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FROM DAVE DILLON  
RPK 11/6/08

**ExxonMobil**

# Piceance Drill Cuttings Injection

## *First Cuttings Injection in Colorado:*

### *Dec 07 – March 08 Pilot Project*

# SUMMARY

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## **Pilot Project goals**

- Evaluate feasibility of drill cuttings injection at Piceance
- Evaluate use of produced water in drilling fluid for intermediate and production holes
- Use proven technology

## **Potential Benefits**

- Reduce freshwater usage by 80% with field-wide implementation
- Reduce freshwater hauling truck loads by 80%
- Elimination of drill cuttings pits, pad footprint reduction

## **Technical Results**

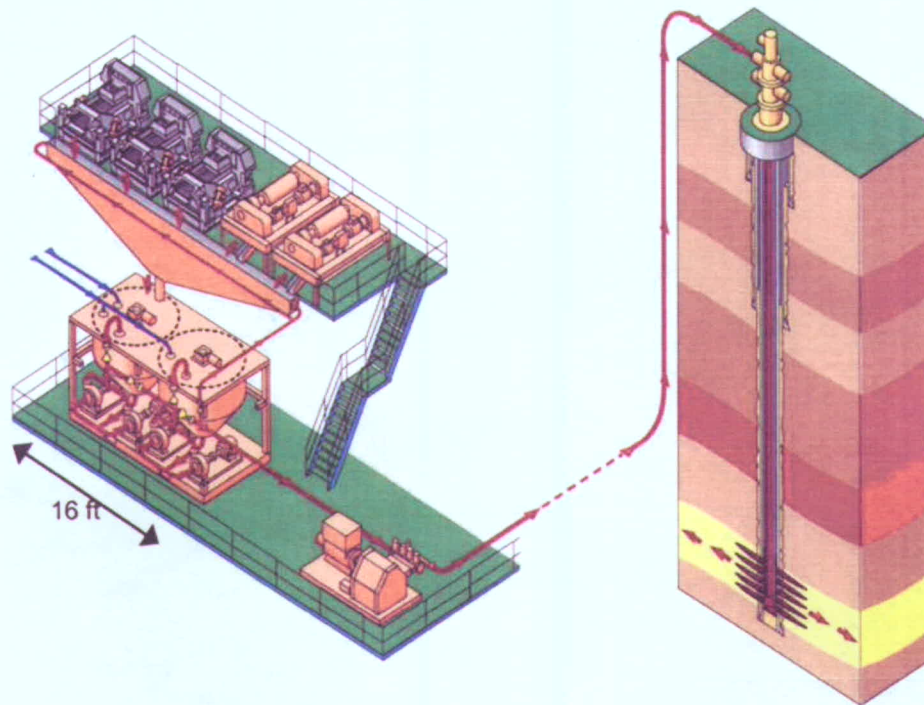
- Demonstrated technical feasibility of drill cuttings injection at Piceance
- Confirmed feasibility of using produced water in drilling fluid
- Injected cuttings were confined to the Wasatch G injection zone
- Low surface injection pressure into drawn-down Wasatch G ? WAS PRODUCED FOR 40 YEARS /
- Consumed 38,000 bbls of produced water for cuttings slurrification HERITAGE MOBILE PRODUCED
- Consumed additional 77,000 bbls in drilling fluid 175,000 Bbls USED SO FAR

## **Economic Evaluation**

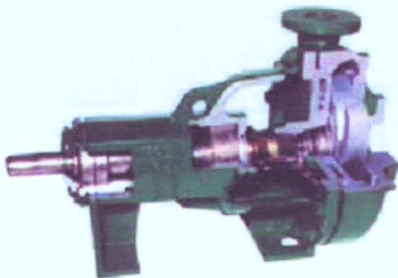
- Cost prohibitive for single pad site disposal case
- Evaluate technical, economic, and regulatory aspects of centralized injection facility to service multiple pads

# Drill Cuttings Grinding for Injection

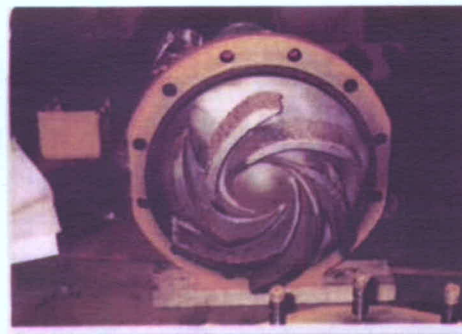
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- Cuttings fall into tank, produced water added
- Centrifugal pumps circulate and grind
- Pump slurry to second tank via classifying shaker
- Oversize pieces sent back to grinding tank
- Slurry sent to storage tank or injection pump

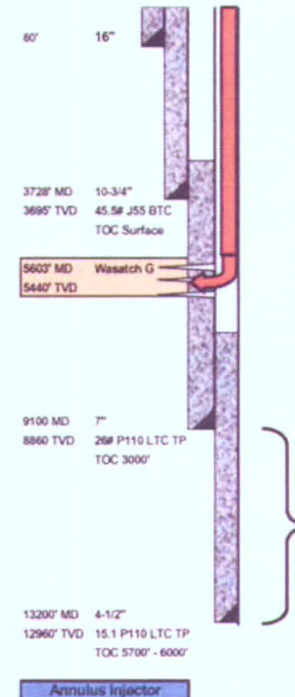
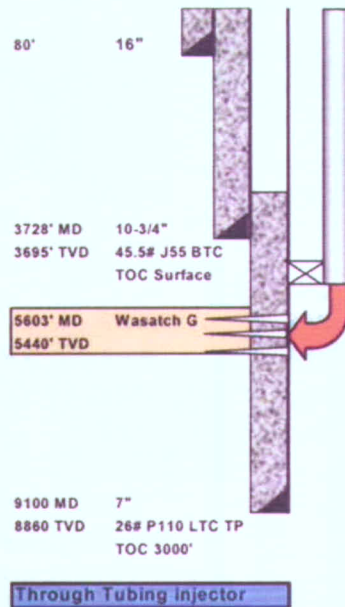


Piceance Drill Cuttings Injection



# Original Piceance Cuttings Injection Proposal

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## Original Scope:

- Drill first intermediate section, suspend as injector
- Inject cuttings from next 4 wells
- Recover injector
- Continue as annulus injector for pit cuttings and produced water

## Proposed Well Geometry:

- Through tubing cuttings slurry injection
- Recover tubing, drill well to TD
- Use production annulus for water injection



## Approved Piceance Drill Cuttings Injection Well and Scope

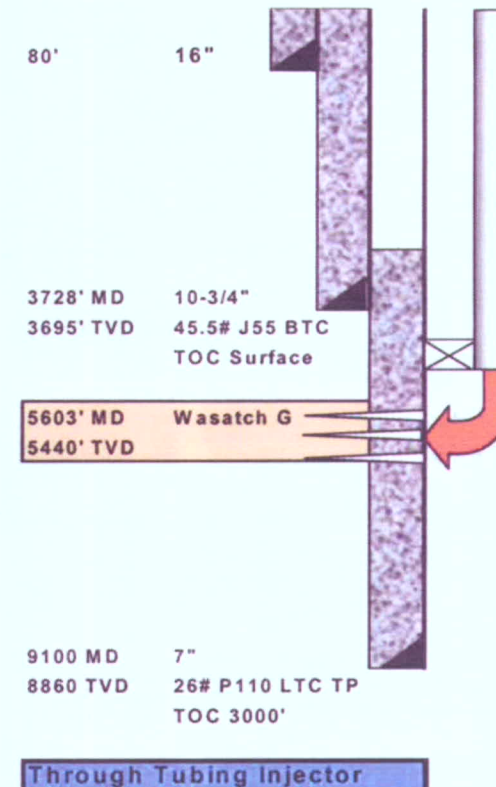
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### Permitted Well Geometry:

- Slurry injection must be through tubing to facilitate Mechanical Integrity Testing (MIT)
- Recover tubing, seal perforations
- Drill well to TD
- Annulus injection not permitted

### Revised Scope:

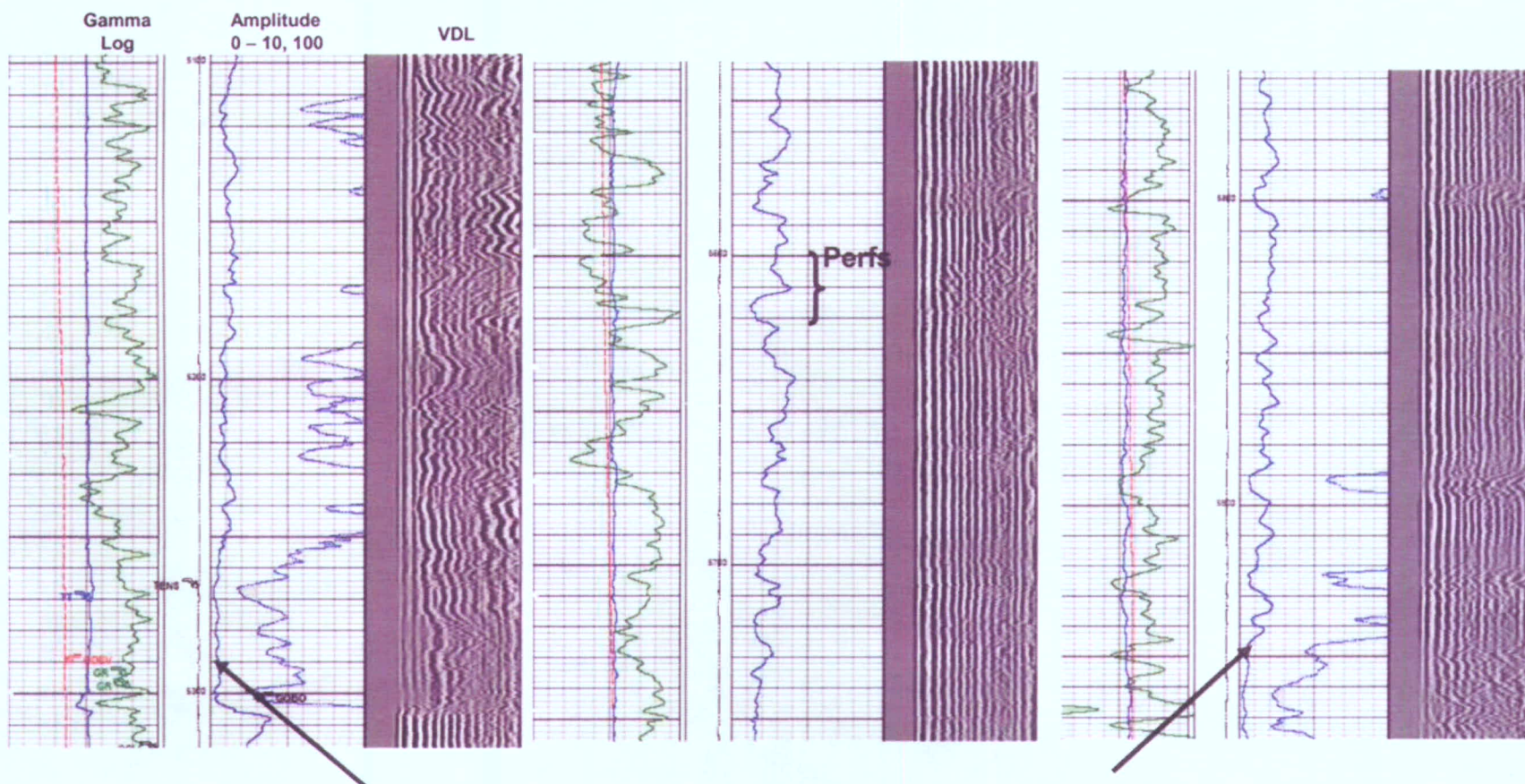
- Grind and inject cuttings from 4 wells
- Recover injector, seal perfs, drill to TD
- Cuttings from last production hole to cuttings pit



*HAD TO RUN A CASING PATCH TO SEAL ANNULUS.  
COULD NOT SQUEEZE*

# CBL Logging to Evaluate Zone Isolation

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Excellent cement bonding above and below injection zone

Higher amplitude across from lost circulation/injection zone

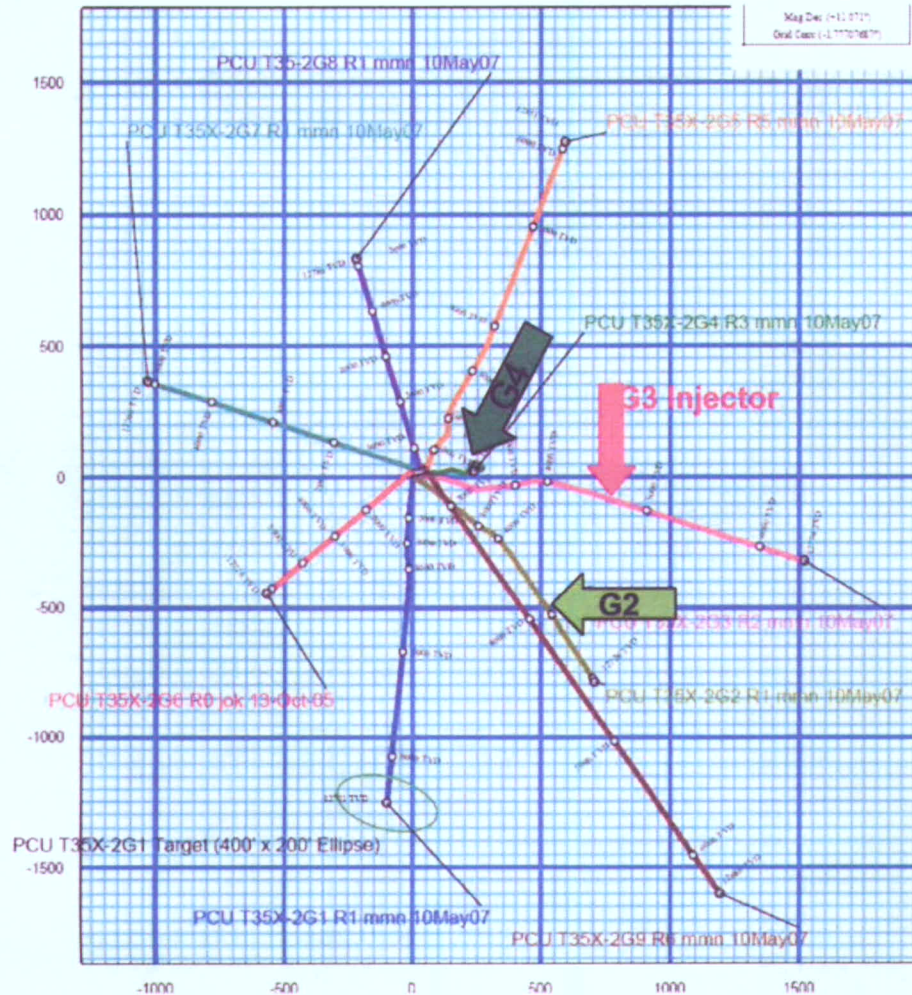
Perforate lost returns zone in sand, 5600 – 5610 ft (lost returns @ 5607 ft)

Fresh water aquifer above 1000 ft

Piceance Drill Cuttings Injection



# Injector Location Pad T35X-2G



- No noticeable effect during drilling offset wells
- G2 closest drilling offset, 675 ft at injection depth
- G4 closest well in projected direction of fracture (105° NW), 975 ft

# Drill Cuttings Processing with Winterized Grinding Unit **ExxonMobil**



Commence Injection: 12/03/07

Demob Injection: 3/24/08

Permitted Volume: 1,560,000 bbls

Final Injection Volumes, bbls:

Cuttings Slurry	9,460
Prod Water Flushes	31,010
Drilling Fluid	1,680
Total	42,150

900 PSI  
FRICTION  
ONLY  
@ Start w

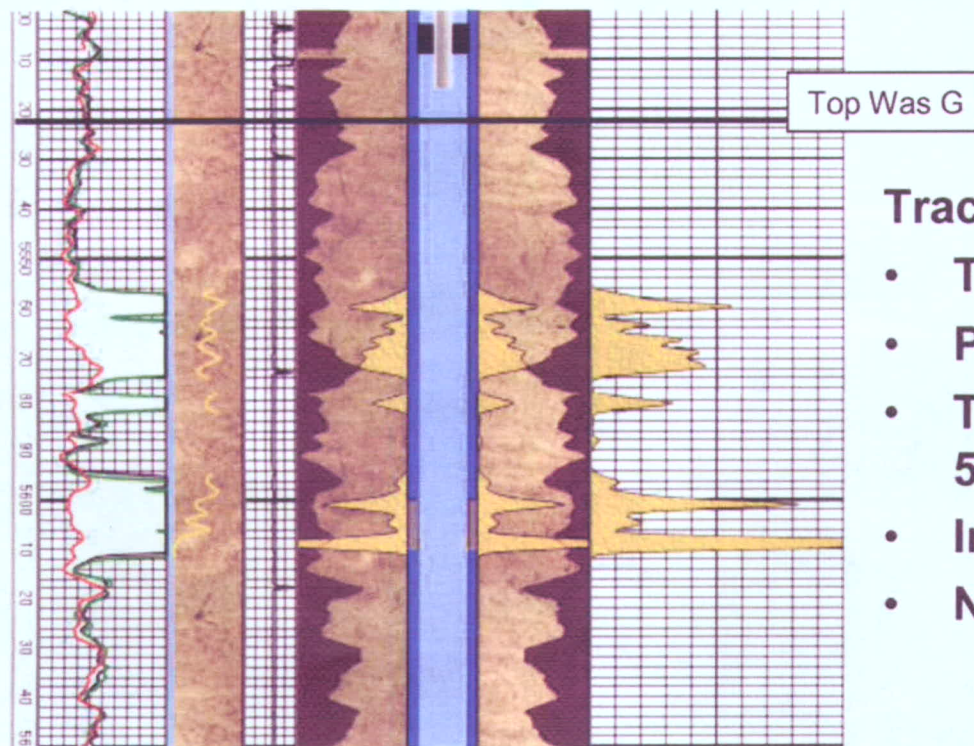


## Total Produced Water Consumption at T35X-2G Pad **ExxonMobil**

- Produced water consumed for cuttings injection: 38,000 bbls
- Produced water consumed in drilling fluid for 5 wells: 77,000 bbls
- Total produced water consumed at pad T35X-2G: 115,000 bbls
- *Avoided consuming 77,000 bbls fresh water*

## Low Level Radioactive Tracer Survey Shows Confinement to Wasatch G

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### Tracer logging results:

- Tracer in 50 bbls slurry *AT END OF PROGRAM*
- Perfs 5,600 – 5,610 ft MD
- Top of Wasatch G 5,522 ft, bottom 5,837 ft
- Injection fracture 5555 - 5610 ft
- No migration out of Wasatch G

# Learnings

## **Successes**

- Piceance drill cuttings can be ground with centrifugal pumps; auxiliary grinding not needed
- The Wasatch G accepted slurry and produced water on vacuum with no indication of pressure buildup
- No noticeable effect on other pad drilling wells
- Augers and equipment functioned even near 0°F
- Constant functioning with produced water prevented system freezing

## **Improvement Opportunities**

- Cost prohibitive for single pad sites (5 - 7 times cost of burial)
- Had to bury cuttings from production hole of last well
- Still needed cuttings pit



# Forward Plans for Expanded Pilot Project



- **One injector on a central pad**
  - Primarily a disposal well (produced water + cuttings)
  - Intermittently accept slurry from multiple pads
  - Transport to central location via truck, slurrify at central injector
  - Propose injection well at 297-13A6
- **Regulatory requirements**
  - BLM approval to move cuttings within field
  - Approval for 297-13A6 injection completion *500 BPH loss zone*
- **Potential future benefits**
  - Elimination of drill cuttings pit
  - Elimination of surface treatment for mud and cuttings prior to burial

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 Upcoming Cuttings Source Pad

 PW Source Pad