

# **PS Reservoir Characterization of the Uteland Butte Formation in the Uinta Basin\***

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## **Abstract**

Following recent success of horizontal drilling, the Uteland Butte Member has received much attention as a horizontal target. The Uteland Butte is known as the basal carbonate of the Green River Formation. The Uteland Butte Member covers a majority of the Uinta Basin. The Uteland Butte, is correlative, has good reservoir properties and is located in an established oil and gas field. Under Bill Barrett Corporation's (BBG) acreage, the main target is a dolomite comprised of 10% quartz, 25% calcite, 63% dolomite and 2% total clay. The dolomite has an average porosity of 20% and the permeability averages 0.076 md based on core samples. The interval ranges in thickness from three to eight feet across the basin being the thickest towards the center of the basin. The over and underlying rock is comprised mostly of highly fractured limestone, which contains oil and gas as well. The fracture count in surrounding rock can be as high as 14 fractures per three feet. This fracture network in combination with the reservoir properties has made the Uteland Butte an attractive target to operators in the basin. BBG, Newfield Exploration (NFX), LINN Energy (LINE) and QEP Resources (QEP) are the most active in the basin. Like other unconventional horizontal targets, the Uteland Butte member has 'sweet spots'. Areas with thicker dolomite and higher temperature and pressure regimes tend to be the most successful. A few operators in the basin have applied for 1,280-acre drilling units, which will enhance the exploitation of the resource.



## Introduction

The Uteland Butte member of the Green River formation marks the transition from a fluvial dominated system to a predominately lacustrine system in the depositional history of the Uinta Basin (Figure 1). The Uteland Butte, also called the Basal Carbonate of the Green River formation, is Eocene in age (51ma). The Uteland Butte is easily identified and correlated across many townships in the center of the basin. The Uteland Butte is comprised of limestone, marlstone and dolostone and has been a vertical exploitation target for decades. Operators such as Bill Barrett Corporation (BBC), Berry Petroleum, Newfield Exploration, QEP Resources, and Anadarko have begun to test the Uteland Butte with horizontal wells (Figure 3). BBC has drilled eleven 640 acre wells targeting the Uteland Butte interval. The average estimated ultimate recovery of these wells is 200 thousand barrels of oil equivalent (MBOE) with a range from 286MBOE to 123MBOE. Newfield Exploration started testing in the Natural Buttes field and is now exploring to the north in their central basin acreage. The Uteland Butte is normally pressured in Natural Buttes but is over pressured in the central basin (Figure 7). Newfield Exploration has drilled thirty seven 640 acre wells and three 1280 acre tests (Figures 3 and 4). According to IHS production data, Newfield's wells in the central basin have the highest per well cumulative oil production with BBC coming in second among all operators (Figure 8). In the south, QEP's acreage contains a Uteland Butte interval with greater dolomite content but the reservoir is normally pressured. Ultimate recoveries will help determine the role of reservoir pressure in well performance.

The Uteland Butte member of the Green River formation covers a majority of the Uinta Basin (Figures 2-7). The Uteland Butte is correlative, has good reservoir properties and is located in an established oil and gas field (Figures 5-9 and 11-12). The horizontal target is a cherty dolomitic limestone comprised of 10% quartz, 25% calcite, 63% dolomite and 2% total clay in BBC's acreage (Figure 12). The dolomite averages 20% porosity and 0.076 md permeability based on core analysis (Figure 12). The interval ranges in thickness from 3' to 6' with the thickest section on the western and southern parts of the Uteland Butte horizontal play (Figure 10). The horizontal target thins toward the central part of the basin but consists of multiple dolomitic intervals (Figures 11 and 12). In addition to dolomite content, the central play shows higher resistivity (Figure 6). Like other unconventional horizontal targets the Uteland Butte member appears to have 'sweet spots'. The central part of the Uteland Butte play is the main 'sweet spot' and has the greatest dolomite thickness, thickness of high resistivity reservoir and an elevated pressure gradient (Figure 5-9). Adjacent to the dolomite are highly fractured limestones which are also charged. The fracture count in these surrounding rocks can be as high as 56 vertical fractures per foot. These fracture networks, in combination with favorable reservoir properties have made the Uteland Butte an attractive target to operators in the basin. Areas with thicker dolomite packages and greater pressure regimes will likely be the sweet spots in the play. (Figure 6-9 and 12).

## Type Log and Horizontal Activity

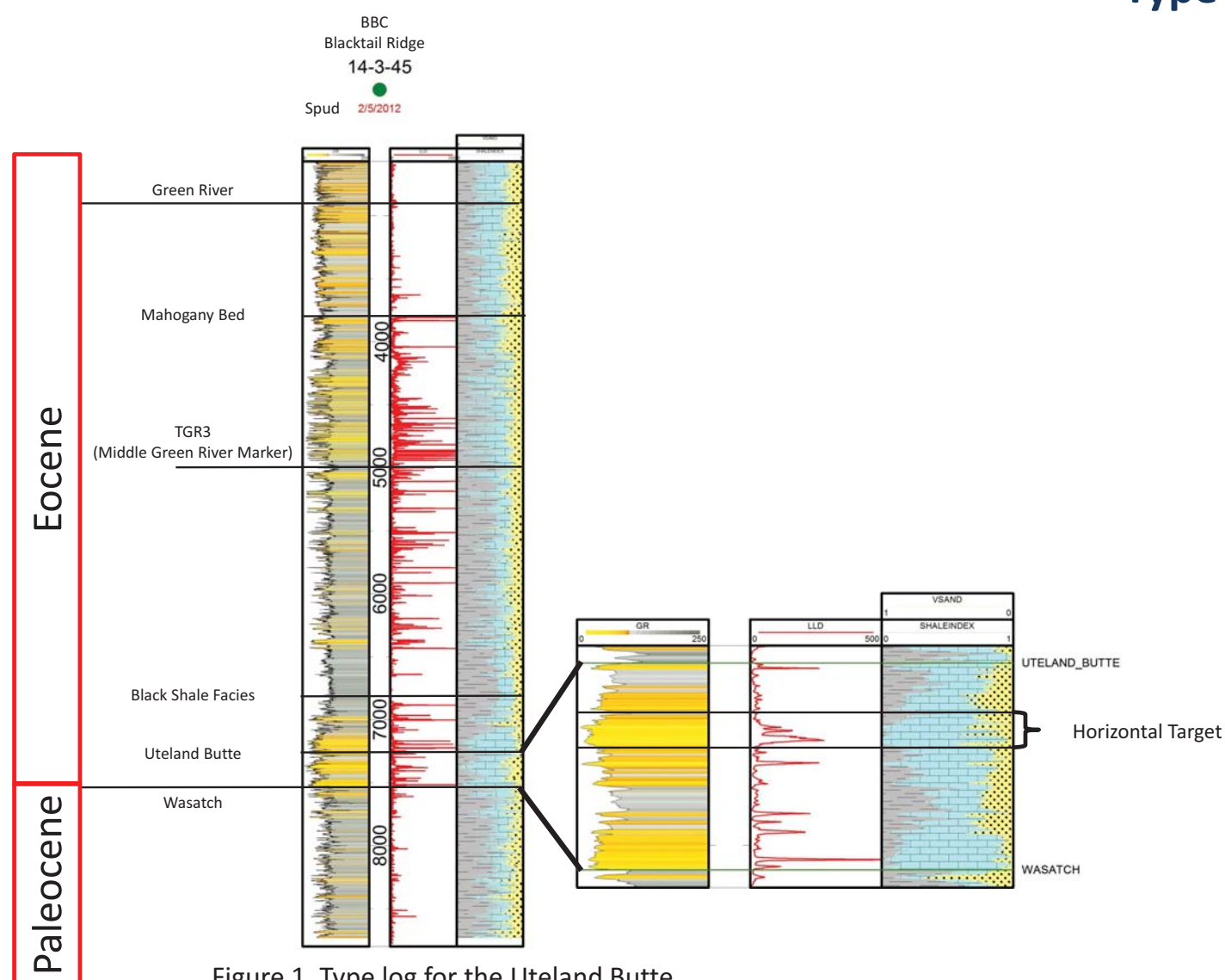


Figure 1. Type log for the Uteland Butte

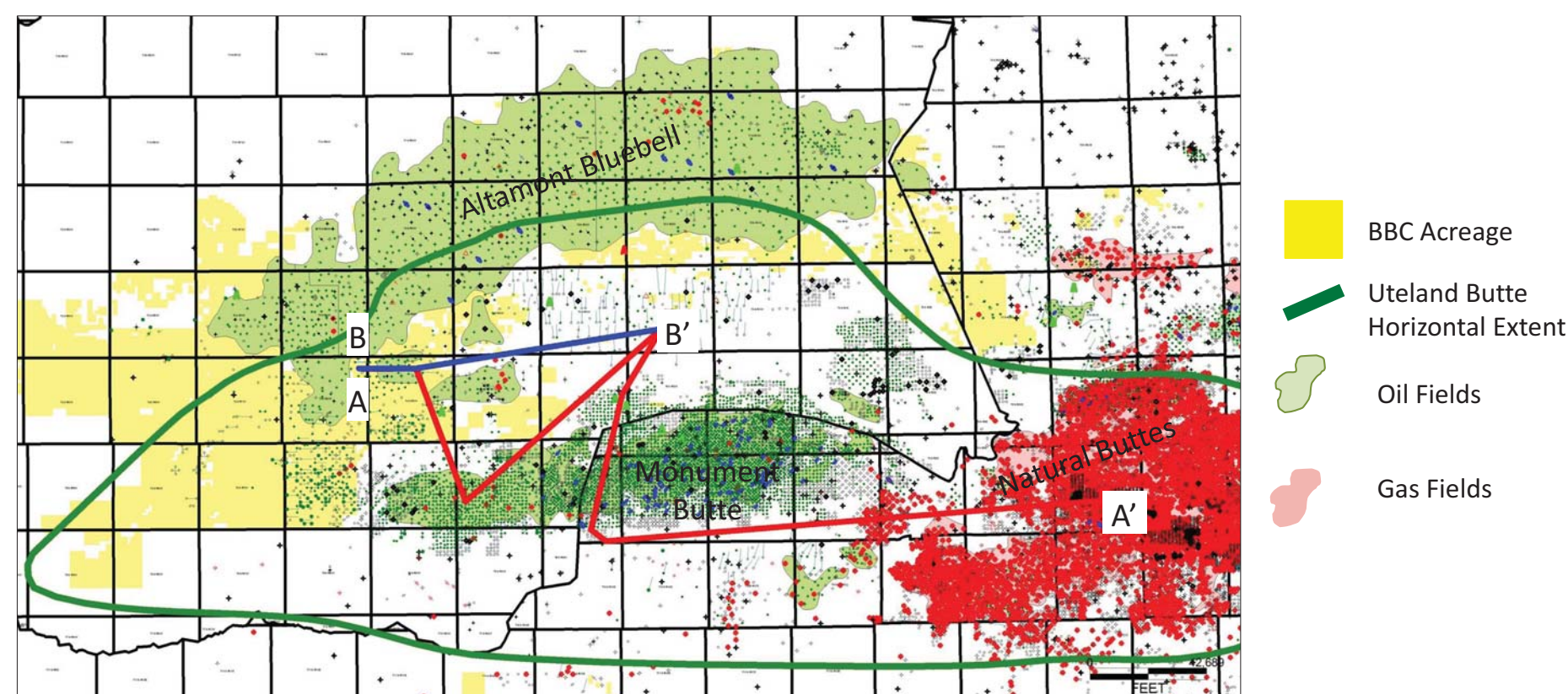


Figure 2. Base map of the Uinta Basin.

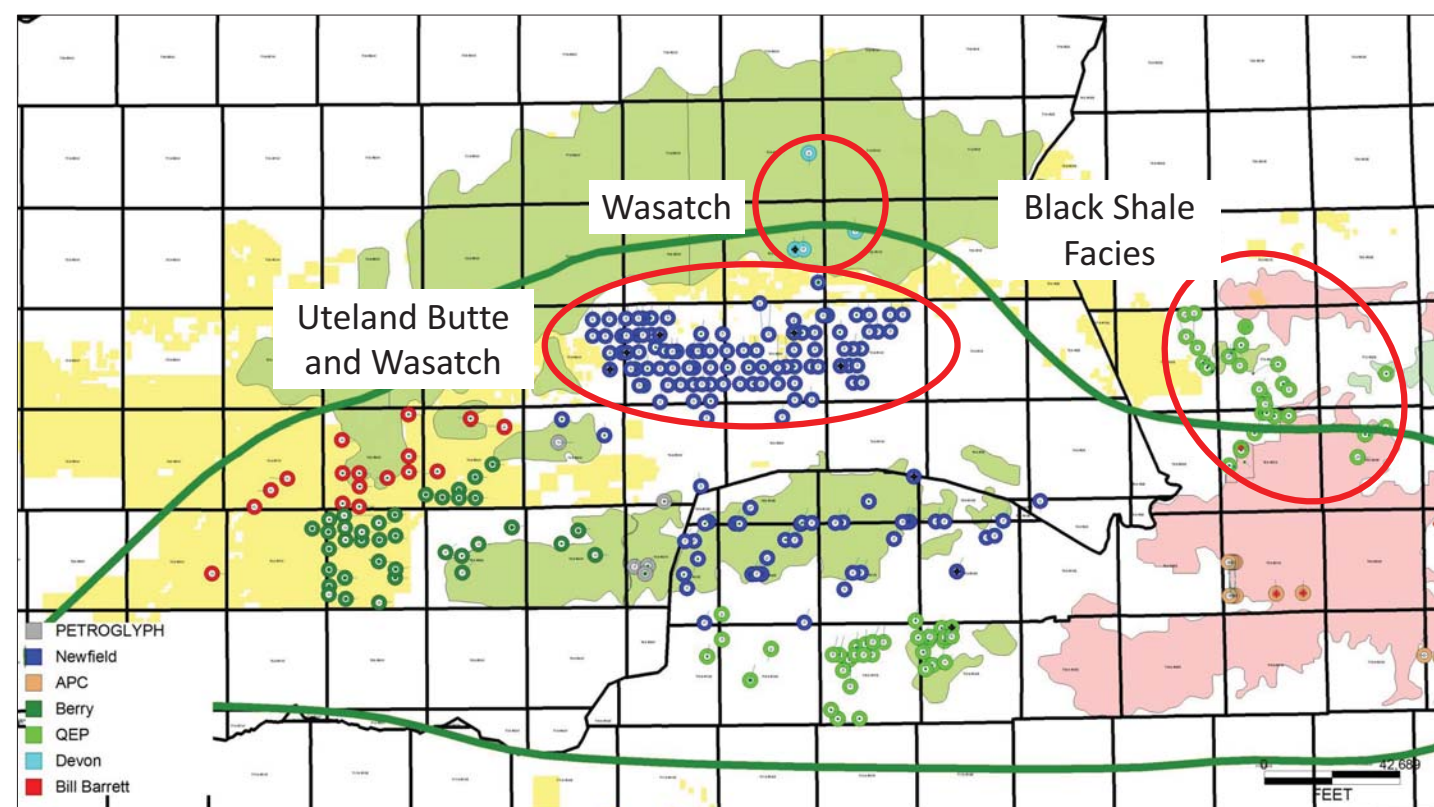


Figure 3. Permitted and active horizontals in the Uinta Basin

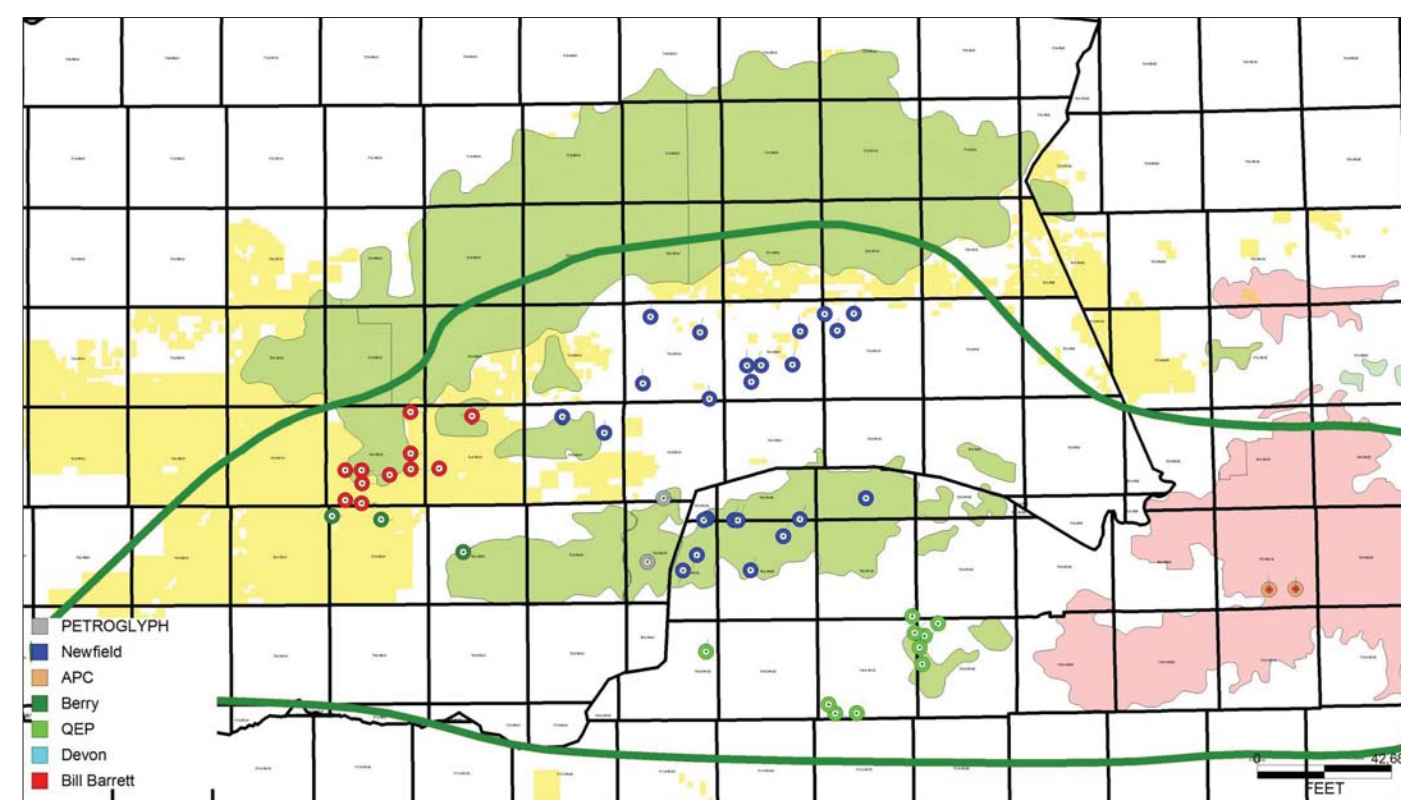


Figure 4. Producing Uteland Butte horizontals in the Uinta Basin



## Reservoir Properties and Production

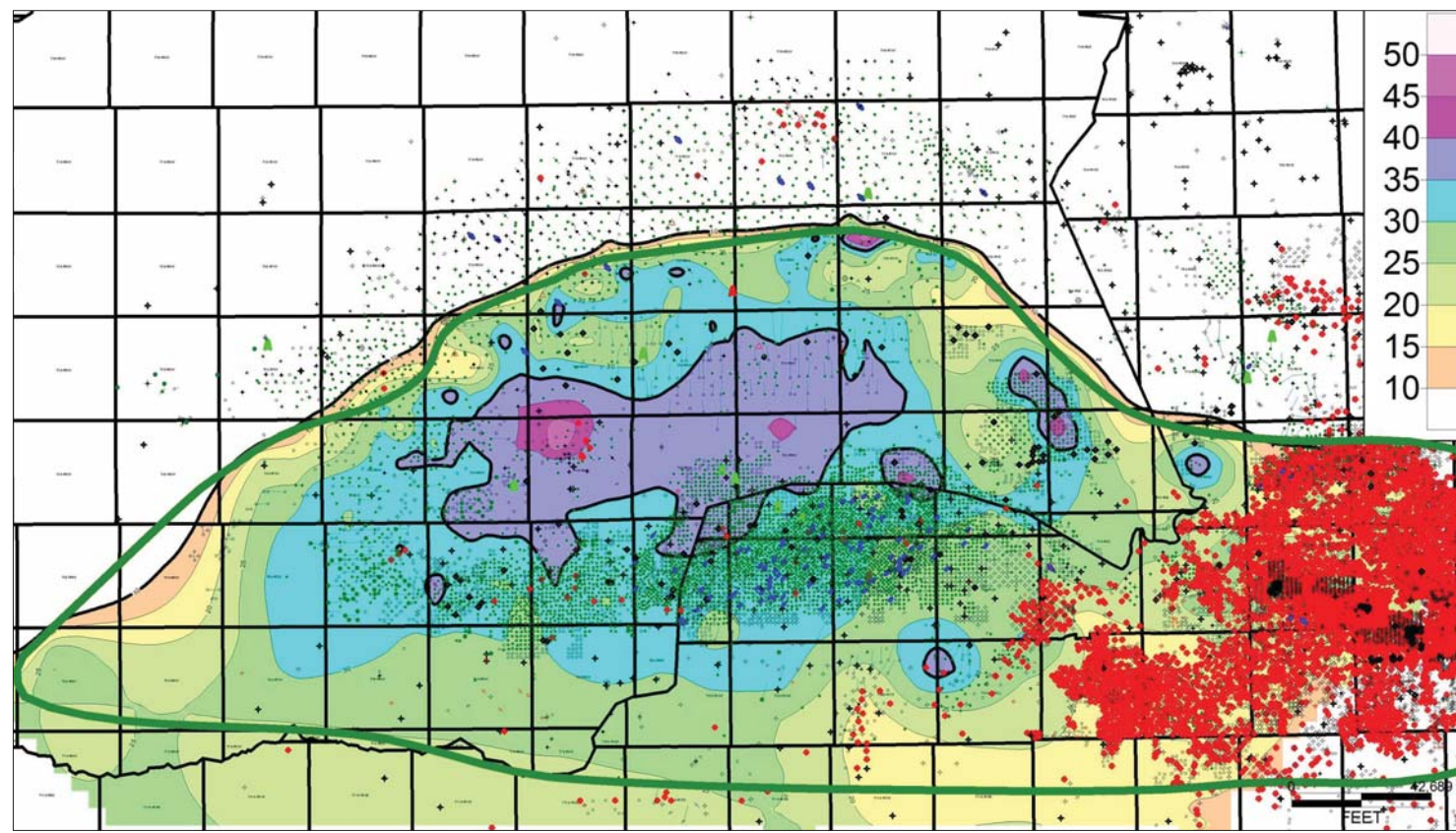


Figure 5. Isopach of gross horizontal target

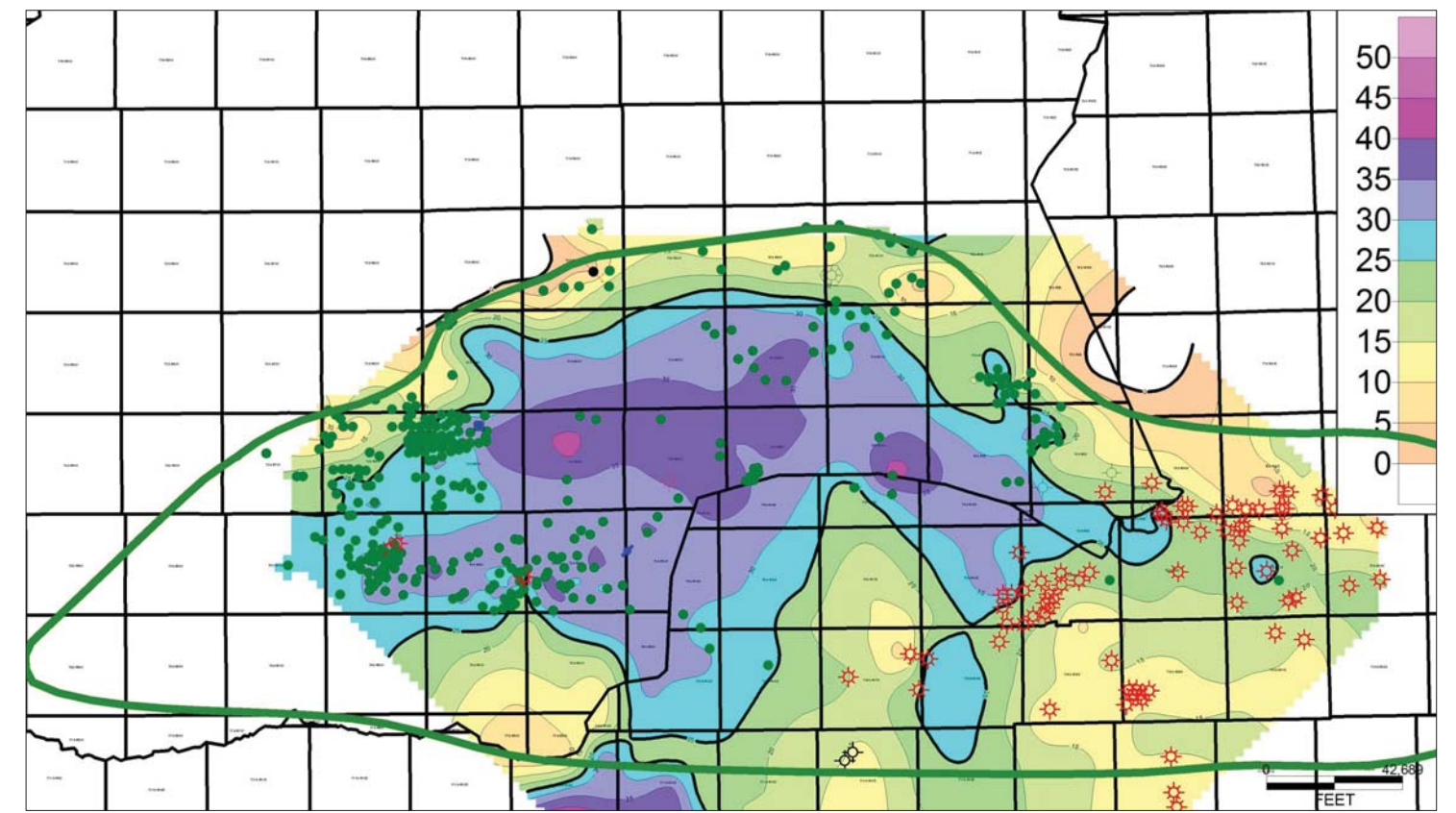


Figure 6. Feet of Resistivity over 20 ohms

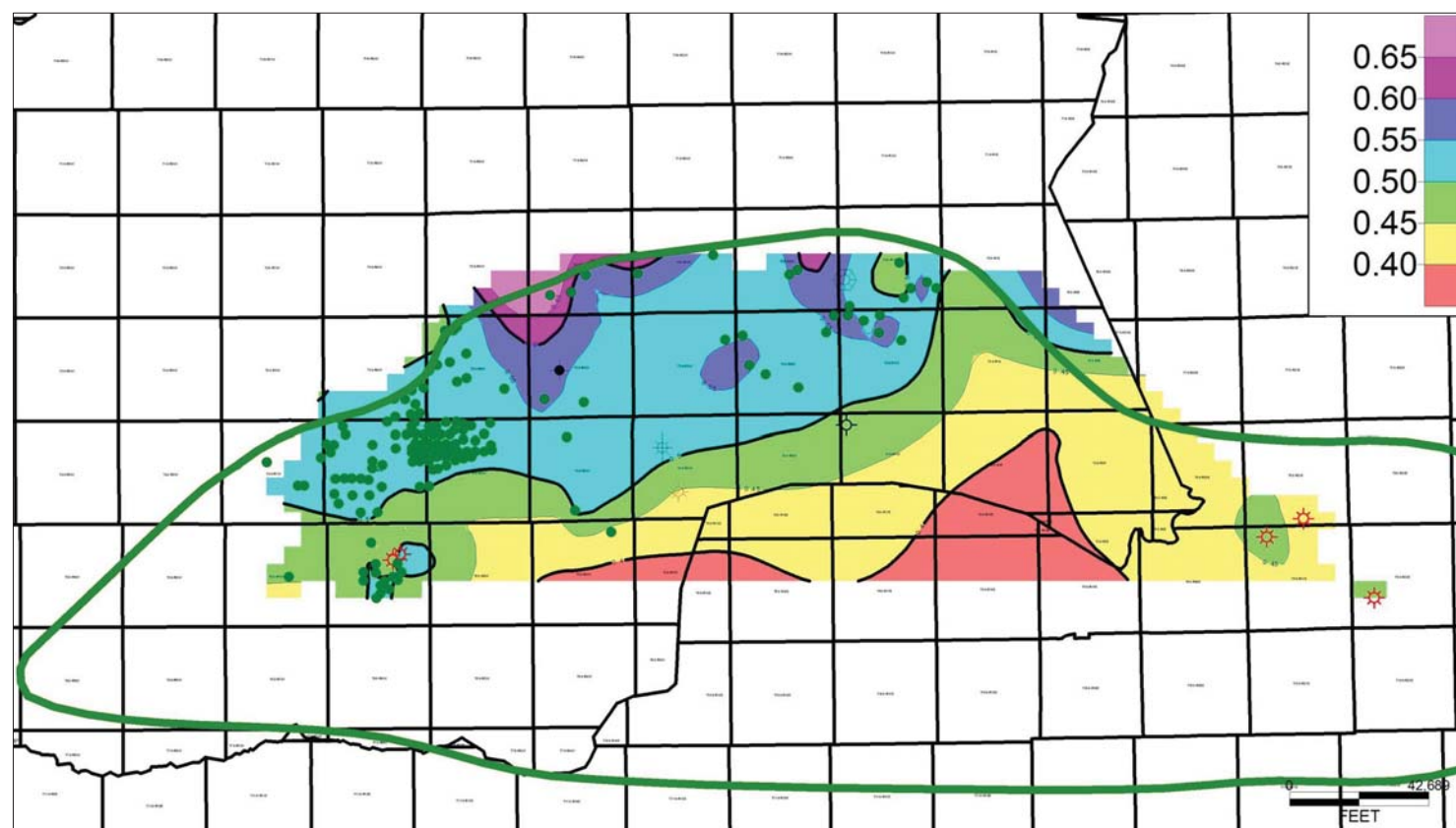


Figure 7. Pressure gradient of the Uteland Butte based on mudweight  
(Pressure Gradient = Mudweight \* 0.052)

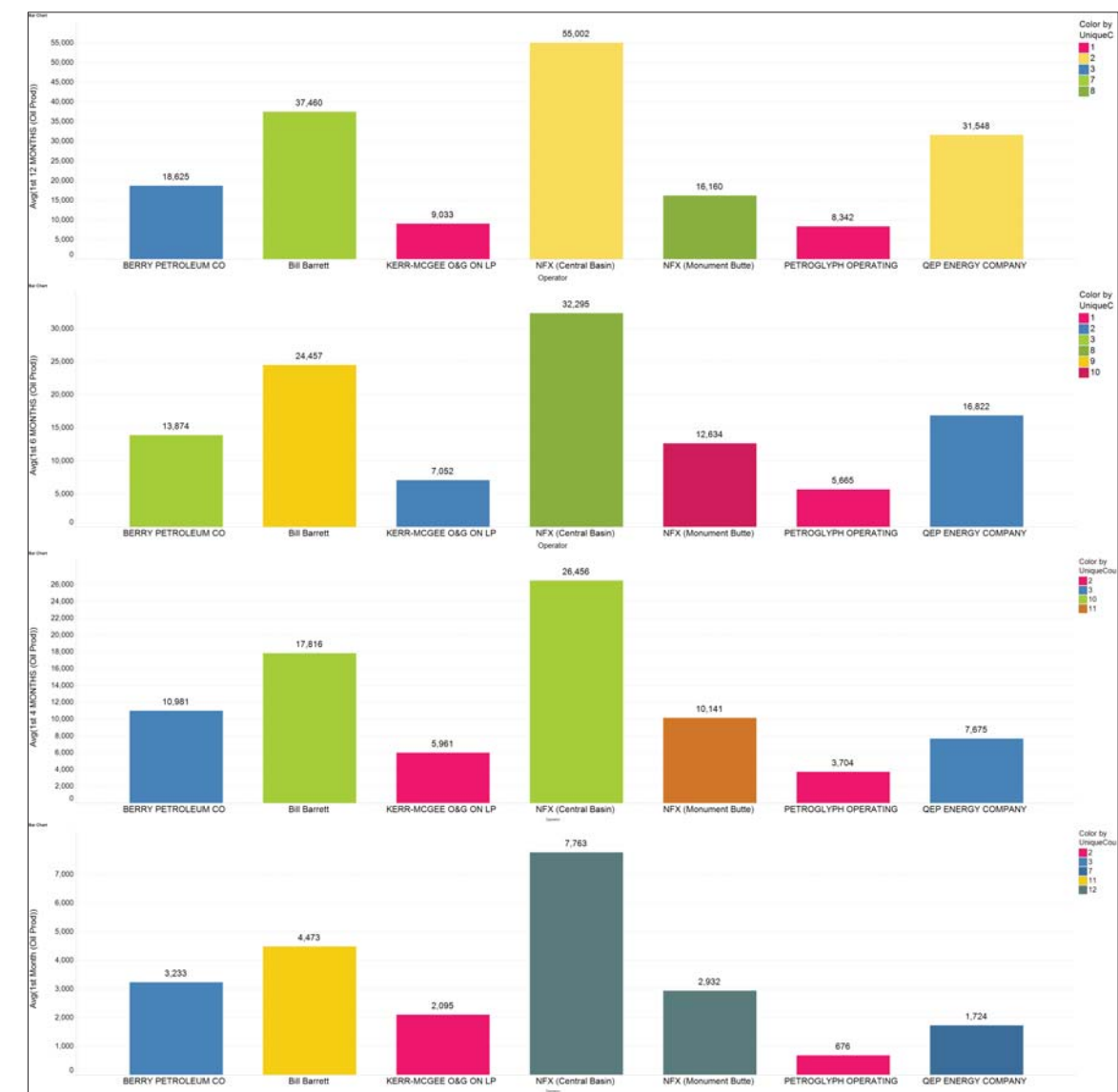


Figure 8. Cumulative production by operator.

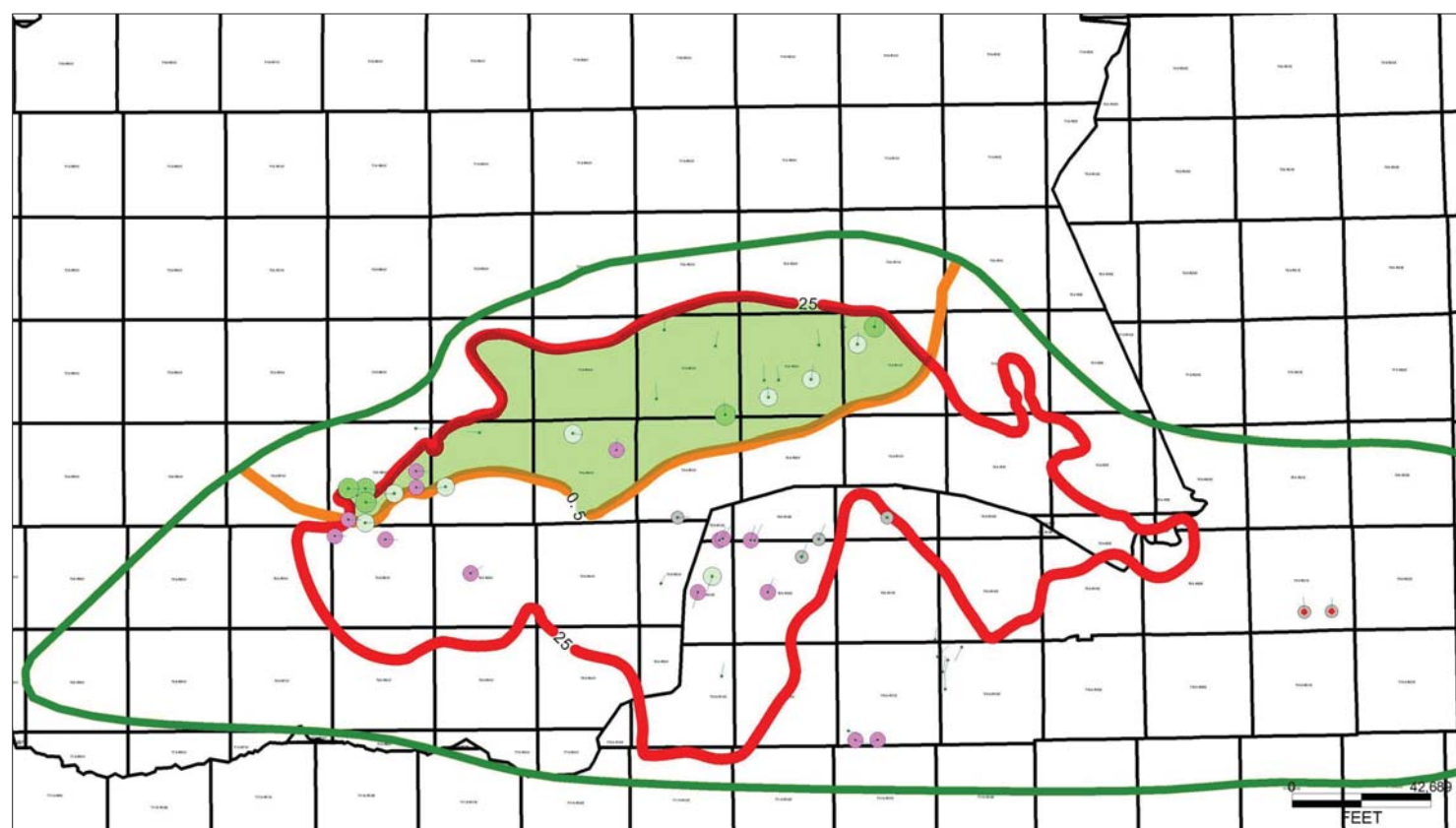


Figure 9. Pressure gradient of 0.50 psi/ft, feet of resistivity > 25 and first 6 months of cumulative oil.

- 25 Feet of Resistivity
- 0.50 Pressure Gradient
- Sweet Spot
- 6 Month Oil Cum**
- 0 to 10,000 bbls of oil
- 10,000 to 20,000 bbls of oil
- 20,000 to 30,000 bbls of oil
- 30,000 to 40,000 bbls of oil



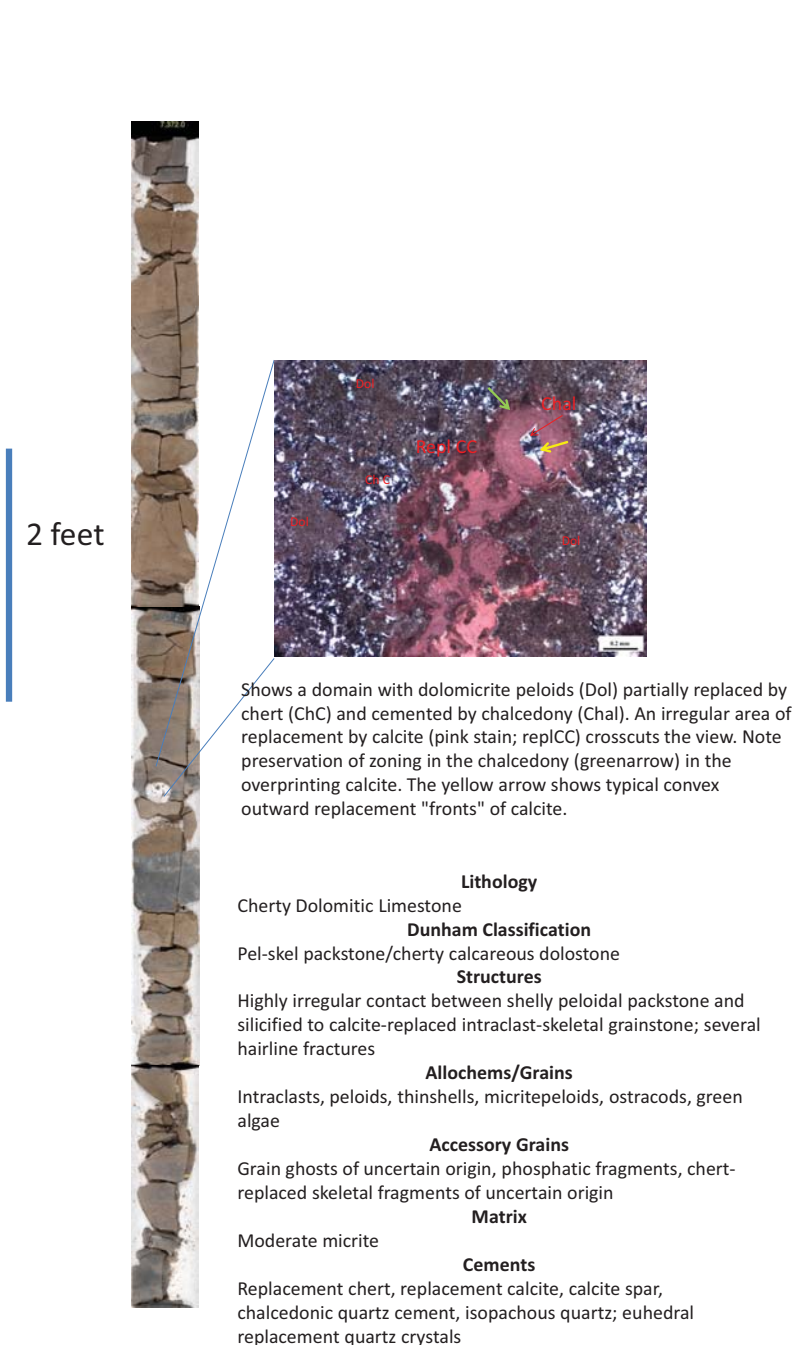


Figure 10. Thin section analysis from the 14-3-45 core.

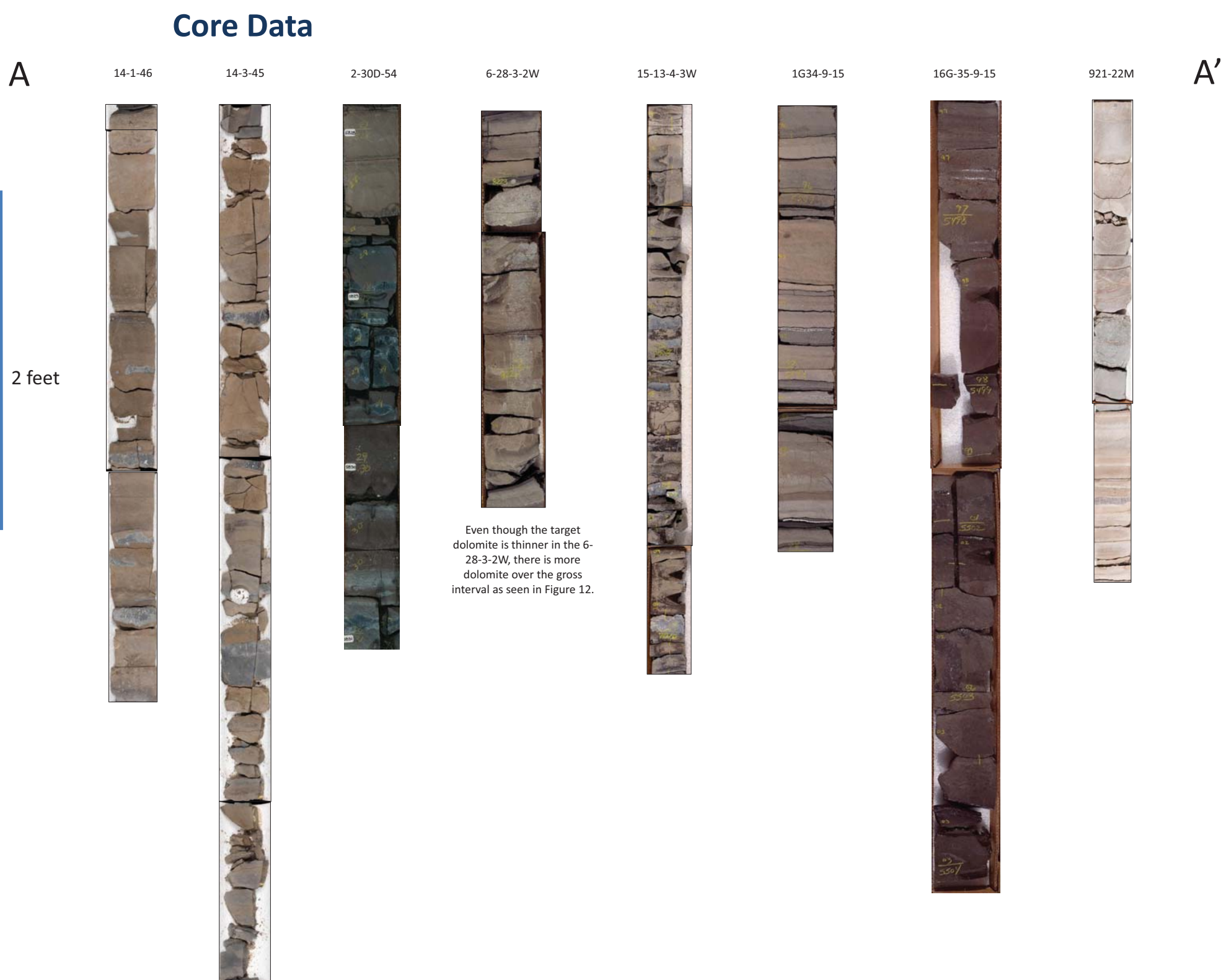


Figure 11. A to A' core cross-section of the dolomitic horizontal target within the Uteland Butte. Note the thickness difference and coloration across the basin.

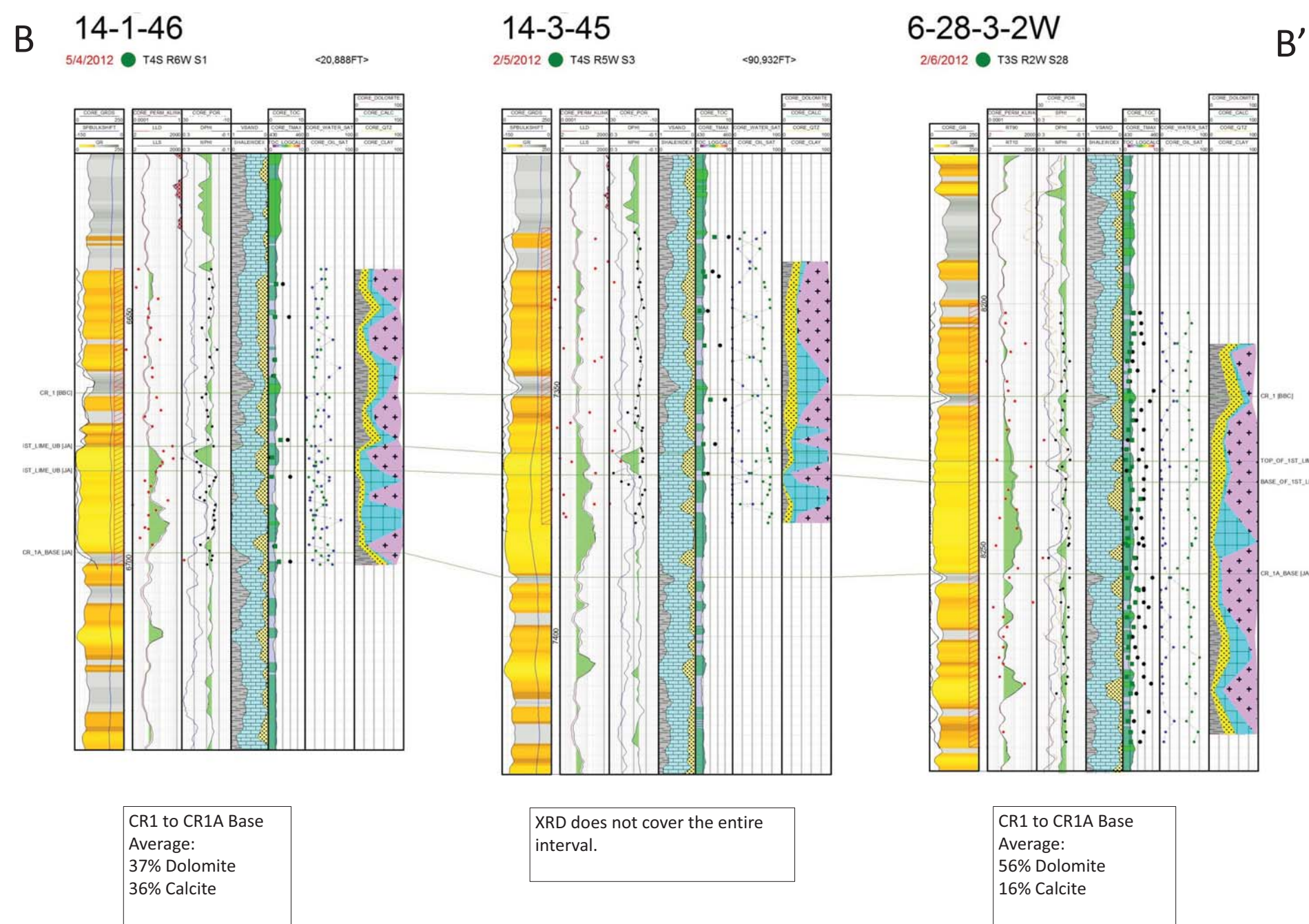


Figure 12. B to B' cross-section from the west to the center part of the Uteland Butte play. Dolomite content and oil saturation increases toward the central part of the Uinta Basin.

## Conclusions and Acknowledgements

### Conclusions

The keys to the Uteland Butte horizontal play are thickness of the dolomite package and geopressuring. As seen in figures 6-9, the central part of the play has the greatest feet of high resistivity reservoir, thickest net pay, elevated pressure gradient and highest cumulative production in the Uinta Basin. This area also has the greatest dolomite content in the basin which translates to increased storage capacity in the reservoir (Figure 12). Collection of more core could lead to identification of additional dolomite-rich interval and more 'sweet spots' in the Uteland Butte horizontal play. The Uteland Butte horizontal play has plenty of running room in the basin and further development will help define the 'sweet spots' and economic limit of the Uteland Butte.

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APC – Aaron van den Berg  
UGS – Michael Vanden Berg