

# Delaware Basin Stratigraphic Column

| System        | Delaware Basin          |                      |
|---------------|-------------------------|----------------------|
| Permian       |                         | Dewey Lake           |
|               |                         | Rustler              |
|               |                         | Salado               |
|               |                         | Castile              |
|               |                         | Lamar                |
|               |                         | Bell Canyon          |
|               |                         | Cherry Canyon        |
|               |                         | Brushy Canyon        |
|               | Delaware Mountain Group |                      |
|               |                         | Avalon Shale         |
| Pennsylvanian | Bone Spring             |                      |
|               |                         | 1st Bone Spring Sand |
|               |                         | 2nd Bone Spring Sand |
|               |                         | 3rd Bone Spring Sand |
|               |                         | Wolfcamp             |
|               |                         | Cisco                |
|               |                         | Canyon               |
|               |                         | Strawn               |
|               |                         | Atoka                |
|               |                         | Morrow               |

4616 TVD

Blue Quail 1 injection interval-- 4640-4850

5520 TVD

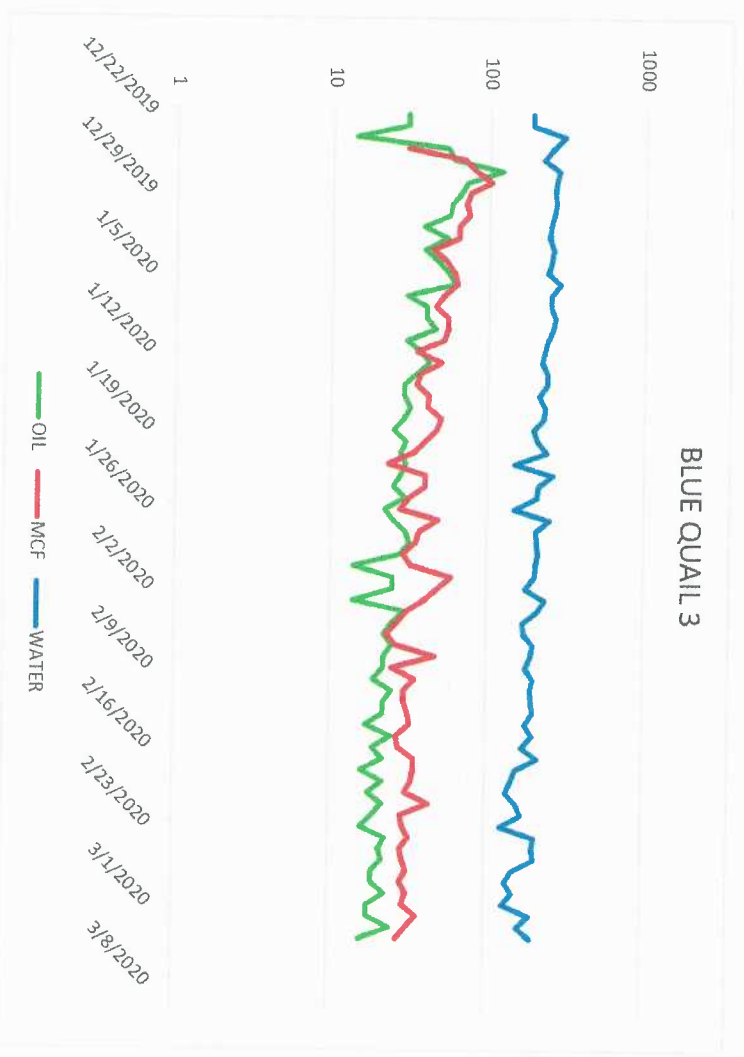
8251 TVD

Top of Devon rights-- 8540

Column taken from [murchisonoil.com](http://murchisonoil.com)  
 Back-checked for accuracy with the strat column published  
 by the SEPM Society for Sedimentary Geology  
[www.sepmstrata.org/](http://www.sepmstrata.org/)

# Prevent Waste

- Blue Quail 3 recompletion
  - Economic production of 25 BOPD, 200 BWPD. EUR of 35 MBO
  - Need for additional water disposal to perform up to 10 more recompletions, preventing waste of 350 MBO.
- Drilling a disposal well to 16,000 would not be economically feasible and would preclude further recompletions and cause waste.



# Blue Quail 1 Delaware Recompletion 36 MBO before lost to well issues at 20 BOPD

## Summary

Producing Entity: COM  
Reservoir: DELAWARE, EAST  
District:  
Lease: BLUE QUAIL FEDERAL  
Latest Well Count: 1  
Max Active Wells: 1  
First Prod: 07-01-2013

Last Prod: 04-01-2018  
Months Producing: 56  
Cum Oil: 36,433  
Cum Gas: 38,614  
Peak Oil: 2,195  
Peak Gas: 2,385

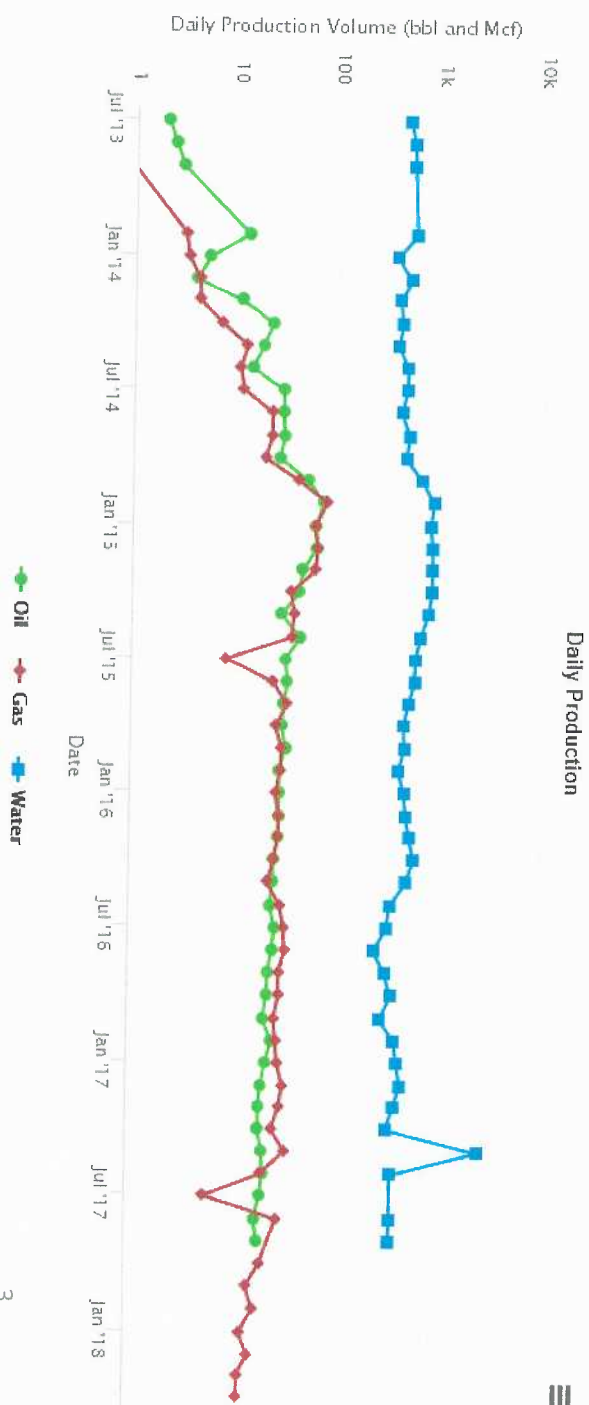
Daily Gas: 36,433  
Oil EUR: 38,614  
Gas EUR: 38,614  
Oil Gatherer: PLAINS MARKETING L.P.  
Gas Gatherer: DCP OPERATING COMPANY, LP

| Completion Date | API            | Reservoir      | Producing Entity |
|-----------------|----------------|----------------|------------------|
| 05-22-2013      | 30025332220000 | DELAWARE, EAST | COM              |
| 01-26-1996      | 30025332220000 | BONE SPRING    | COM              |

Select Production to View

## Chart

Chart Type: Daily Production



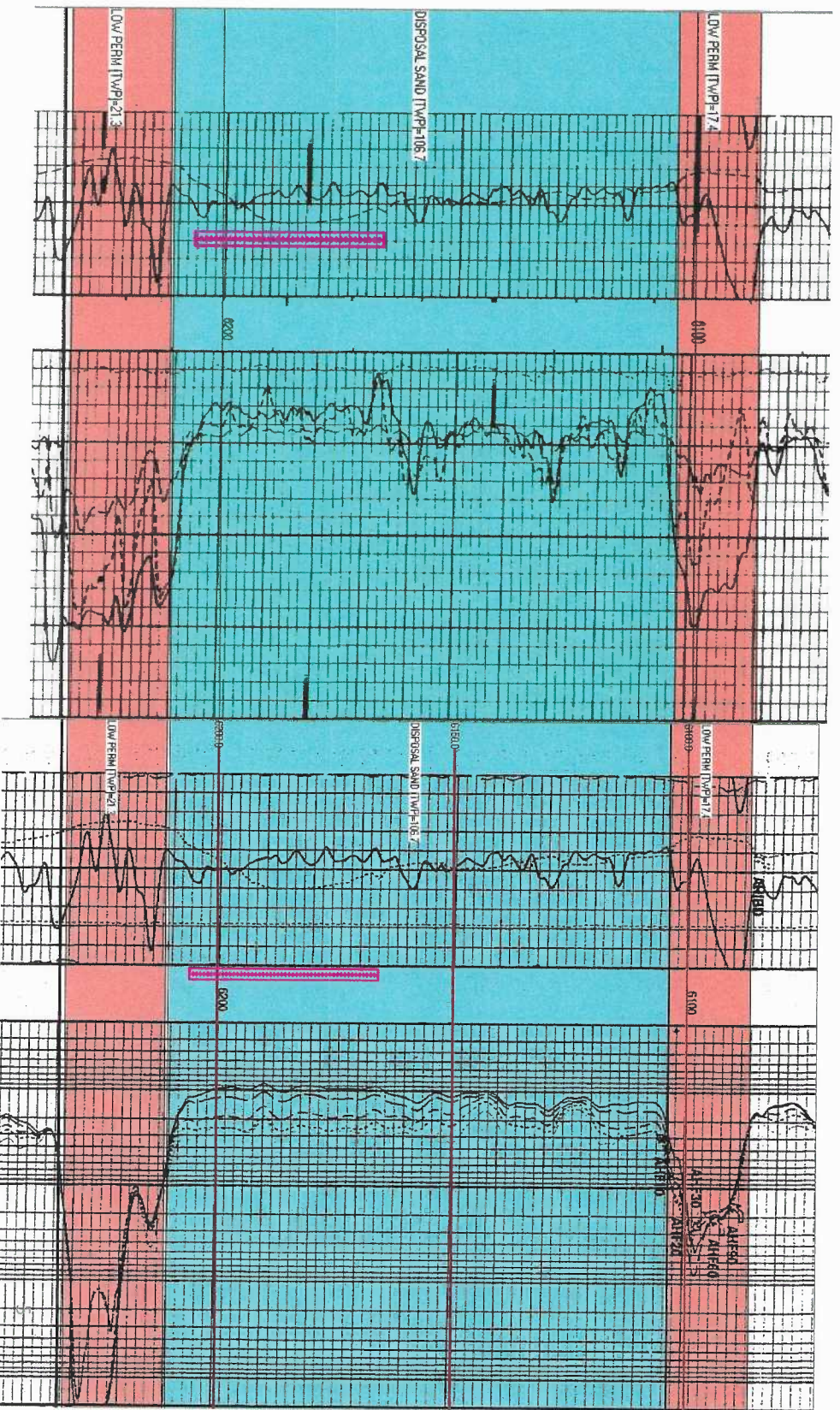


# Bitsy SWD Cherry Canyon disposal sand

Perm barrier  
Less than 0.2 mD

50-100 mD  
Based on offset CMR  
log

Perm barrier  
Less than 0.2 mD



# Section 7 Avalon Production—Sharbro Federal 10

No water influx from offset Cherry Canyon water disposal after 3.25 million barrels injected

| Time Frame   | Production |          |             |          |
|--------------|------------|----------|-------------|----------|
|              | Oil(BBLs)  | Gas(Mcf) | Water(BBLs) | Days P/I |
| 2011         | 654        | 5022     | 84          | 30       |
| 2012         | 3993       | 47514    | 178         | 355      |
| 2013         | 1745       | 36807    | 90          | 254      |
| 2014         | 1500       | 27332    | 123         | 306      |
| 2015         | 1384       | 15472    | 47          | 316      |
| 2016         | 1387       | 15212    | 230         | 363      |
| 2017         | 1112       | 14486    | 19          | 365      |
| 2018         | 998        | 10469    | 0           | 356      |
| 2019         | 1170       | 8656     | 2258        | 365      |
| Grand Total: | 13943      | 180970   | 3029        | 2710     |

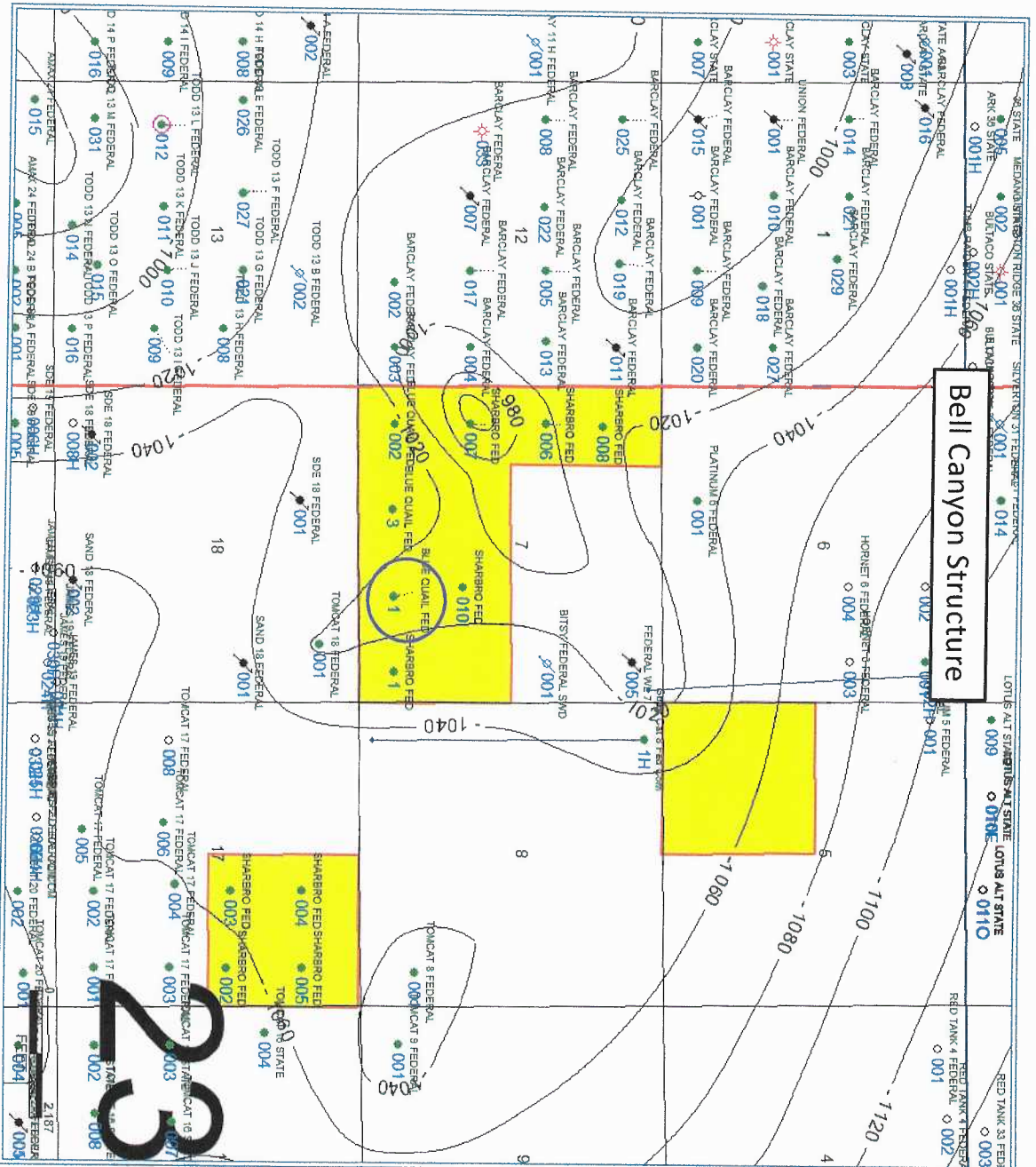


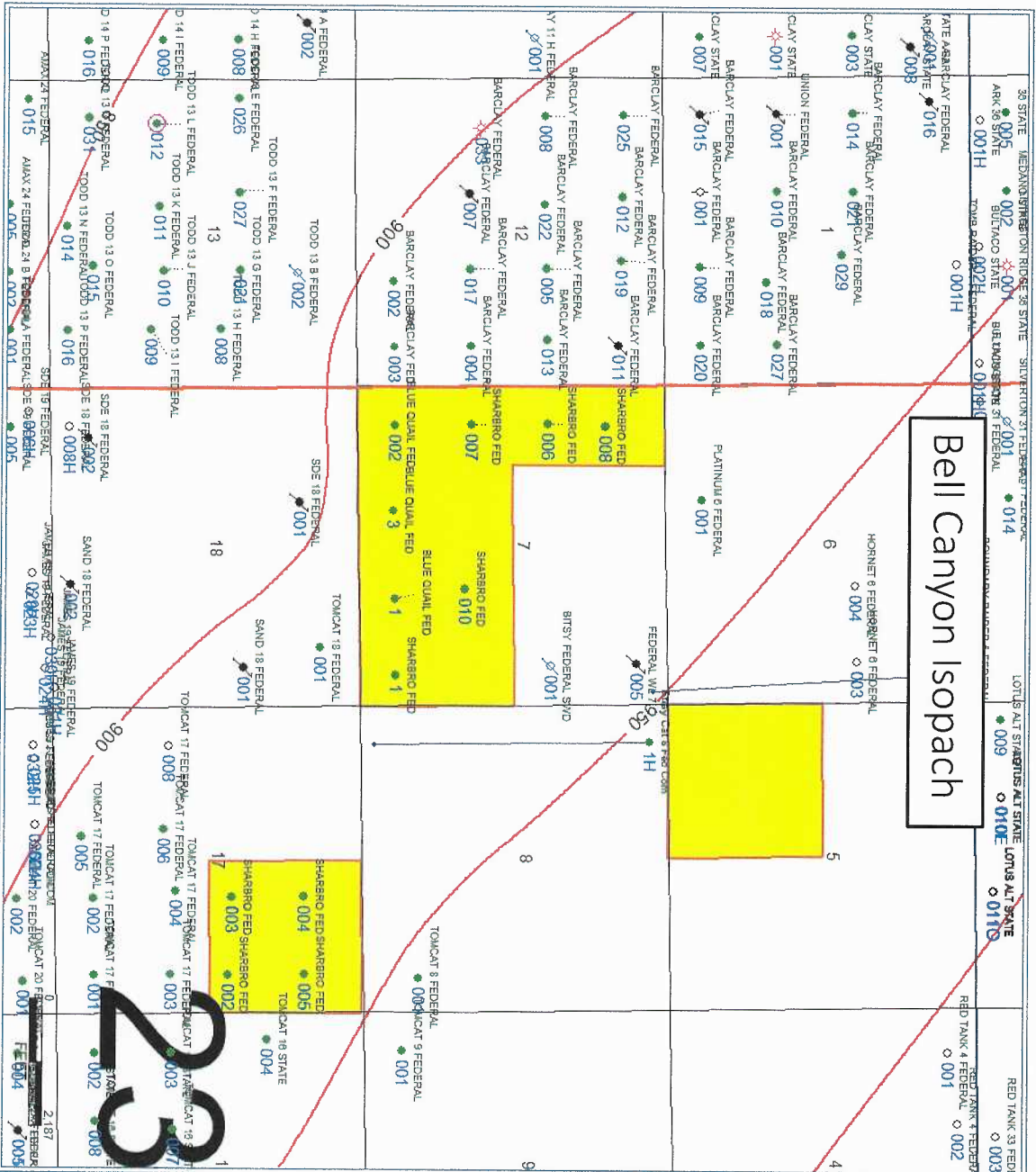
# Section 7 Avalon Production—Blue Quail 3

No water influx from offset Cherry Canyon water disposal after 3.25 million barrels injected

| Time Frame   | Production |          |              |
|--------------|------------|----------|--------------|
|              | Oil(BBL/S) | Gas(MCF) | Water(BBL/S) |
| 2010         | 704        | 0        | 1062         |
| 2011         | 4992       | 59109    | 828          |
| 2012         | 2458       | 47803    | 242          |
| 2013         | 1832       | 35099    | 140          |
| 2014         | 1527       | 25230    | 90           |
| 2015         | 766        | 14960    | 2            |
| 2016         | 709        | 15027    | 0            |
| 2017         | 570        | 13621    | 0            |
| 2018         | 524        | 10778    | 0            |
| 2019         | 790        | 8146     | 0            |
| Grand Total: | 14872      | 229773   | 2364         |



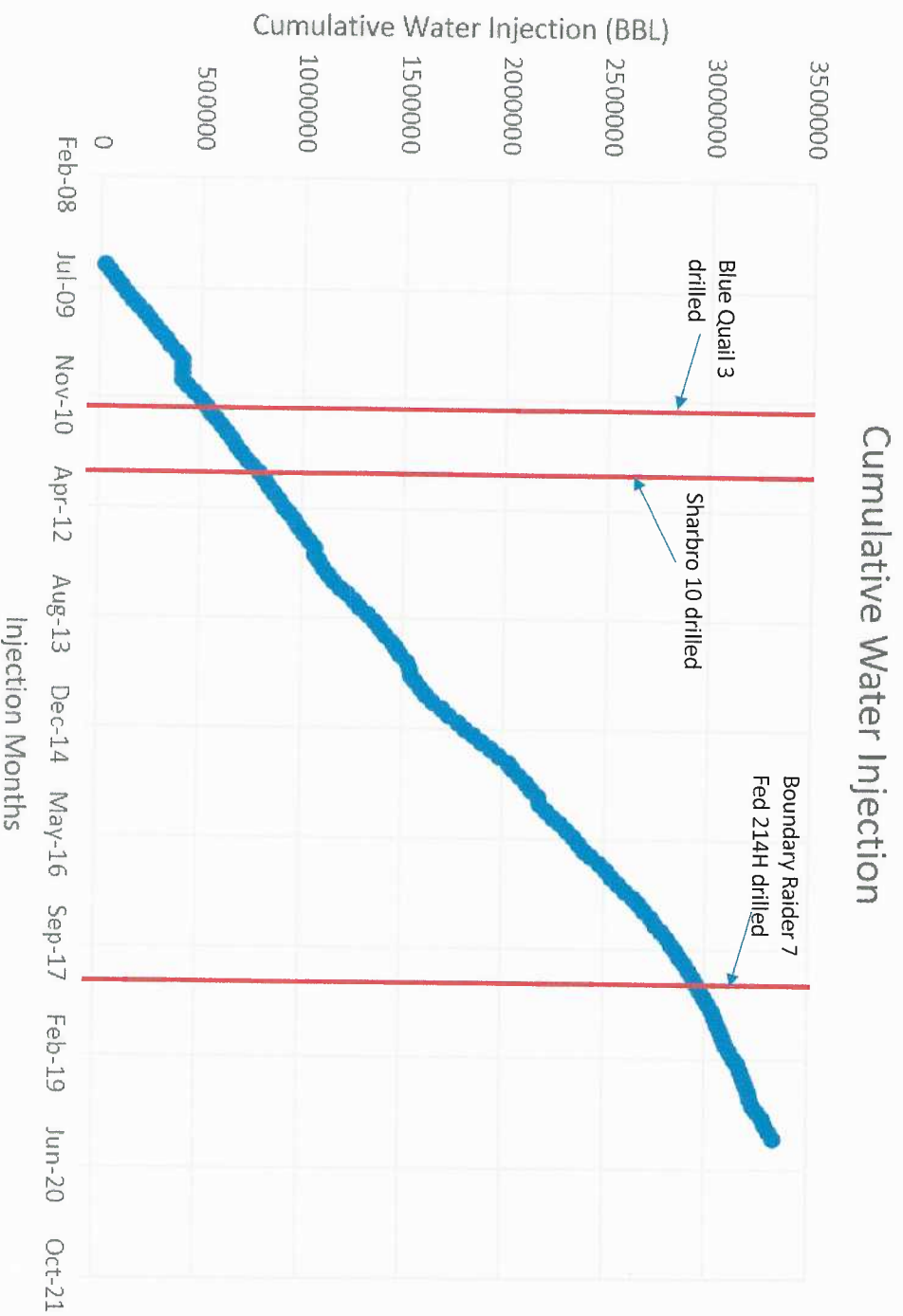




## Bitsy 1 Water Disposal

- The Sharbro 10 is the nearest producer to the Bitsy 1 SWD, which disposes into the Cherry Canyon. (1972 ft away)
  - There were no complications reported in the Sharbro 10 drilling reports as it drilled through the disposal zone, even though 716,000 barrels had already been injected at the time of drilling.
- Devon was able to drill the Boundary Raider 7 Fed 214H after 3 Million barrels of water had been disposed of into the Cherry Canyon in the Bitsy 1 SWD (1915 feet away)

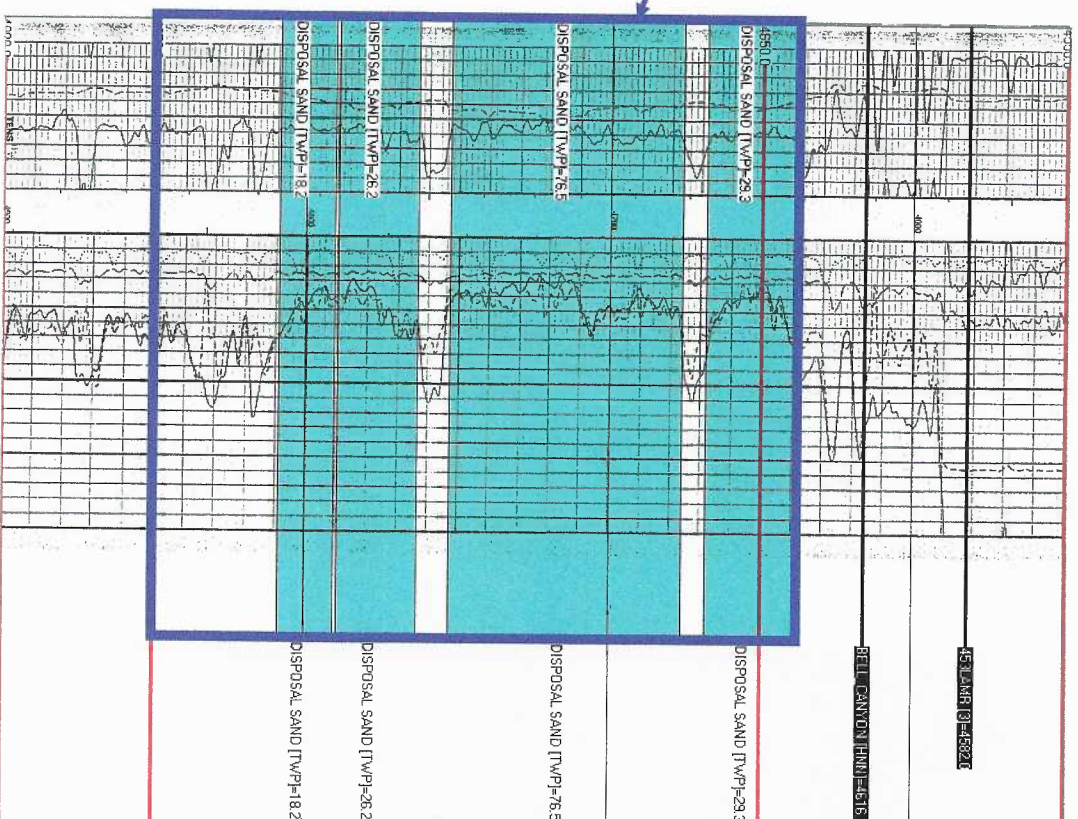
# Bitsy 1 Cumulative Water Disposal





# Blue Quail 1 neutron density log

Injection interval



# WCDSC Permian NM

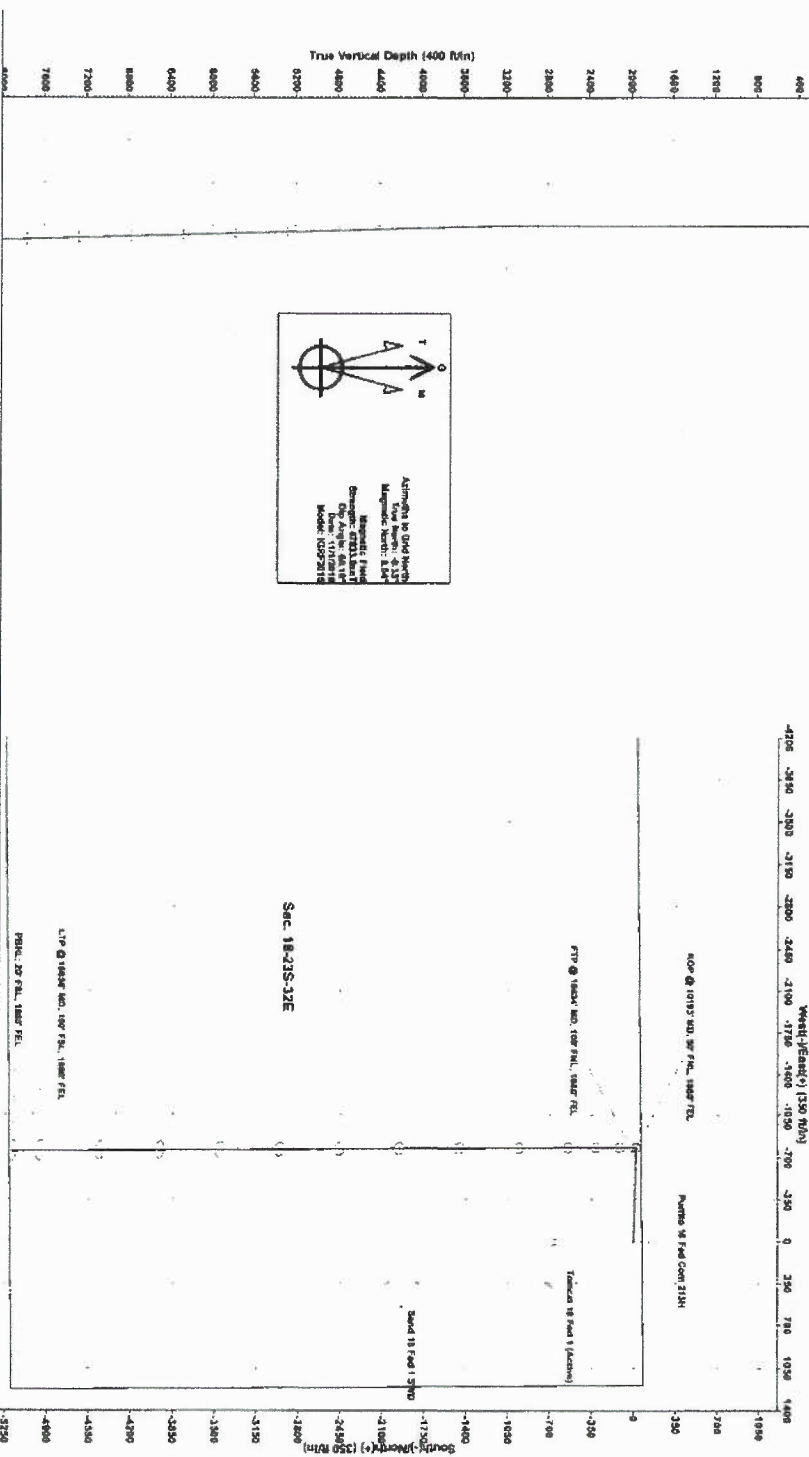
WELL DETAILS: Purrito 18 Fed Com 213H

Wellhead  
3570 90  
Easting  
734185.24  
Northing  
477540.28  
Latitude  
32.311562  
Longitude  
-103.105092

SECTION DETAILS Permit Plan 1

| MD       | Inc   | Azi    | TVD      | +N/S     | +E/W    | Diag  | VSect   | Amplitude                          |
|----------|-------|--------|----------|----------|---------|-------|---------|------------------------------------|
| 0.00     | 0.00  | 0.00   | 0.00     | 0.00     | 0.00    | 0.00  | 0.00    |                                    |
| 2750.00  | 0.00  | 0.00   | 2750.00  | 0.00     | 0.00    | 0.00  | 0.00    |                                    |
| 2844.12  | 0.00  | 0.00   | 2844.12  | 0.00     | 0.00    | 0.00  | 0.00    |                                    |
| 8382.21  | 6.81  | 271.53 | 8337.37  | 20.36    | -756.26 | 0.00  | 87.87   |                                    |
| 8842.96  | 0.00  | 0.00   | 8797.00  | 21.00    | -794.00 | 1.50  | 91.20   | KOP @ 10187 MD, 50' FNL, 1800' FEL |
| 10193.00 | 0.00  | 0.00   | 10147.04 | 21.00    | -794.00 | 0.00  | 91.20   | KOP @ 10187 MD, 50' FNL, 1800' FEL |
| 11093.00 | 90.00 | 178.62 | 10720.00 | -551.95  | -780.23 | 10.00 | 637.73  |                                    |
| 15735.88 | 90.00 | 179.62 | 10720.00 | -5194.12 | -749.67 | 0.00  | 5246.54 | PBHL: 20' FSL, 1800' FEL           |

Purrito 18 Fed Com 213H directional plat





# Injection pressure distribution

- We used the reservoir pressure distribution equation to calculate the reservoir pressure at various distances away from the injector based on the bottom hole injection pressure.
- The Sharbro 10 was drilled 2,000' away from the Bitsy SWD which had injected ~700,000 stb of water before the Sharbro 10 was drilled. No reports of increased pressure at the Sharbro 10 were found. Using the pressure distribution equation, and assuming the Bitsy SWD was injecting at a max allowable surface pressure of 900 psi surface pressure and 885 BWP, it formulated no pressure increase would have been seen from the Bitsy to the Sharbro 10.
- Using the reservoir pressure distribution equation to estimate the increase in reservoir pressure at the Devon new drill 697' away if we are injecting at max permitted injection pressure and rate into the proposed Blue Quail #1 SWD, it formulates that a typical drilling overbalance program will have adequate pressure to contain the increase in reservoir pressure from injection.

# FORMULA USED TO FIND PRESSURE ANY DISTANCE AWAY FROM BLUE QUAIL #1

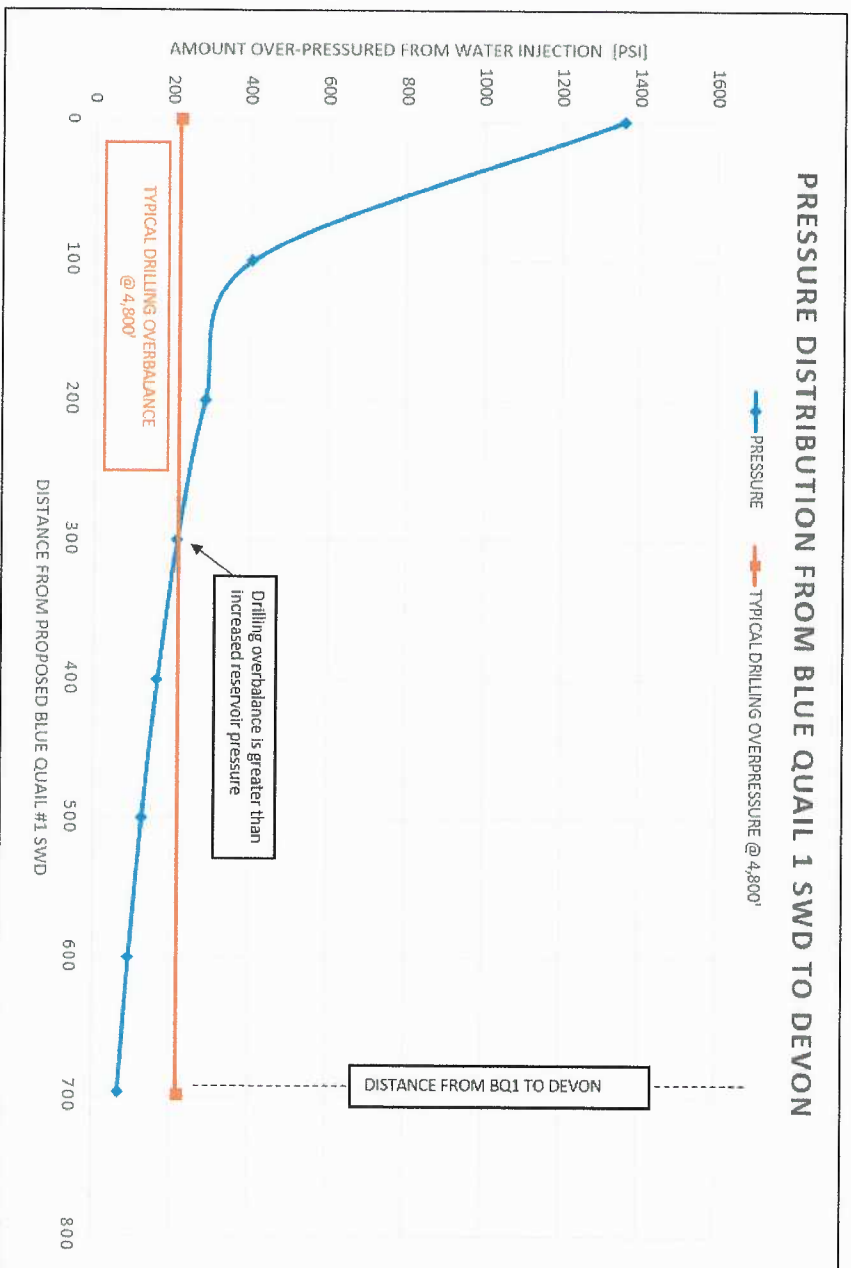
$$P = P_{wi} - \frac{141.2 i_w \mu_w}{k_w h} \left[ \ln \left( \frac{r}{r_w} \right) + S_i \right]$$

| Variable        | Description                    | Value     | Assumption                                                   |
|-----------------|--------------------------------|-----------|--------------------------------------------------------------|
| P <sub>wi</sub> | Bottom Hole Injection Pressure | 3436 psi  | Surface inj pressure = 938 psi, 10.16 ppg water, 4,800' deep |
| i <sub>w</sub>  | Injection rate                 | 1500 bwpd | Max allowable inj rate on permit                             |
| k <sub>w</sub>  | Water Perm                     | 10 md     | From log                                                     |
| s <sub>i</sub>  | Skin Factor                    | 0         |                                                              |
| μ <sub>w</sub>  | Water Viscosity                | 1.23 cp   | From correlation                                             |
| h               | Thickness of sand              | 150 ft    | Assume we perf all 3 sands                                   |
| r <sub>w</sub>  | Wellbore radius                | 0.4125 ft | 5-1/2" casing                                                |
| r               | Distance away from Injector    | 697 ft    | Distance from BQ 1 to Devon new drill                        |
| P               | Pressure at radius 'r'         | 2145 psi  |                                                              |

## WHAT WILL BE THE PRESSURE AT THE DEVON WELL IN THE BELL CANYON DURING DRILLING?

### ASSUMPTIONS:

- RADIAL FLOW
- PSEUDO STEADY STATE CONDITION
- BQ 1 IS INJECTING AT 938 PSI AND 1500 BWPD IN THE BELL CANYON SAND DURING THE TIME THE DEVON WELL IS DRILLED



THE ABOVE GRAPH SHOWS THAT THE RESERVOIR PRESSURE WILL BE LESS THAN NORMAL DRILLING OVERBALANCE AFTER 300' AWAY FROM THE BQ #1