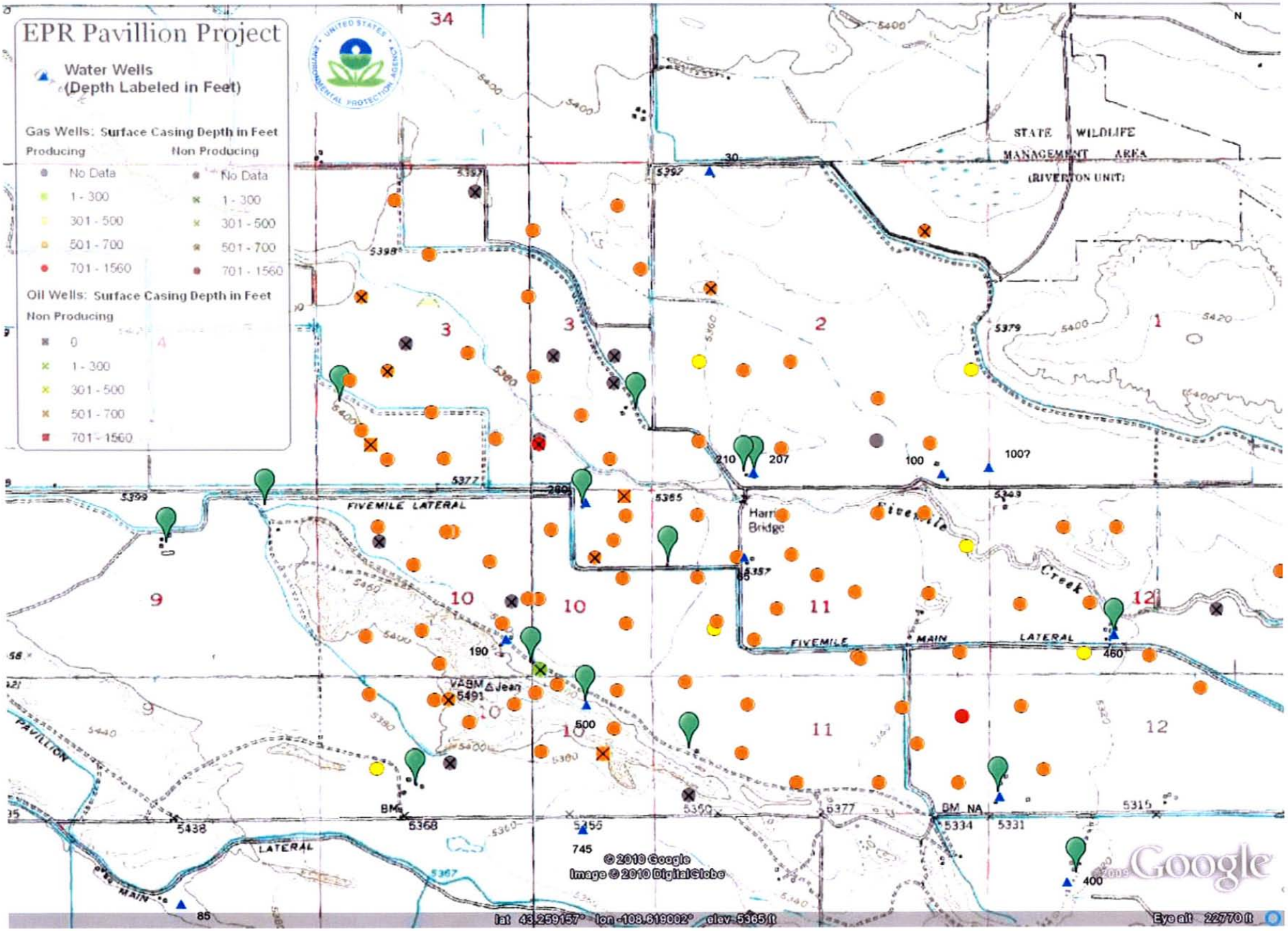
Map Projection: UTM, Meters, Zone 12N, NAD83

Data Sources: *Imagery* - Bing Maps webservice (2010); *Sample Locations* - UOS (2009).

Area Enlarged

In January, 2010 EPA tested 17 private wells, 4 stock/irrigation wells, 2 municipal wells, surface water and sediment from Five Mile Creek, 3 shallow groundwater monitoring wells and soils and production fluids from 4 natural gas well – 41 locations total, over 300 different constituents analyzed.




EPR Pavillion Project
Water Wells
(Depth Labeled in Feet)
Gas Wells: Surface Casing Depth in Feet
Producing
No Data
1 - 300
301 - 500
501 - 700
701 - 1560
Non Producing
No Data
1 - 300
301 - 500
501 - 700
701 - 1560
Oil Wells: Surface Casing Depth in Feet
Non Producing
0
1 - 300
301 - 500
501 - 700
701 - 1560
STATE WILDLIFE MANAGEMENT AREA
(RIVERTON UNIT)
FIVEMILE LATERAL
Harris Bridge
Fivemile Creek
FIVEMILE MAIN LATERAL
PAVILLION
LATERAL
© 2010 Google
Image © 2010 DigitalGlobe
Google
lat 43.259157° lon -108.619002° elev 5365 ft
Eye alt 22770 ft

Thomas E. Doll
State Oil and Gas
Supervisor

Findings Update August 31, 2010:

Drinking Water Wells

- 2 wells with exceedance in EPA primary drinking water standard – 1 with lead and phthalate , 1 with nitrate;
- 17 of 19 drinking water wells show detection of total petroleum hydrocarbon (naphthalene, phenols and methane);
- 7 drinking water wells had thermogenic methane and 1 well had biogenic methane;
- Without more information on flow direction and contaminant movement, uncertainty exists regarding future impacts to drinking water wells. Sample results reflect a single snapshot in time and EPA cannot identify trends or changes in condition.

Findings August 31, 2010 (continued):

Private Wells

- Inorganic constituents found in both domestic and monitoring wells include sodium, sulfates, and magnesium with 4 pesticides found in 4 private wells;
- 11 wells confirmed March 2009 sampling results of tris 2-butoxythanol phoshate (2 BE-P or TBEP) less than 5 ppb (TBEP is used as a plasticizer);
- 4 wells confirmed March 2009 sampling results of adamantane at low concentrations (commonly associated with hydrocarbon production fluids and other products such as Simple Green).

Findings August 31, 2010 (continued):

Monitoring Wells

- EPA's analysis of samples taken from monitoring wells in Pavillion indicates high levels of petroleum compounds such as benzene, xylene, methylcyclohexane, naphthalene, and phenol. This shallow groundwater is hydrologically connected to the drinking water aquifer. Wyoming Department of Environmental Quality and EnCana, the primary natural gas producer in the area, have recognized this contamination and through the Voluntary Remediation Program have been working to clean-up three reserve pits located in close proximity to shallow water supply wells.

Thomas E. Doll
State Oil and Gas
Supervisor

Findings Update August 31, 2010 (continued):

EPA Conclusions:

- EPA has not reached any conclusions about how constituents of concern are occurring in domestic wells.

The Agency for Toxic Substances and Disease Registry (ATSDR), a federal agency of the U. S. Department of Health and Human Services, worked closely with EPA Region 8 and state agencies since 2009 to examine potential health effects from contaminated groundwater and well water in Pavillion. ATSDR examined EPA data and made the following health recommendations.

Findings August 31, 2010 (continued):

ATSDR Conclusions:

- These recommendations are based on several factors, including chemicals found in the well water, the possibility of further contamination from nearby groundwater, and the lack of health information for some of the compounds found. The samples reflect a single snapshot in time and cannot provide a picture of well water quality over time.

Thomas E. Doll
State Oil and Gas
Supervisor

Findings August 31, 2010 (continued):

ATSDR Health Recommendations:

- People who are using private well water should use other water for cooking and drinking. Inorganic constituents in the water including sodium, magnesium, iron, selenium, sulfate, and nitrates could cause health effects. Petroleum hydrocarbons, which are not usually found in drinking water, were found in many wells.
- People whose wells contain methane should take specific precautions.

Scientists do not believe there is enough methane in well water to cause health problems or explosions.

Thomas E. Doll
State Oil and Gas
Supervisor

Pavillion Area Water Quality

Reality: Always has been poor quality water

- High Total Dissolved Solids
- High Sulfate in 17 of 41 wells (rotten egg odor, WHO: 400 mg/L maximum contaminant level, range 175 to 3,640mg/L)
- High alkalinity
- High Sodium in 17 of 41 wells (>200 mg/L or 100 times the EPA upper limit, concern for those with sodium-restricted diets)
- High Concentrations of Bacteria in 5 wells: 1 sulfate reducing, 2 iron-reducing and 2 natural non-specific

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State Oil and Gas
Supervisor

2-TBE Phosphate

- Detected in 11 Drinking Water Wells
- EPA and USGS studies cite that this constituent is found frequently all over the world and in areas that do not have oil and gas operations
- These studies suggest that 2-TBE Phosphate "is a common constituent of rubber gaskets and washers and can be introduced into water from components in the tap used for sampling." WHO, 2000.
- Extremely low concentrations detected (range 0.55 to 2.1 micrograms per liter)
- EPA has ruled out other plasticizer agents as cause for concern; EPA paper cites that 2-TBE Phosphate is biodegradable

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Supervisor

Adamantane

- Detected in 3 Drinking Water Wells ranging 0.21 to 0.30 micrograms/liter (no EPA maximum contaminant level threshold)
- One of the three wells with detection also had high methane
- Extremely low concentrations found in very few wells
- Adamantane is used in hydraulic cylinder as hydraulic pump fluids as found in use on tractor power takeoffs, backhoe, loader, fork lifts, etc.
- ATSDR states "health effects associated with drinking "adamantanes" in the Pavillion area are not likely to be associated with adverse health effects."

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Supervisor

WOGCC Review of Surface Casing Set Depths

- In the 9 Section area of concern, 147 natural gas wellbores were reviewed (Sec 1, 2, 3, 10, 11, 12, 13, 14, 15 T3N R2E, Fremont Co. WY)
- 102 were completed as producing natural gas wells
- 102 or 100 % of the natural gas wells had surface casing set and cement circulated to surface
- 1 producing natural gas well was found to have surface casing set at a depth less than the total depth of the offset water supply well
- The offset water supply well was sampled by EPA and found to have components that included TPH, methane, ethane, sulfates and sodium
- 93 or 91.2% of the natural gas wells had production casing cement circulated from TD to the surface or into the surface casing
- Only 9 or 8.8% of the natural gas wells had production casing cement that did not circulate to the base of the surface casing

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Supervisor

Pavillion Area Water Supply Study Requested by Governor Freudenthal

September 10, 2010

Governor Dave Freudenthal has instructed the Wyoming Water Development Commission, WWDC, to conduct a study to identify long-term solutions to the water supply problems in the Pavillion area. Mike Purcell, director of the Wyoming Water Development Program, said public meetings will be held in the area to develop potential long-term solutions. The WWDC will retain a consultant to complete the Pavillion water study and define alternative solutions, develop cost estimates, and identify the most feasible solution for area residents.

Thomas E. Doll
State Oil and Gas
Supervisor

Pavillion Area Water Supply Study Requested by Governor Freudenthal

September 10, 2010 (continued):

After a preferred alternative is selected, conceptual designs, cost estimates, and financing plans will be developed for consideration by the water users. A public hearing will be held to discuss and receive input on the results of the study. John Corra, director of the Wyoming Department of Environmental Quality, said efforts to identify the sources of contamination will continue and remediation will be implemented as appropriate. The preliminary time line is: study begins December 2010, alternative screening completed July 2011, study finalized by December 1, 2011 for the 2012 Legislative Session.

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Why does Pavillion continue to garner media attention?

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