

# Value in Time-Lapse Seismic as a Tool to Measure Production Effects in the Niobrara and Codell Reservoirs

Wattenberg Field, CO, USA

Jake Utley



## Objective

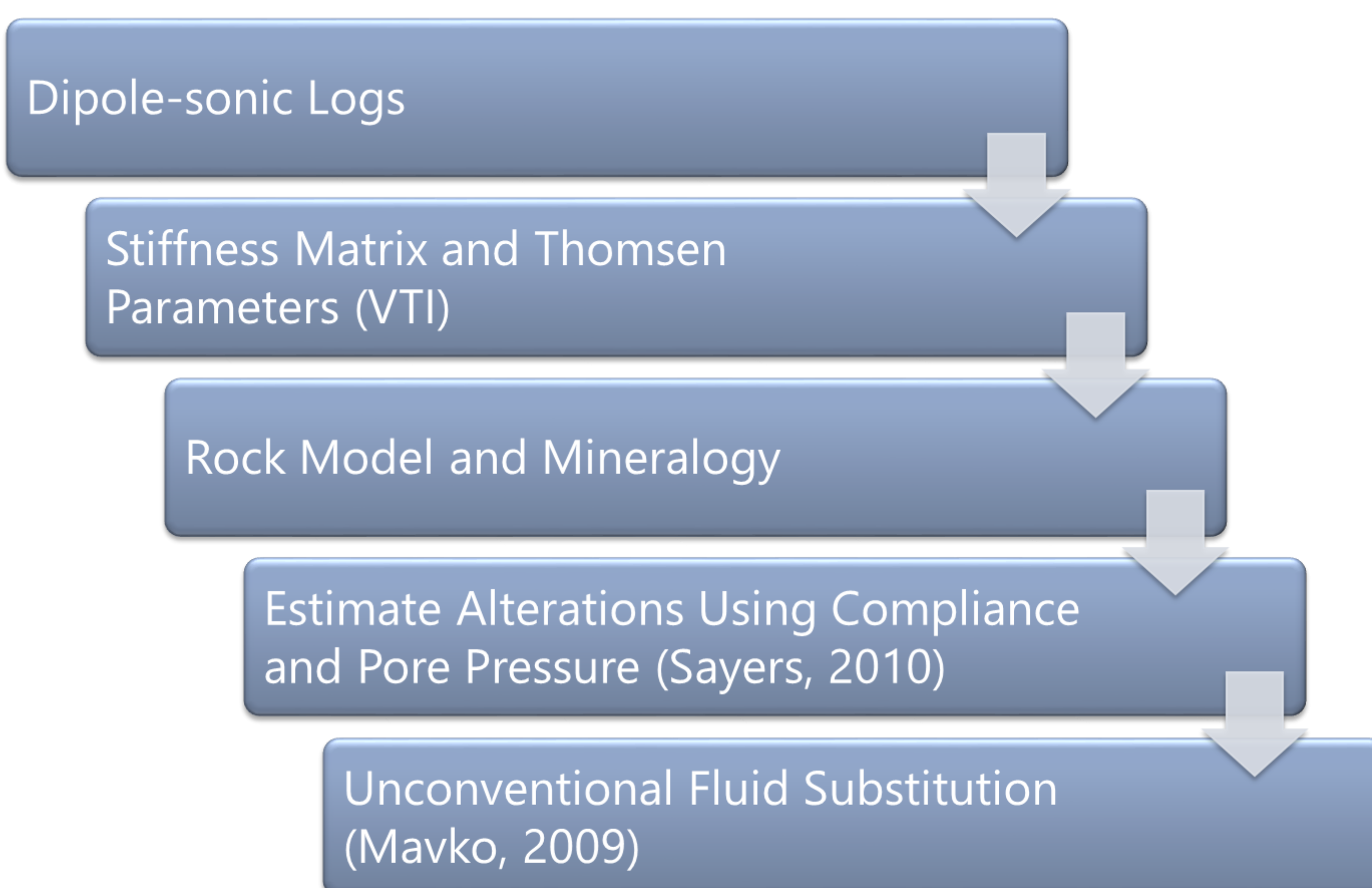
Use time-lapse seismic to characterize and identify production effects over a two-year period in the Niobrara and Codell reservoirs, Wattenberg Field, CO

Perform a pre-stack, time-lapse inversion on provided compressional wave seismic data to better understand differences between the initial Baseline (BL) survey and production Monitor 2 (M2) data

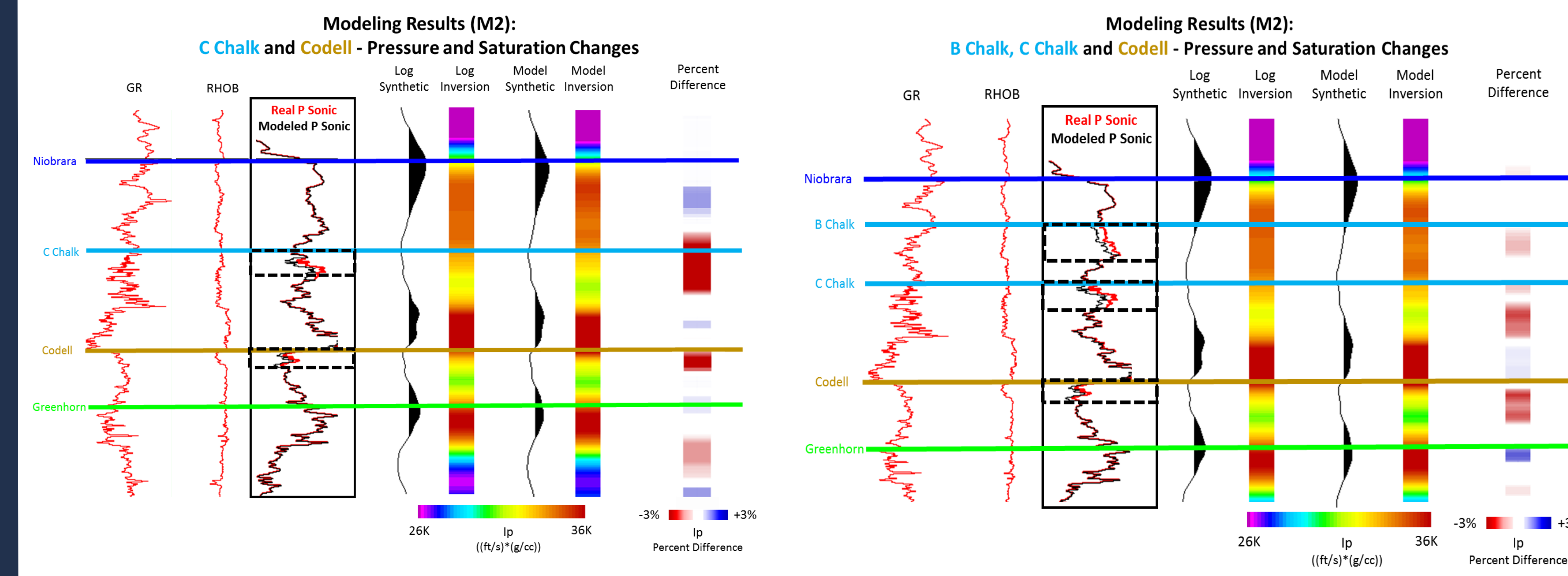
Characterize the negative P-impedance changes observed in the M2 data

Provide multidisciplinary applications for the continued use of this study to further characterize the Niobrara and Codell reservoirs

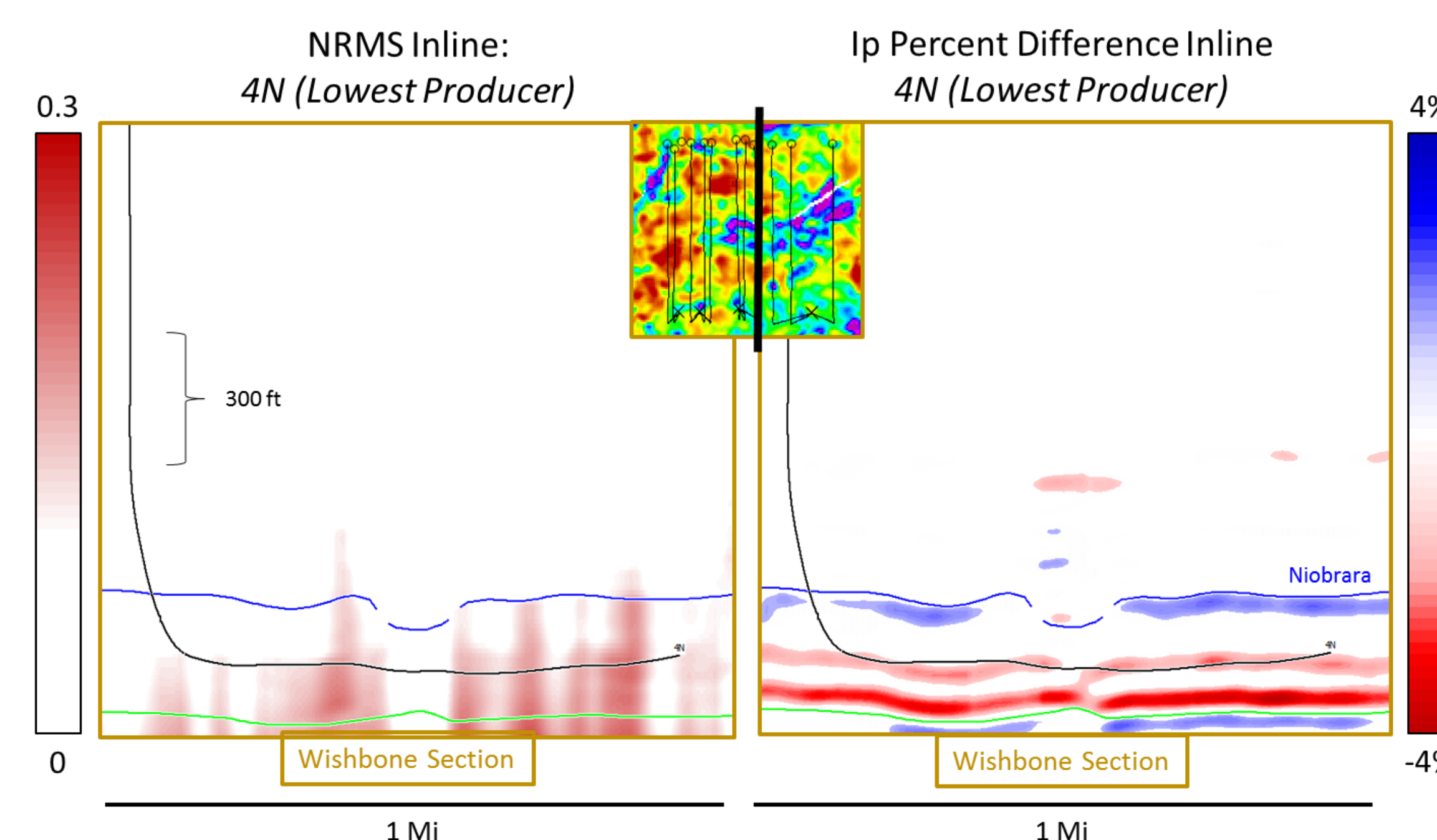
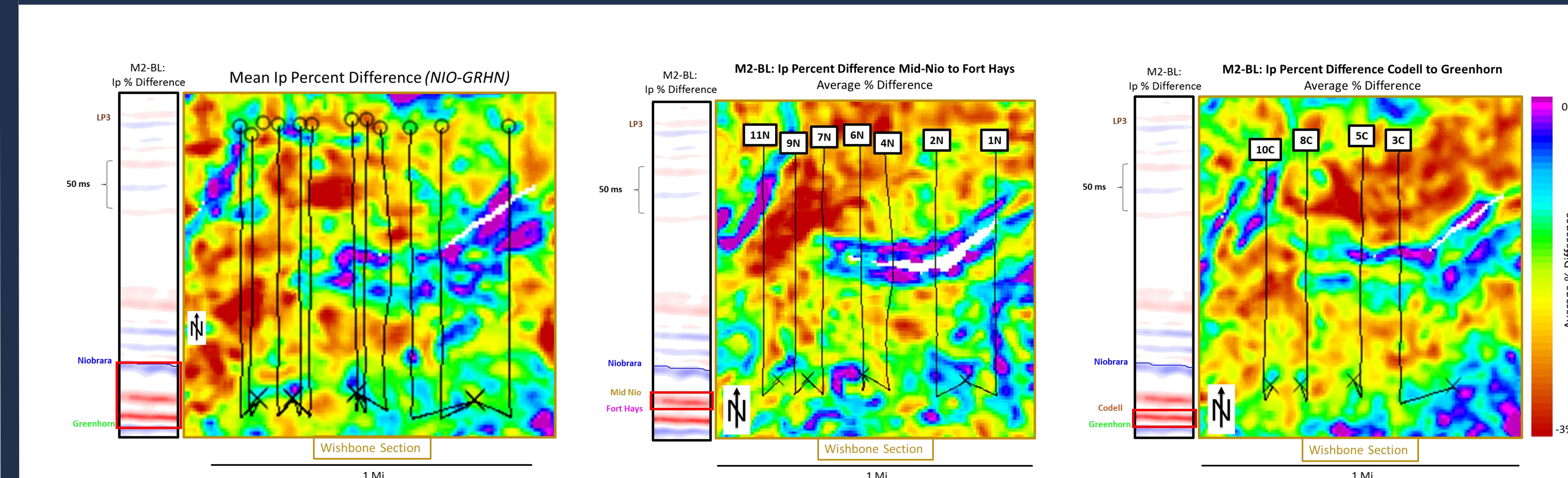
## Modeling



## Model Results

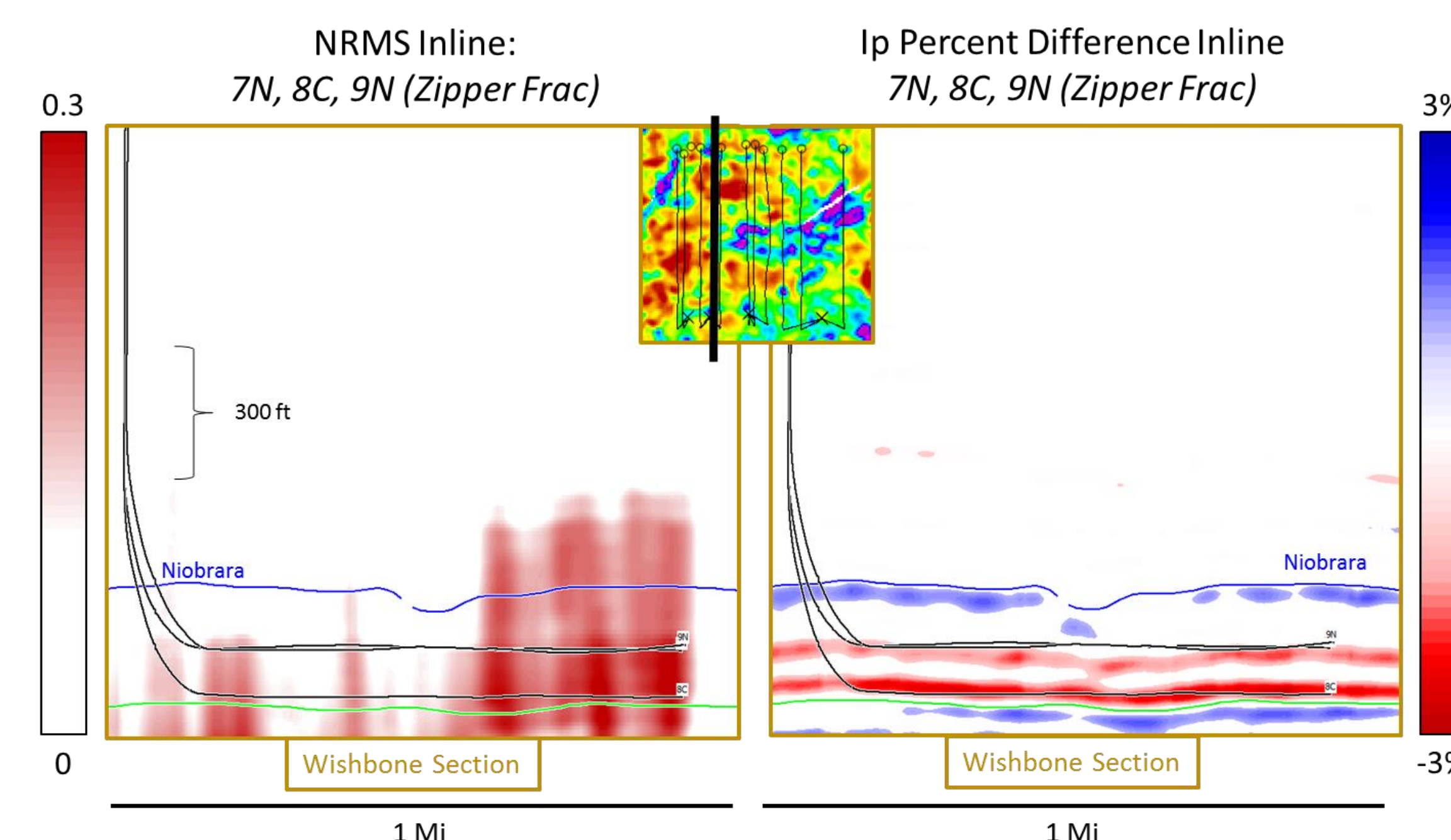


## Inversion Results



Distribution of larger negative differences in the survey at different intervals of the reservoir

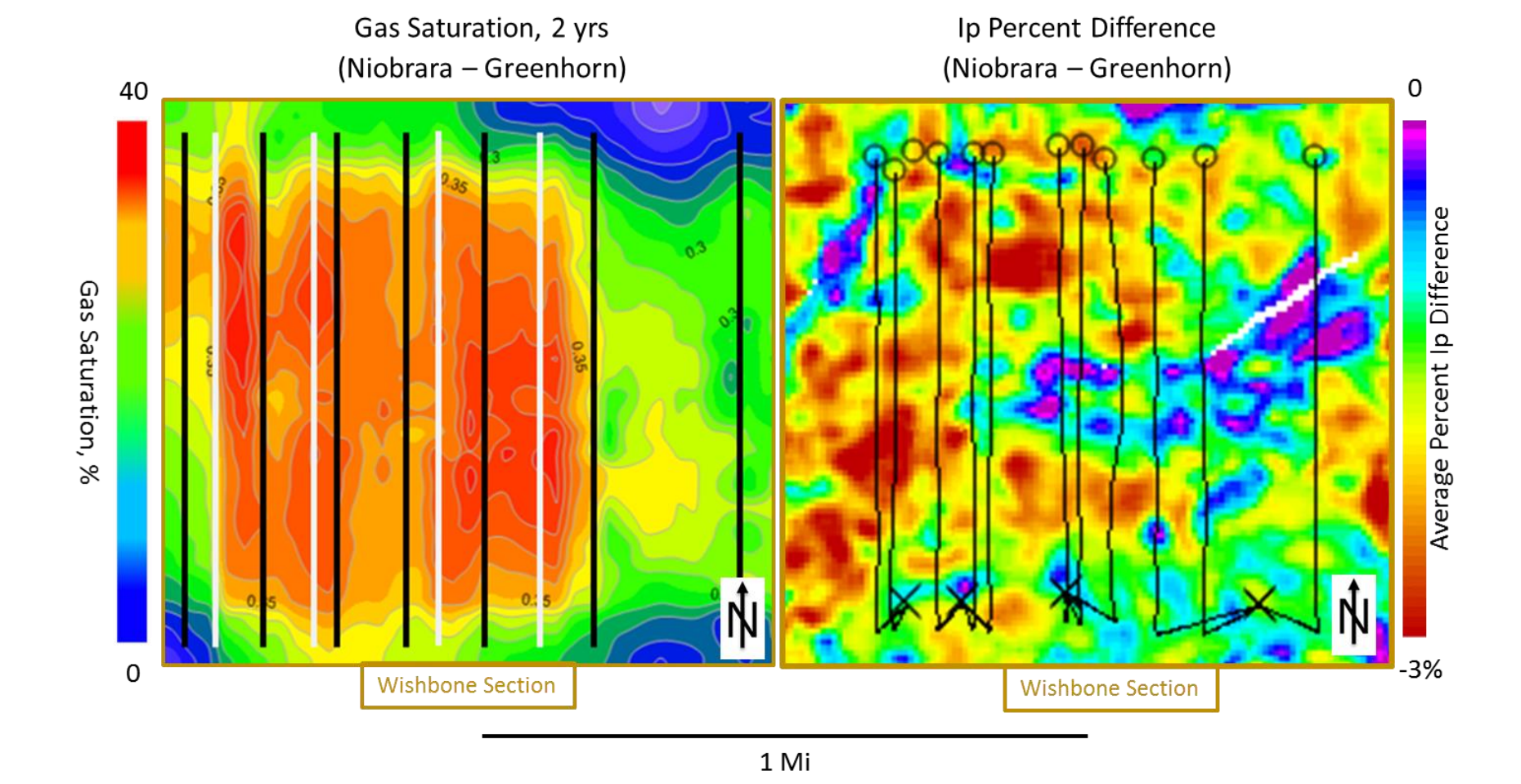
Cross section showing magnitude of overall and negative differences over the isolated, lowest producing well



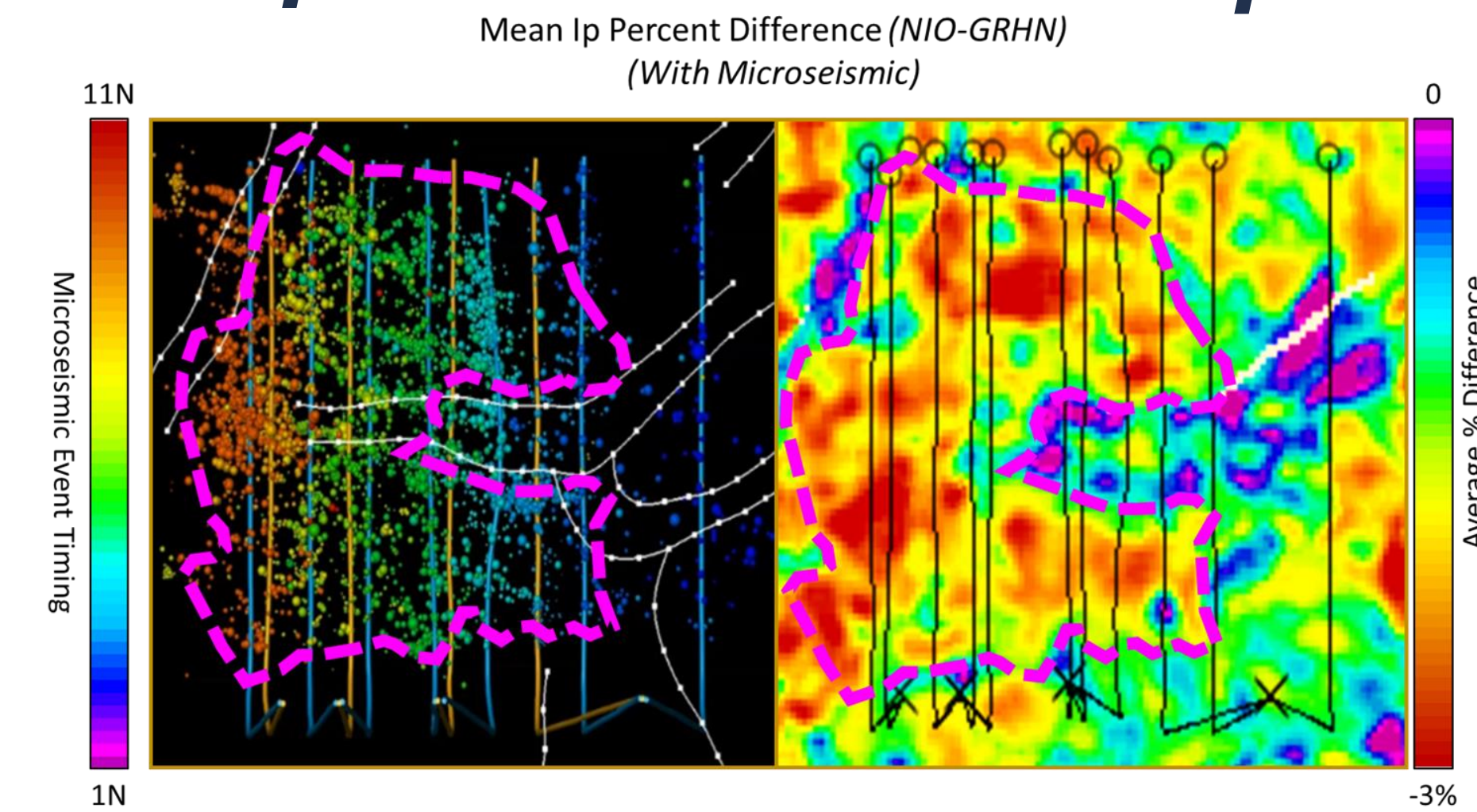
vs  
the tightly spaced, highest producing wells

## Integration

The gas influence on the 4D differences can constrain future reservoir simulations



Integration with other geoscience or engineering data will further aid in all interpretations



## Conclusions

Time-lapse pre-stack inversion P-impedance differences yield a negative overall change from the Baseline to Monitor survey

The time-lapse surveys are repeatable and present a 3D representation of the dynamic changes to the reservoir after two-years production

Modeling supports gas out of solution as the main 4D P-impedance changes as reservoir is depleted

The West and North areas of the survey have the most largest 4D differences consistent with the simulations and the microseismic