H2S Occurrences
San Juan Basin

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Hydrogen Sulfide: Issues and Answers Workshop
December 7, 2005
San Juan College Henderson Fine Arts Center Room 9008  8am-4pm
1) Went before San Juan Basin Working Committee and requested that operators submit the data in a useable format to build data base. Chairman distributed the request

2) Wrote some official requests to operators
Purpose

- Is the same as Onshore order #6
- Protect public health and safety and those personnel essential for maintenance
- BLM wants to build a data base to track occurrences & construct maps
- Last time BLM requested data was back in Jan. 1998
- BLM would like concentrations as low as 10 ppm
- Type data: Concentration and date measured
  Well name and number – API number- legal location
Questions

1) How many wells? What areas affected? And what is the geographic extent?

2) What type of wells have H2S? What producing formations contain H2S. What is the range?

3) Has man introduced SRB to the San Juan Basin or have they always been present in the formations?

4) What are the controls (geologic) on H2S occurrences in the San Juan Basin?
Operator Reported History SJB

- 1998  (201 wells reported H2S from 11 operators)
  - Tabular list of wells by location

- 2005  (376 wells H2S from 11 operators)
  - Spreadsheet with GIS mapping
  - approx 50-60% were the same wells -mostly producers
  - some were P&A and not reported again
  - some were just not reported by operator as containing H2S again
  - Enterprise-gas gather did supply some data

- Not the whole picture - Missing smaller operators in SJB
  - Not all wells with H2S have been reported
  - Missing Ute Mountain Ute-Barker Dome-Hogback-Jicarilla
  - 75-90% (good estimate)  Ask for your participation in gathering data
Observations

- Spreadsheet
- Maps

Go to Excel spreadsheet
3 layers - on gardwells-roads-geology
Number of H2S Wells by Company

<table>
<thead>
<tr>
<th>Company</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConocoPhil</td>
<td>93</td>
</tr>
<tr>
<td>Black Hills</td>
<td>69</td>
</tr>
<tr>
<td>BP America</td>
<td>65</td>
</tr>
<tr>
<td>Burlington R</td>
<td>60</td>
</tr>
<tr>
<td>XTO</td>
<td>24</td>
</tr>
<tr>
<td>Dugan</td>
<td>22</td>
</tr>
<tr>
<td>DJSimmons</td>
<td>20</td>
</tr>
<tr>
<td>Pogo Prod</td>
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</tr>
<tr>
<td>Bayless</td>
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<tr>
<td>Patina</td>
<td>1</td>
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<td>Devon E</td>
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</tbody>
</table>
Murphy D #2 Well- A report of 1200+ ppm in Shut-in well now P&A

- 3 miles out of Aztec and within 300' of a major highway (550) between Aztec and Bloomfield

- 9:30-Moved on to the location and the Safety man opened up the well and registered zero H2S at the well head. Moved in with the A-Plus rig and began rigging up the equipment. Blew down about 30 lbs of gas to atmosphere with zero H2S detected. 11:30 began nipple up. 1:25-TIH with wire line and Retainer. Detected 400 PPM which bled down to 100 PPM by the time we reached 2217' and set the CIBP there with no problems.
Onshore Order #6

- Effective Jan 1991
- Address requirements for conducting operations in H2S environment
- Operating requirements for conducting drilling, completion, workover, and production in H2S
- Describes required Public Protection Plan
- Any release of potentially hazardous volume must be reported in 24 hrs to BLM (authorized officer)
Onshore Order #6

Potentially hazardous volume defined - as H2S concentration & flow rate that it may result in a radius of exposure of 100 ppm at any occupied residence, school, church, park, bus stop, place of business or other area where the public could reasonably be expected to frequent or 500 ppm at road or highway (Federal, State, or municipal).
Operator Reported History Paradox SE Utah

- 1998 - 58 facilities from 6 operators
  - Aneth-White Mesa-Ratherford-McElmo Creek-Ismay Units
  - Storage tank volumes 10,000-16,000 ppm
  - Gas stream volumes 2,000-9,550 ppm

- 2005 - 60 facilities in just Aneth Unit from Chevron-Texaco
  - Wells, headers & tank batteries
  - Gas stream volumes mostly range from 1100-8260 ppm
Conclusions
Controls on H2S occurrences in San Juan Basin

- General scattering of wells with H2S in the center of basin with a distinct trend.
- Isolated areas that are formation specific example Black Hills - Ojo Alamo and Dugan FC wells on west side of basin.
- All formations Not limited to specific producing formation FC, PC, Chacra, MV or DK
- All operators are involved if your lease is located in a known area
- H2S wells trend to the northwest