

Appendix A

Instrumentation 3.1.1-5c, d

October 2018

Instrumentation in Wells

Regional Multi-zone Monitoring Wells

3.1.1-5c

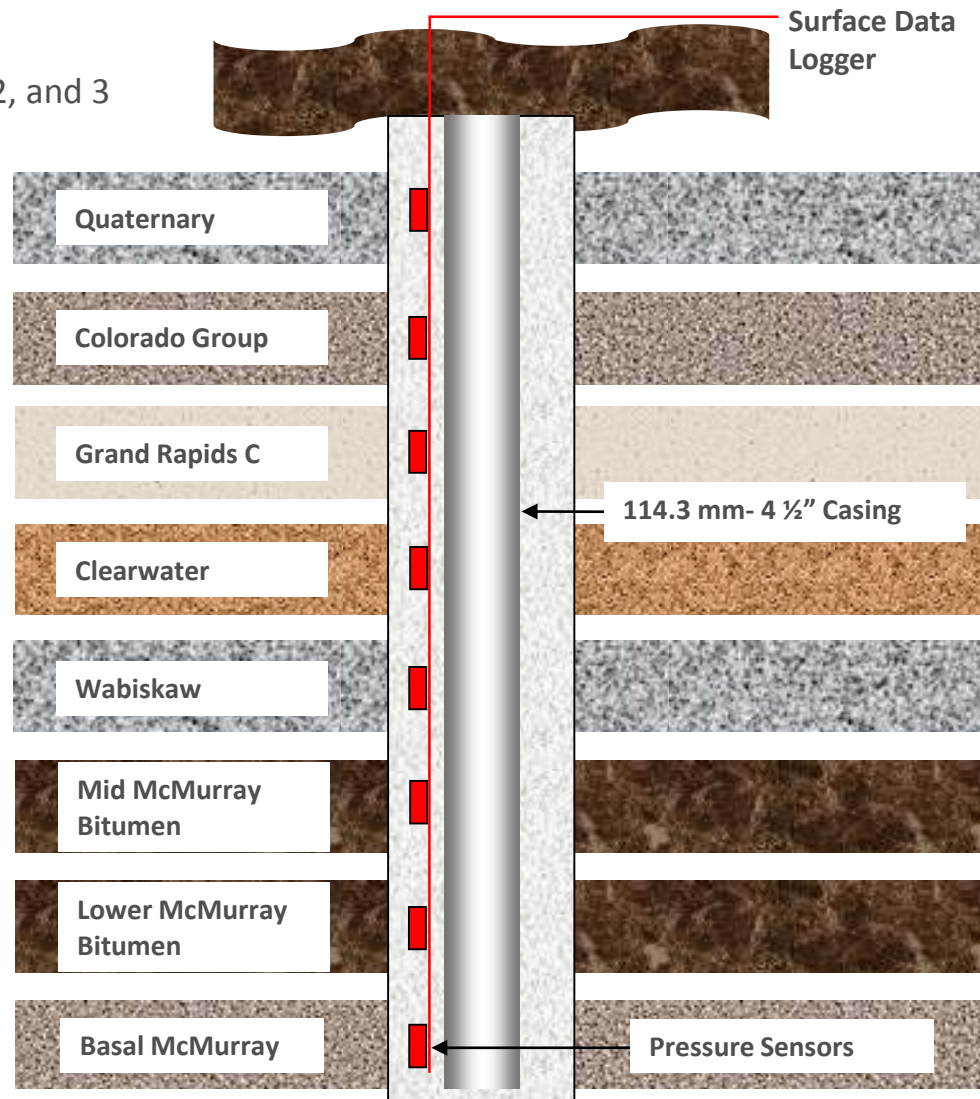
Monitoring wells cover areas of Jackfish 1, 2, and 3

Twenty-one wells

- 00/07-32-75-6W4 (5 piezometers)
- F1/08-28-75-6W4 (4 piezometers)
- F1/09-14-75-6W4 (4 piezometers)
- F1/12-31-75-6W4 (4 piezometers)
- F1/10-22-75-6W4 (5 piezometers)
- F1/04-26-75-7W4 (5 piezometers)
- F1/06-28-75-7W4 (5 piezometers)
- F1/15-19-75-6W4 (5 piezometers)
- F1/09-24-75-7W4 (5 piezometers)
- F1/14-25-75-6W4 (5 piezometers)
- F1/05-12-75-6W4 (5 piezometers)
- F1/09-22-75-7W4 (4 piezometers)
- 02/12-23-75-7W4 (4 piezometers) *
- 02/01-35-75-7W4 (3 piezometers)
- 00/15-07-75-5W4 (4 piezometers)
- 00/07-22-75-7W4 (2 piezometers)
- 00/03-15-75-6W4 (3 piezometers) **
- 02/09-33-75-6W4 (4 piezometers)
- 00/04-30-75-7W4 (3 piezometers)
- 00/01-19-75-6W4 (3 piezometers) **
- AA/11-30-75-6W4 (5 piezometers)

* Perf with a Level Logger

** Perf for water sampling



~440 mKB --

Observation Well Summary

Measurement Challenges

3.1.1-5d

Measurement Challenge	Description Of Challenge	Action Plan
Non-Repeatable Data: Temperature and/or Pressure	<p>Low confidence in non-repeatable day-to-day temperature and/or pressure data is potentially caused by, but not limited to:</p> <ul style="list-style-type: none"> • Irregular or noisy power from solar panel, (including SunSaver), inducing noise on the thermocouple wires • Noise induced from other sources • Poor reference temperature devices • Poor grounding/isolation • Power issues 	<ul style="list-style-type: none"> • Working with vendor to identify root cause of non-repeatable data and implement solution(s) from investigation across all observation wells
Data distortion with long exposure to high temperatures	<ul style="list-style-type: none"> • Only few select thermocouples at Pad A and D have begun to see these effects • Long exposure to high temperature zones have begun to see eroded temperature data quality 	<ul style="list-style-type: none"> • Flag thermocouples that begin to see similar effects and be aware of compromised data quality
Piezometer Currently or Historically Considered in Poor Communication With Reservoir	<p>Piezometer pressure data considered suspect due to unlikely pressure readings when compared to other nearby piezometers and downhole operating conditions</p>	<ul style="list-style-type: none"> • Currently viewing other vendor options • Reviewing moving instrumentation internal to the casing • Continuing to work with current instrumentation vendor to develop corrective actions to improve data reliability • Conducting fluid shots on adjacent wellbores to confirm suspect pressure readings

Observation Well Summary

Measurement Challenges

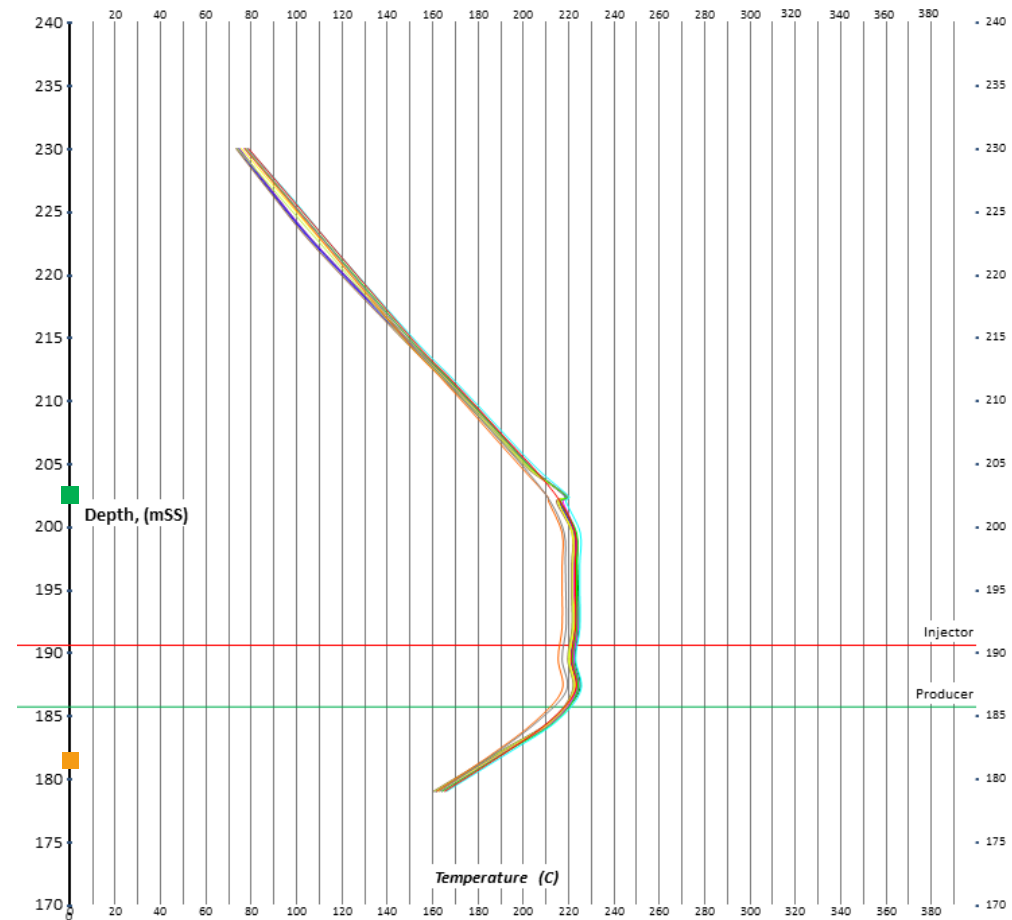
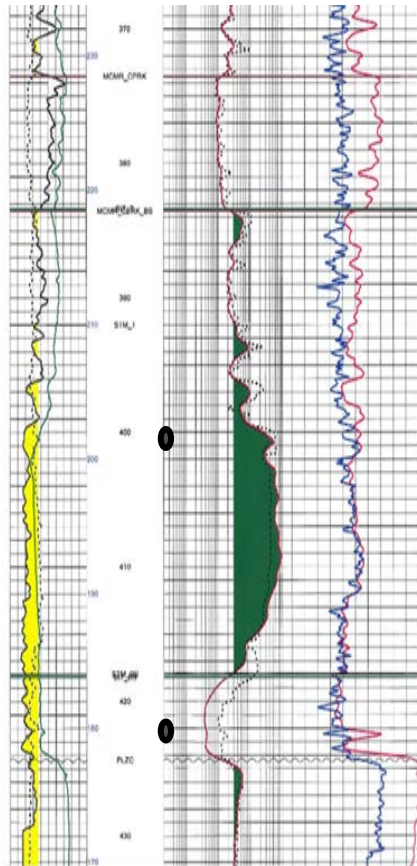
3.1.1-5d

Devon remains committed in working towards overcoming current observation well measurement challenges and increasing data reliability. Steps towards mitigating issues outlined include:

- Monthly reviews of observation well data to track and prioritize issues
- Conducting maintenance trips in spring, summer, and fall, involving vendor technicians visiting and troubleshooting various issues at the observation wells
- Fall preventative maintenance trip: includes battery and power system inspection to reduce the potential for power loss during winter months
- Work with vendor to investigate non-repeatable data issues and implement corrective actions
- Reduction in polling frequency to lower power use at site to prevent future power loss

Pad A Heel Observation Well Temp (7.1m from A5 well pair)

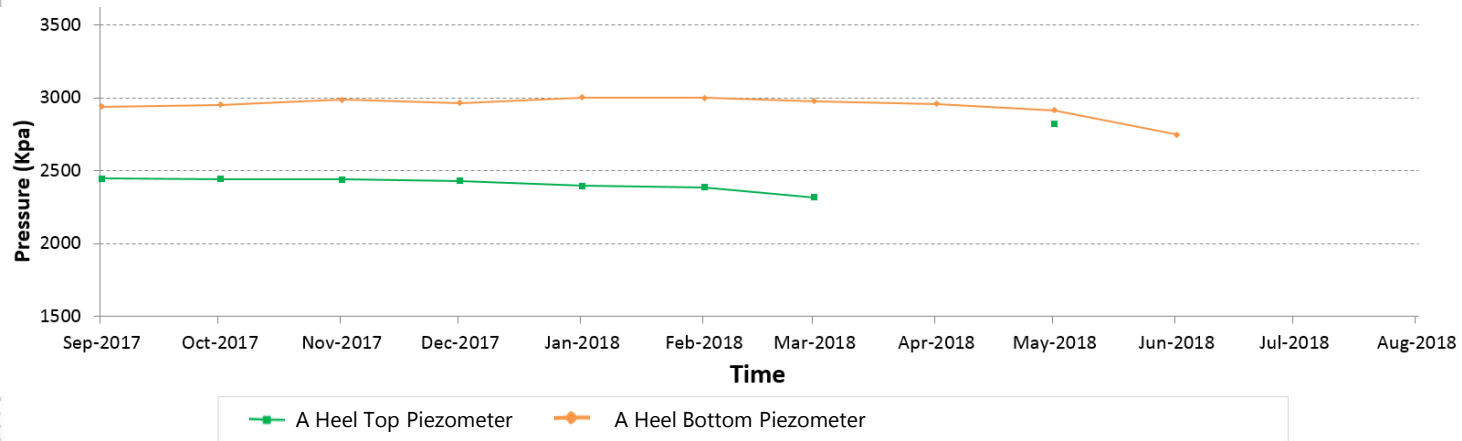
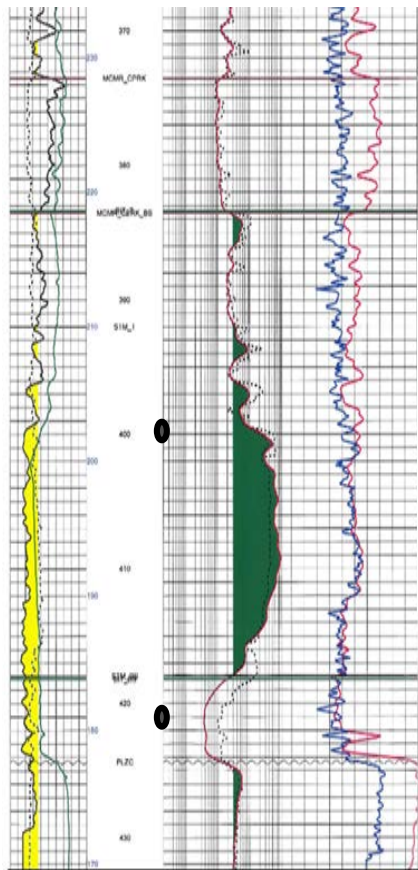
3.1.1-5d



—9/1/2017 —10/1/2017 —11/1/2017 —12/1/2017 —1/1/2018 —2/1/2018 —3/1/2018 —4/1/2018 —5/1/2018 —6/1/2018 —7/1/2018 —8/1/2018

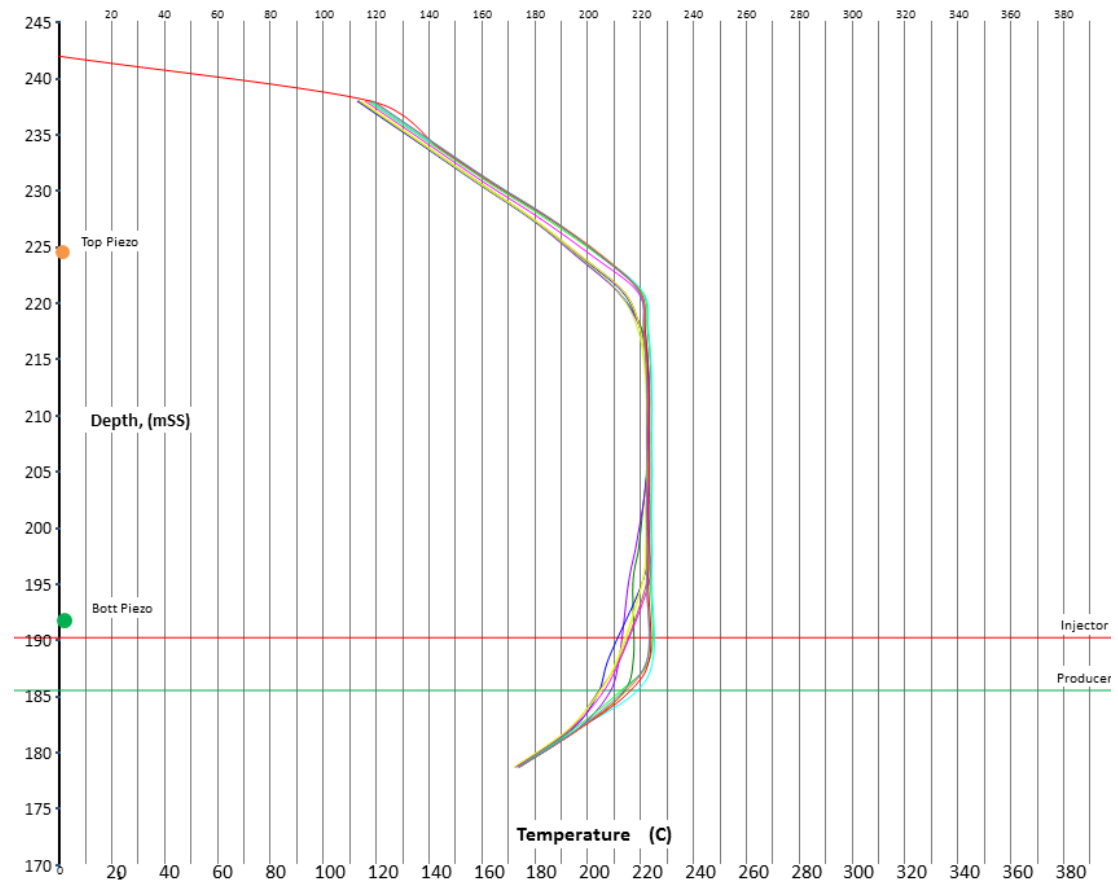
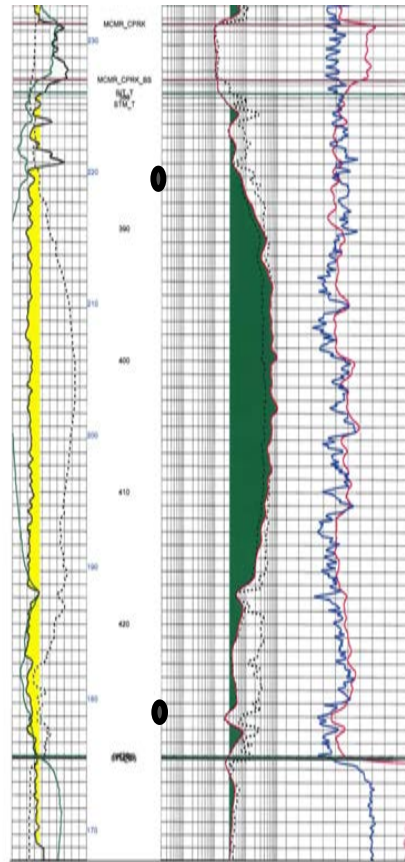
Pad A Heel Observation Well Pressure (7.1m from A5 well pair)

3.1.1-5d



Pad A Toe Observation Well Temp (5.3m from A5 well pair)

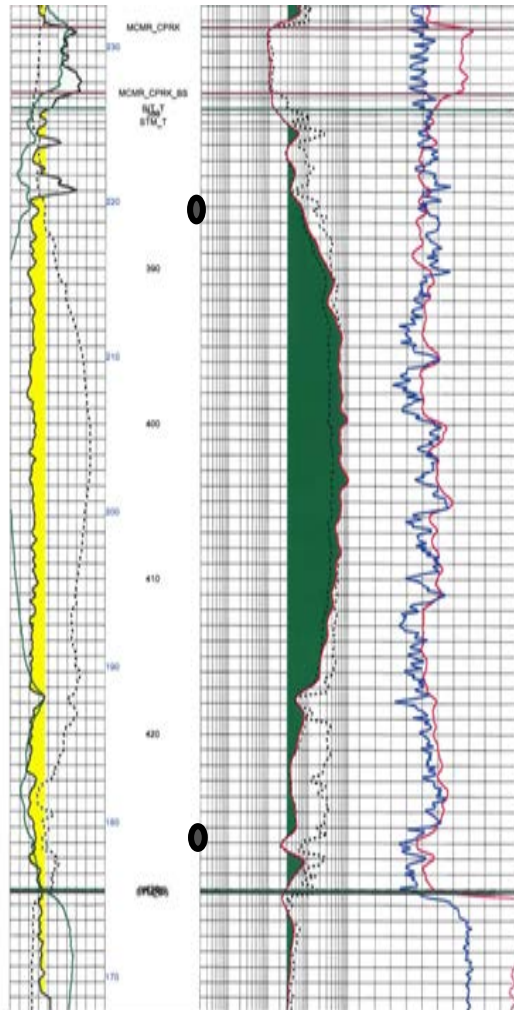
3.1.1-5d



—2014/09/01 —9/1/2017 —10/1/2017 —11/1/2017 —12/1/2017 —1/1/2018 —2/1/2018 —3/1/2018 —4/1/2018 —5/1/2018 —6/1/2018 —7/1/2018 —8/1/2018

Pad A Toe Observation Well Pressure (5.3m from to A5 well pair)

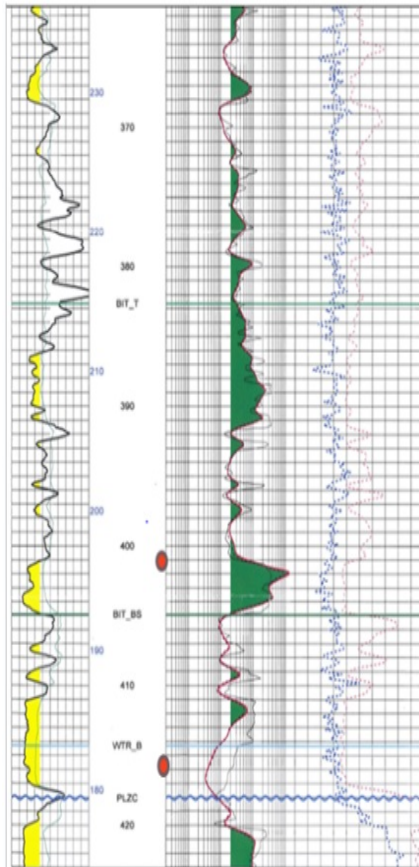
3.1.1-5d



Both piezometers have failed,
no pressure data available

Pad B Heel Observation Well Temp (6.5m from B2 well pair)

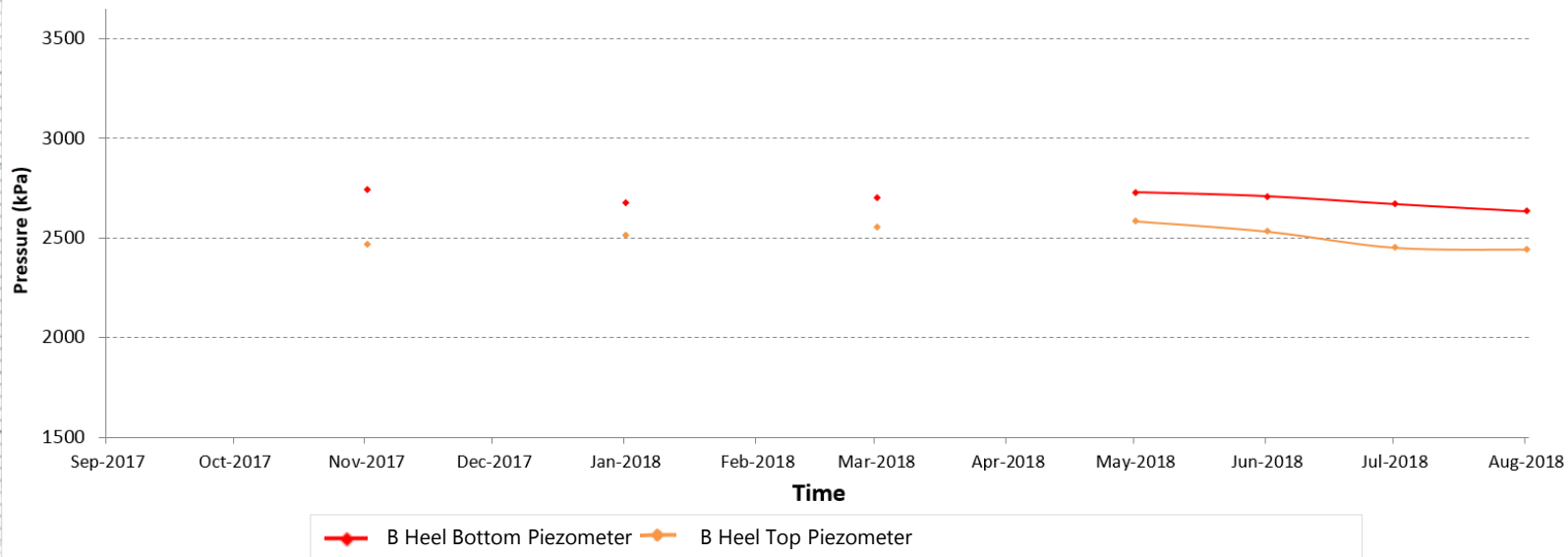
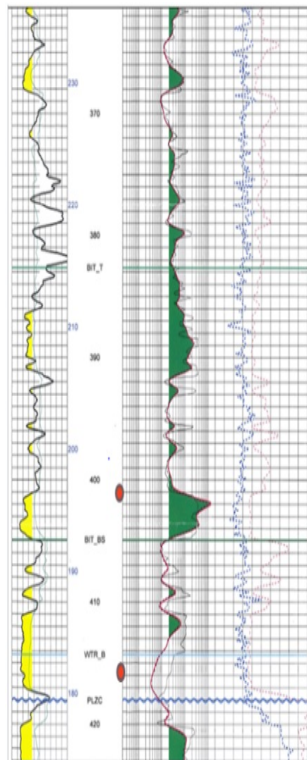
3.1.1-5d



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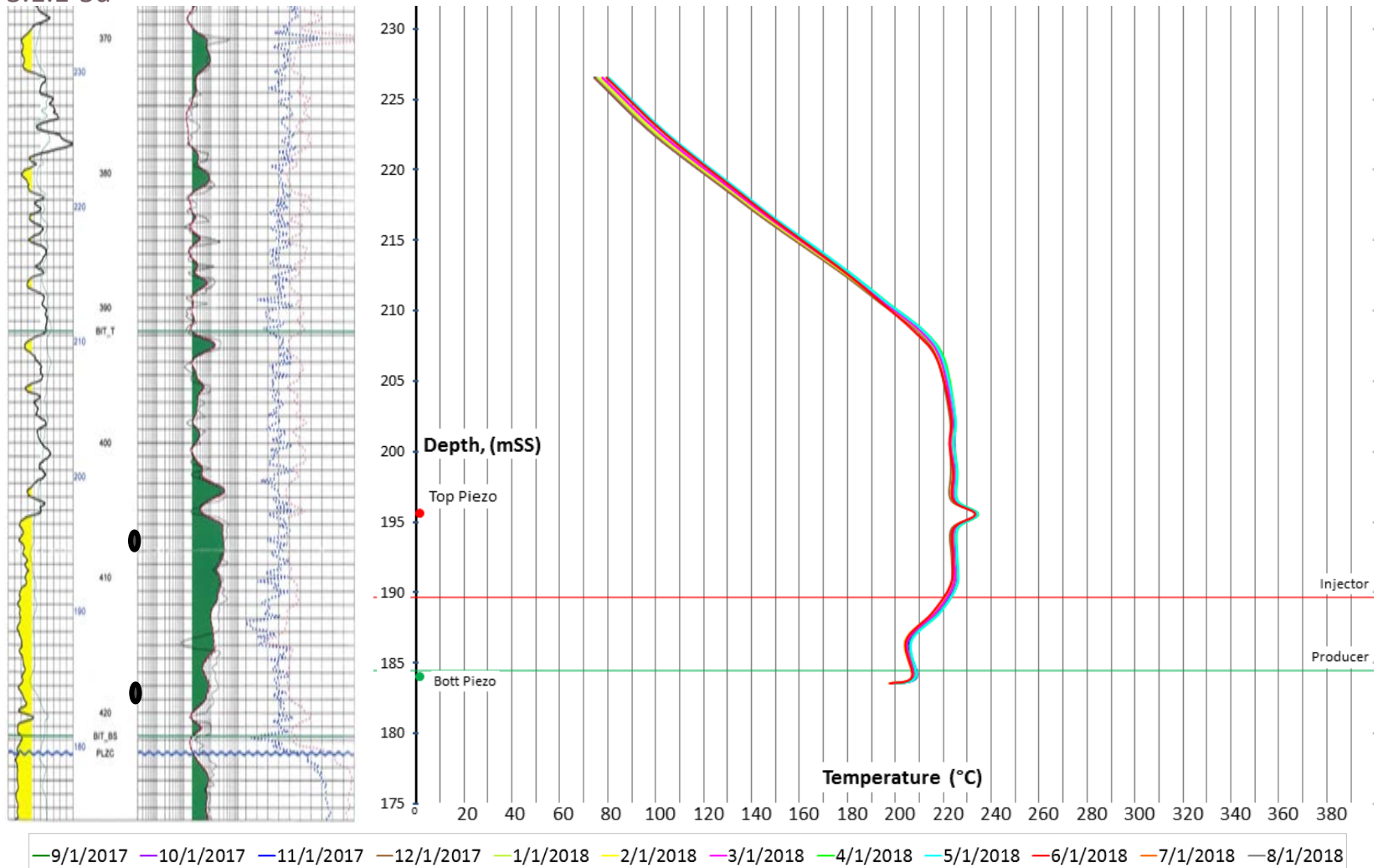
Pad B Heel Observation Well Pressure (6.5m from B2 well pair)

3.1.1-5d



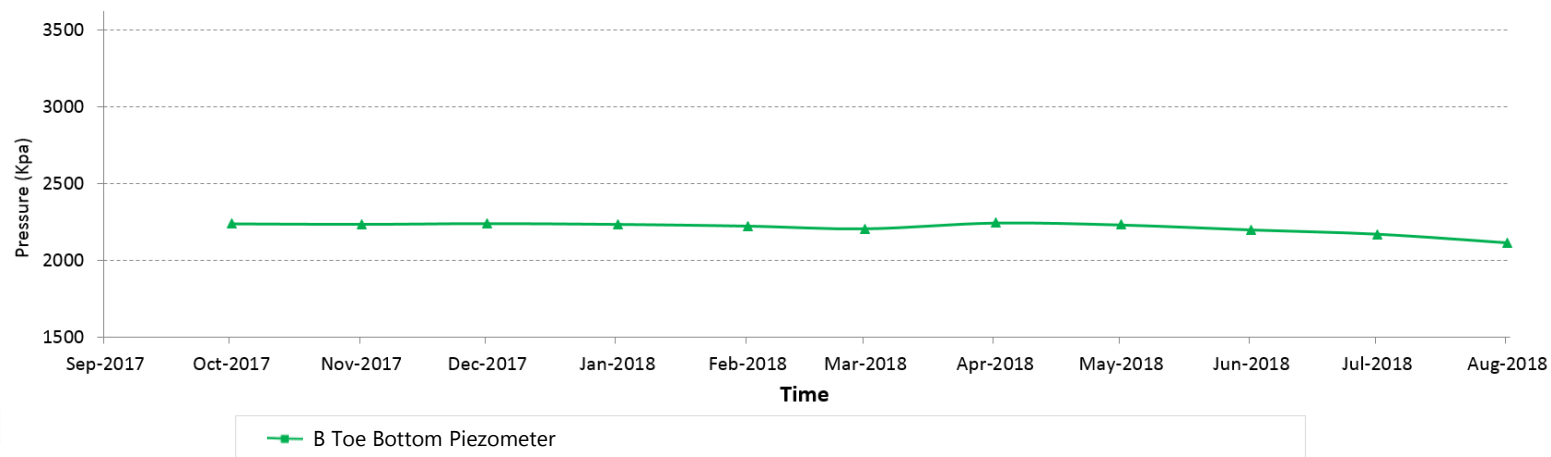
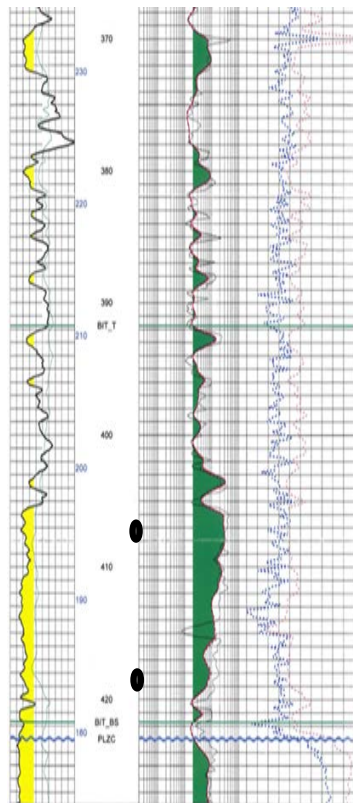
Pad B Toe Observation Well Temp (4.1m from B2 well pair)

3.1.1-5d



Pad B Toe Observation Well Pressure (4.1m from B2 well pair)

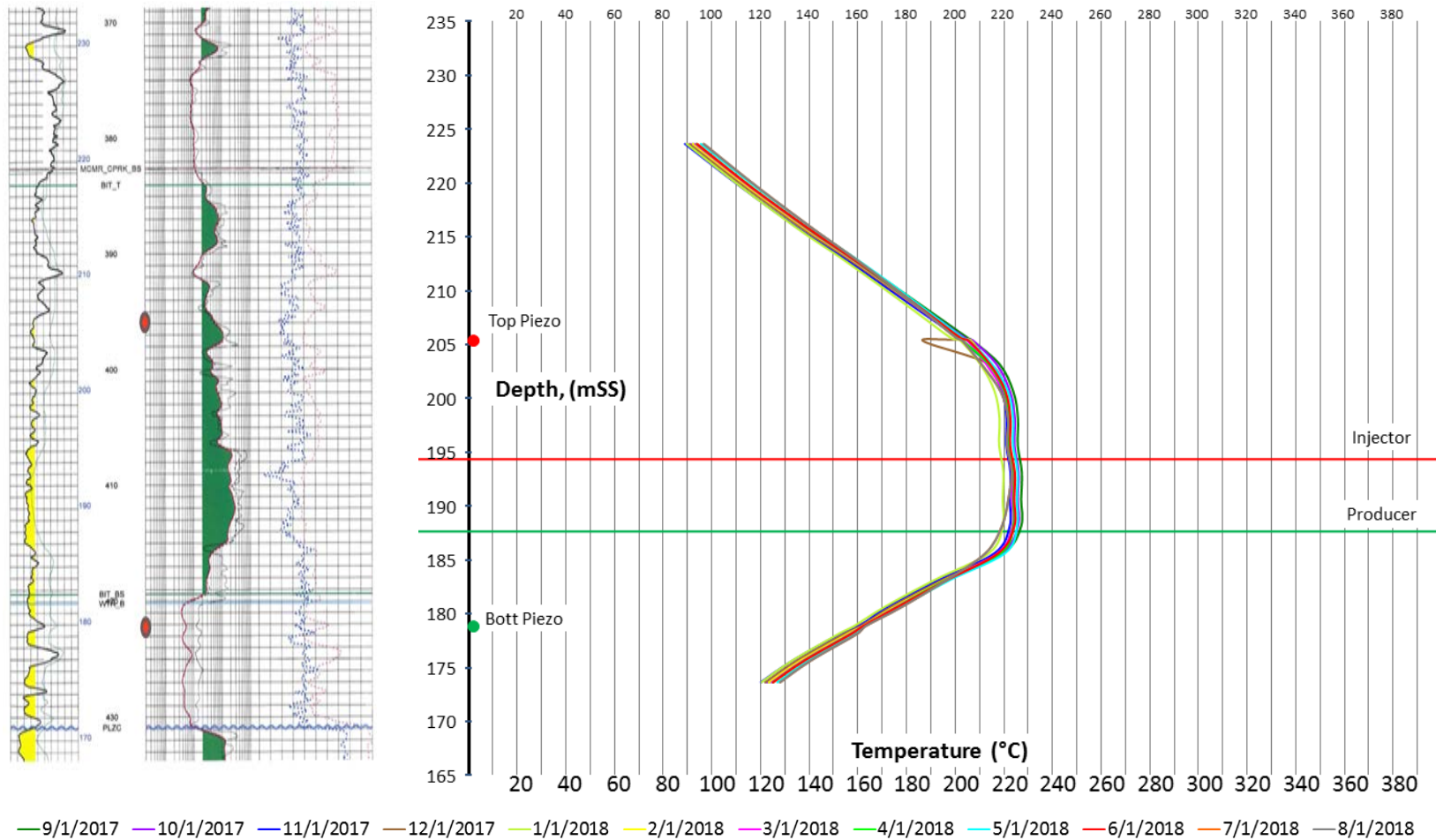
3.1.1-5d



* The top piezometer has failed

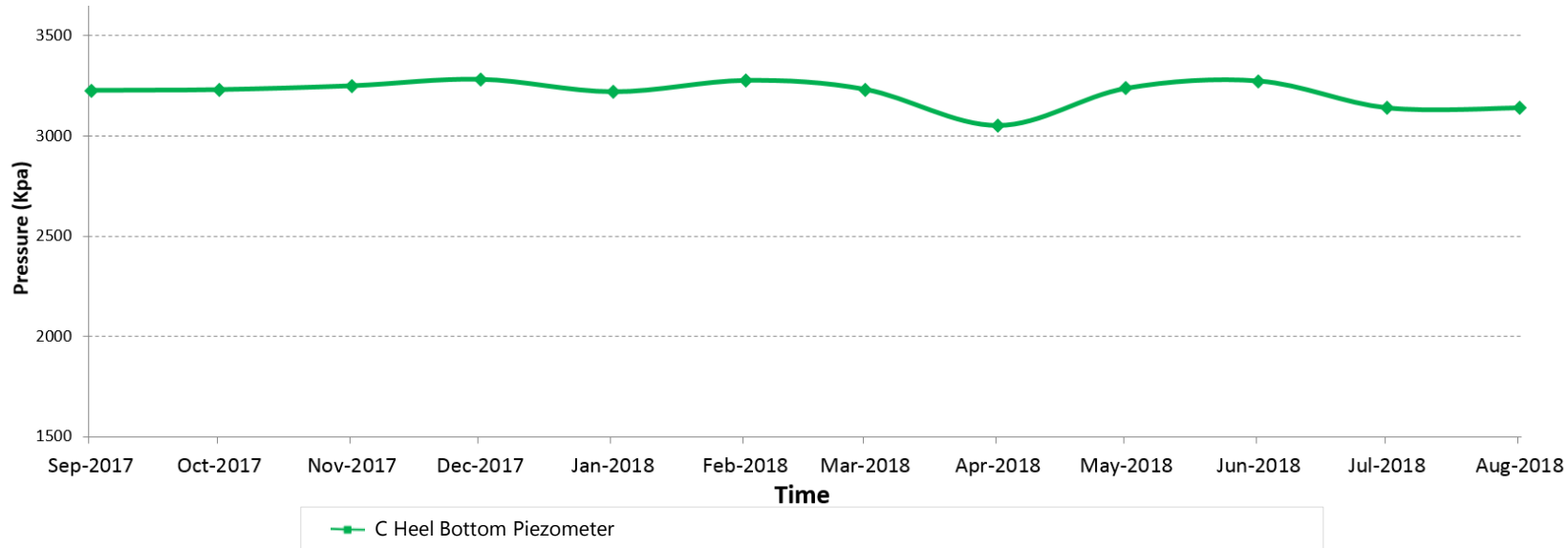
Pad C Heel Observation Well Temp (3.1m from C5 well pair)

3.1.1-5d



Pad C Heel Observation Well Pressure (3.1m from C5 well pair)

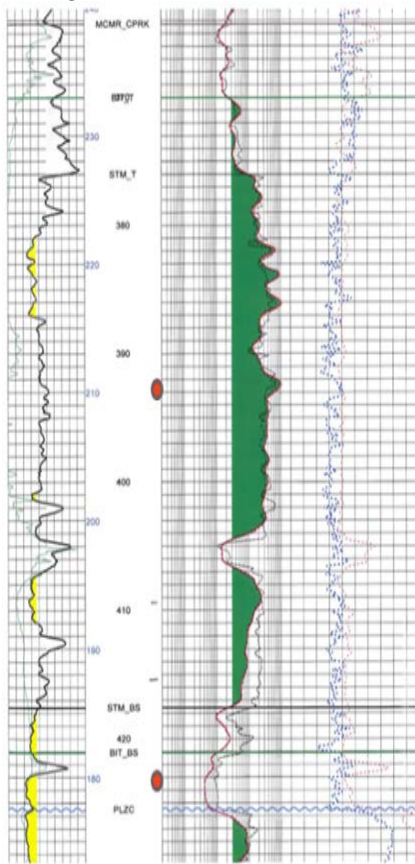
3.1.1-5d



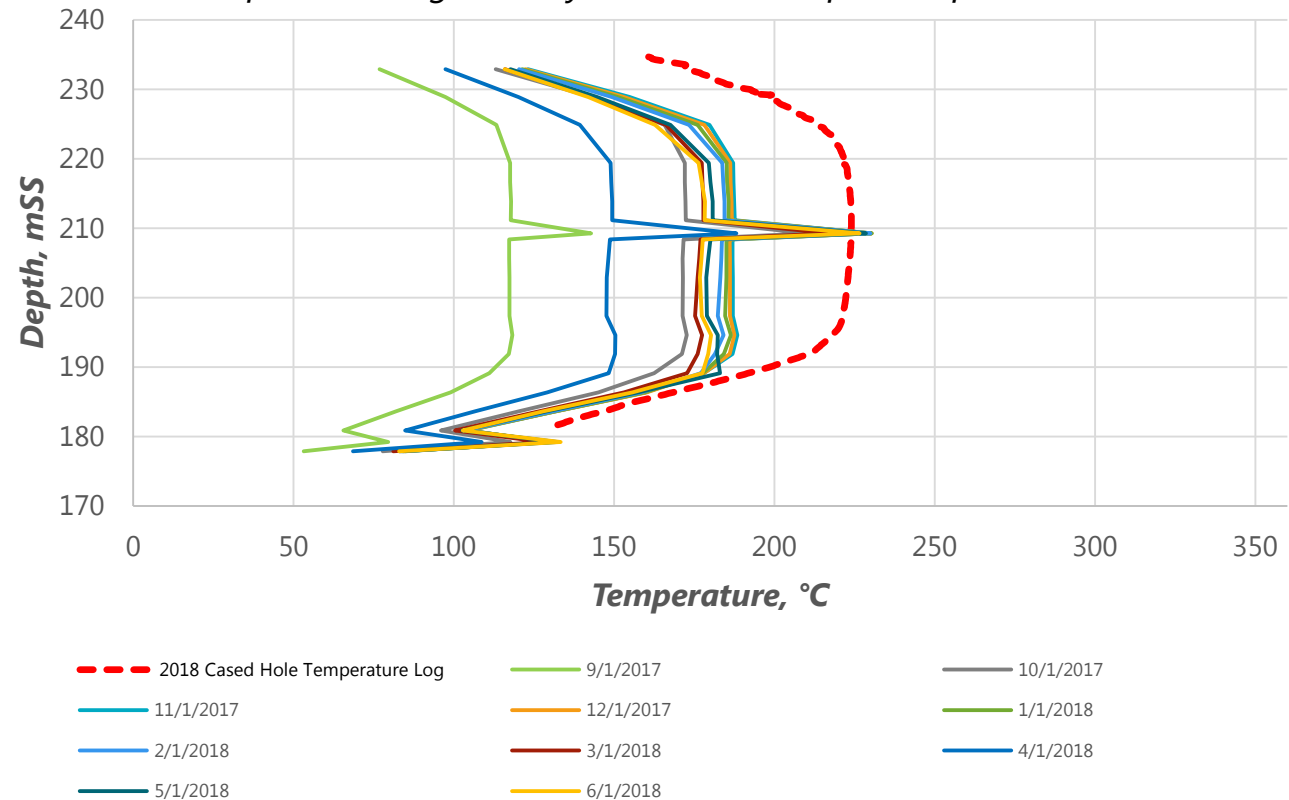
* The top piezometer has failed

Pad C Toe Observation Well Temperature (5.0m from C5 well pair)

3.1.1-5d



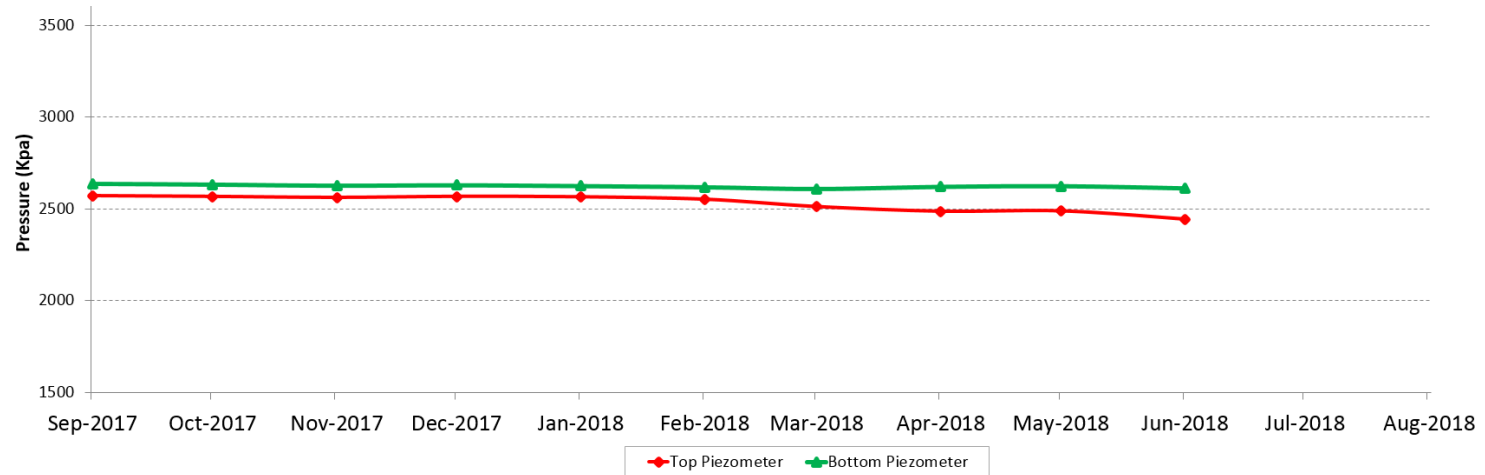
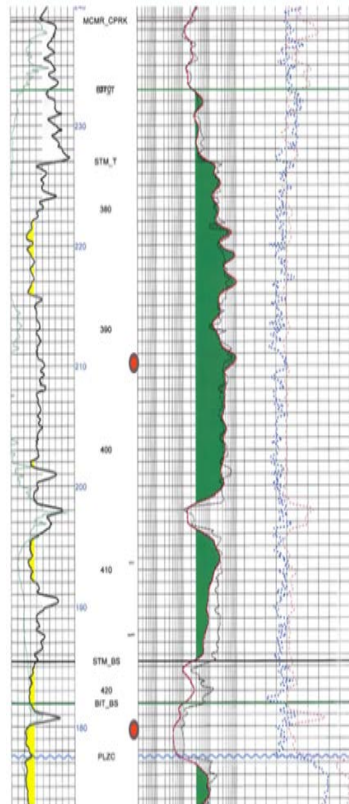
Temperature Log Overlay on Thermocouple Temperatures



**Thermocouple data experiencing temperature drift due to downhole reference thermocouple heating*

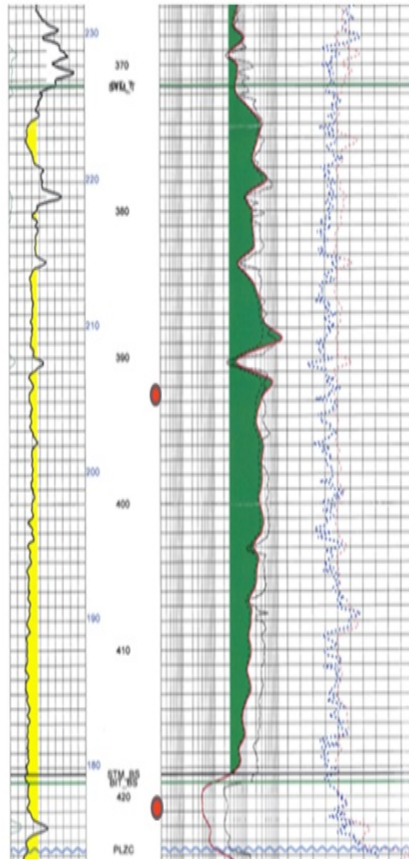
Pad C Toe Observation Well Pressure (5.0m from C5 well pair)

3.1.1-5d

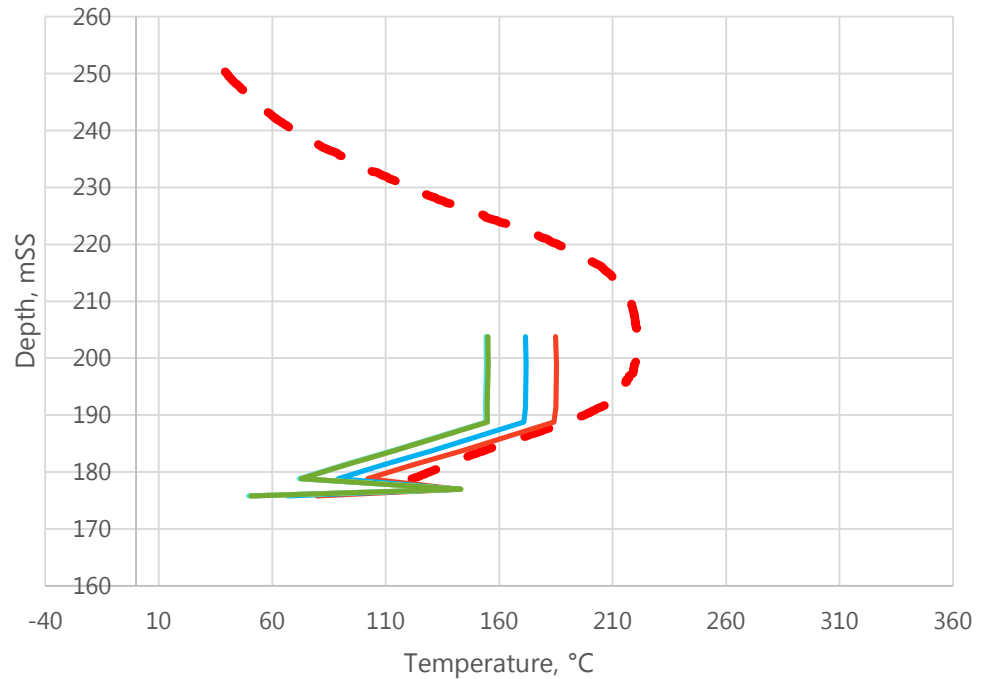


Pad D Heel Observation Well Temp (10.9m from D4 well pair)

3.1.1-5d



2018 Temperature Log and Thermocouple
Temperatures



- 2018 Cased Hole Temperature Log
- 9/1/2017
- 10/1/2017
- 11/1/2017
- 6/1/2018
- 7/1/2018
- 8/1/2018

Pad D Heel Observation Well Pressure (10.9m from D4 well pair)

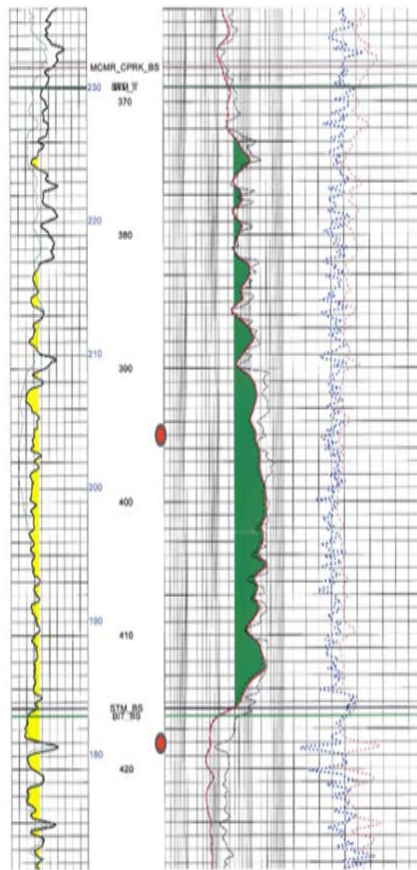
3.1.1-5d



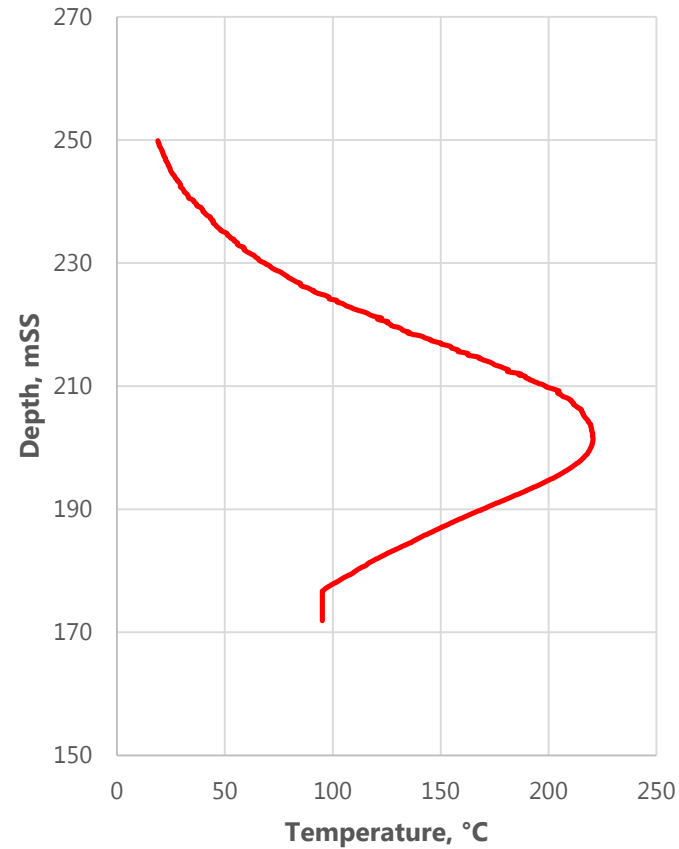
* The top piezometer has failed

Pad D Toe Observation Well Temp (19.8m from D4 well pair)

3.1.1-5d



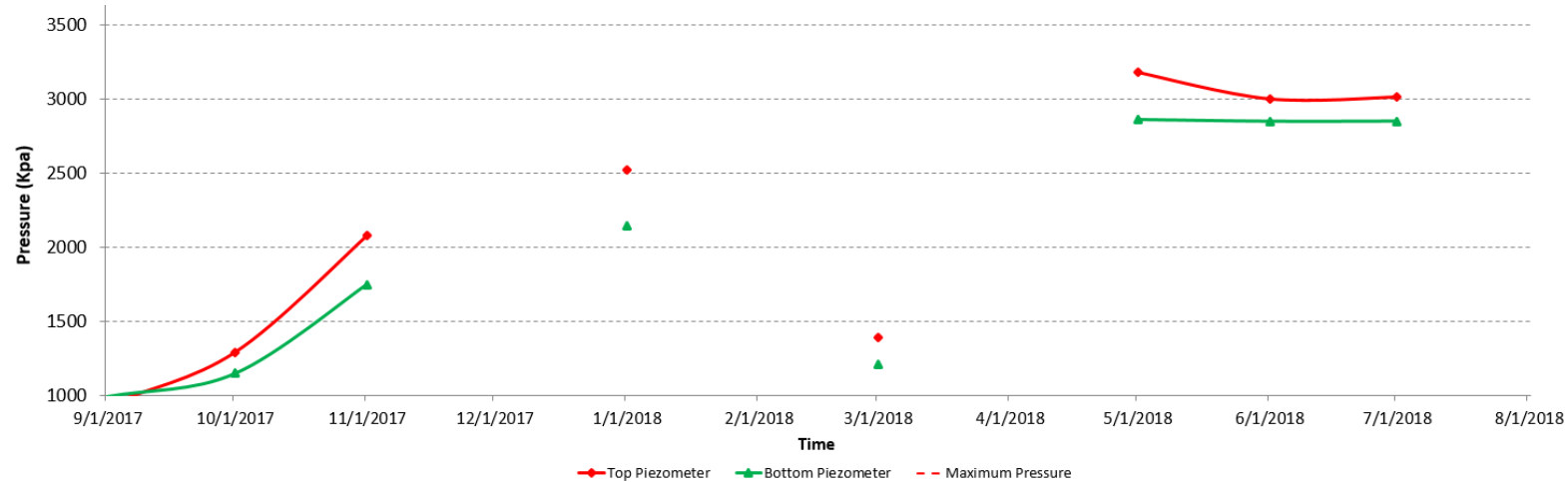
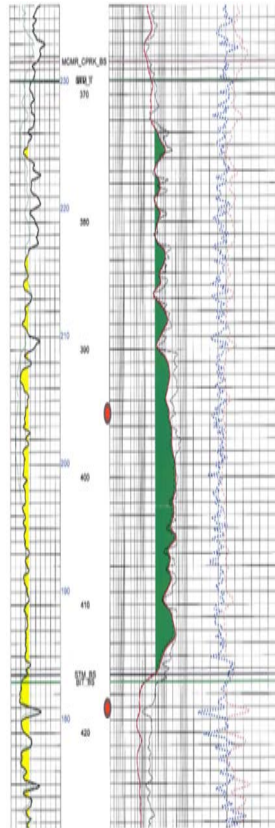
2018 Cased Hole Temperature Log



*Unreliable thermocouple data, highly fluctuating temperatures

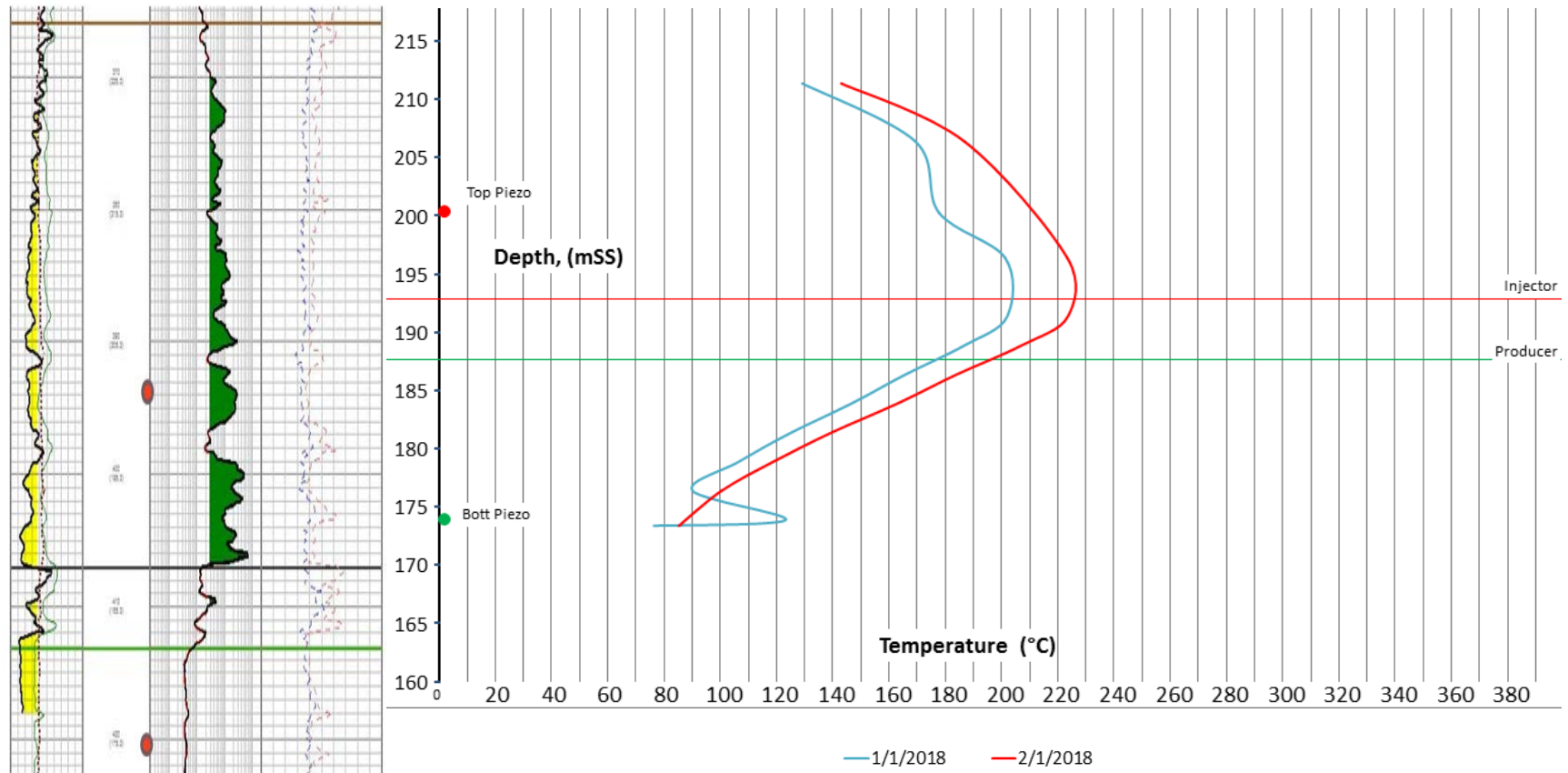
Pad D Toe Observation Well Pressure (19.8m from D4 well pair)

3.1.1-5d



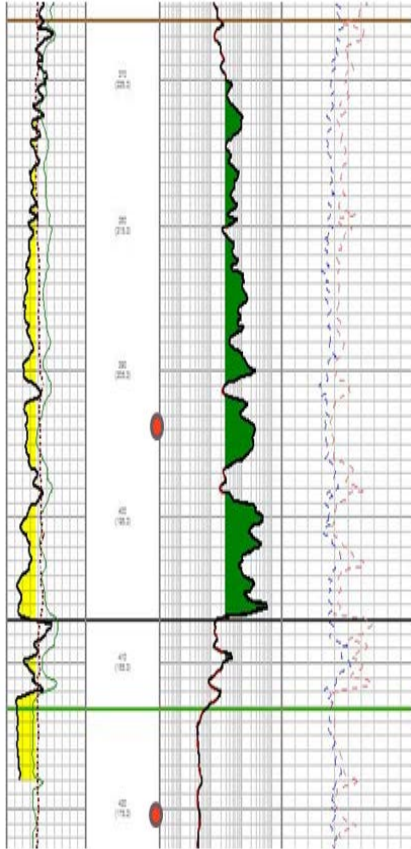
Pad E Heel Observation Well Temp (35m from E5 well pair)

3.1.1-5d



Pad E Heel Observation Well Pressure (35m from E5 well pair)

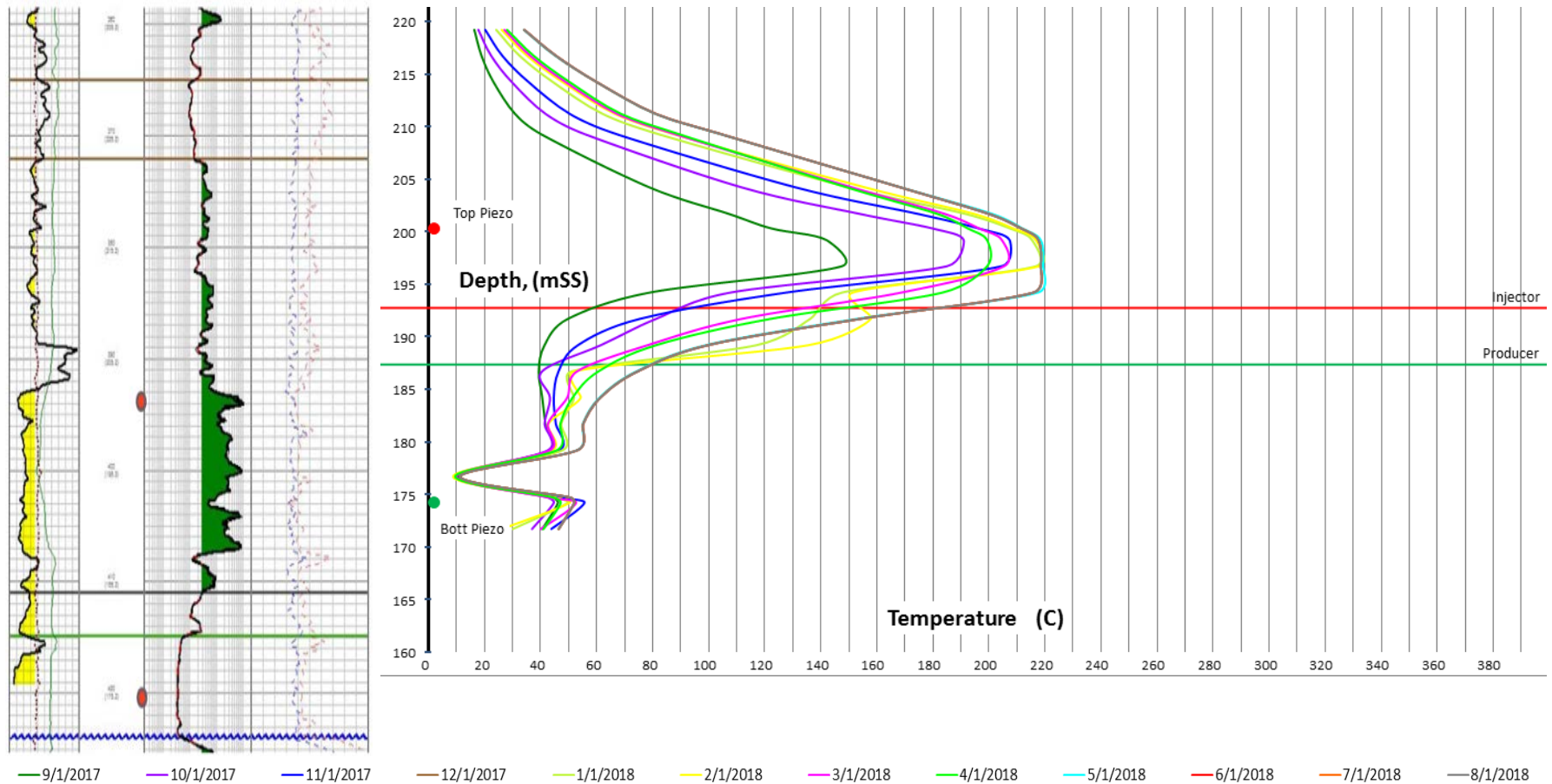
3.1.1-5d



- Both of the piezometers have failed.

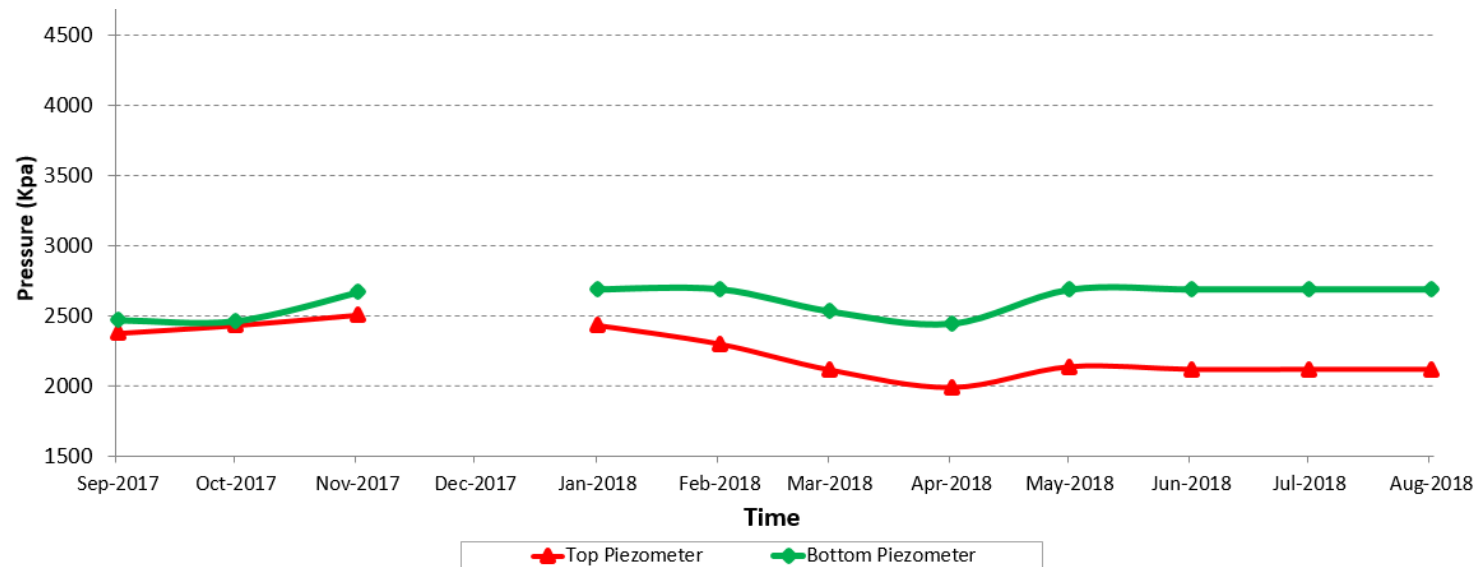
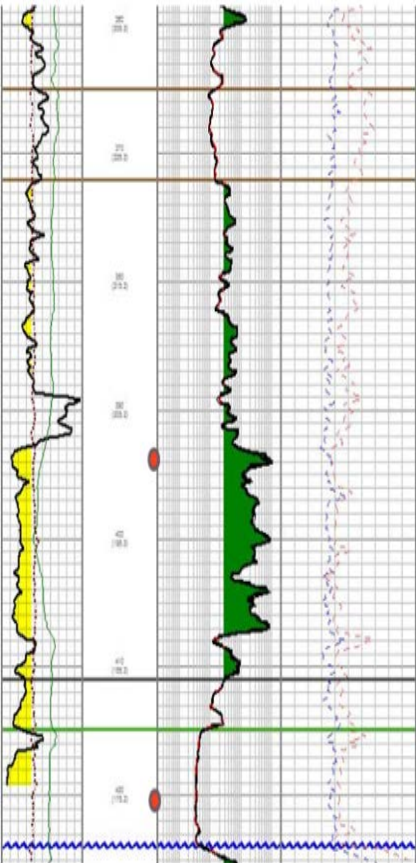
Pad E Toe Observation Well Temp (32m from E6 well pair)

3.1.1-5d



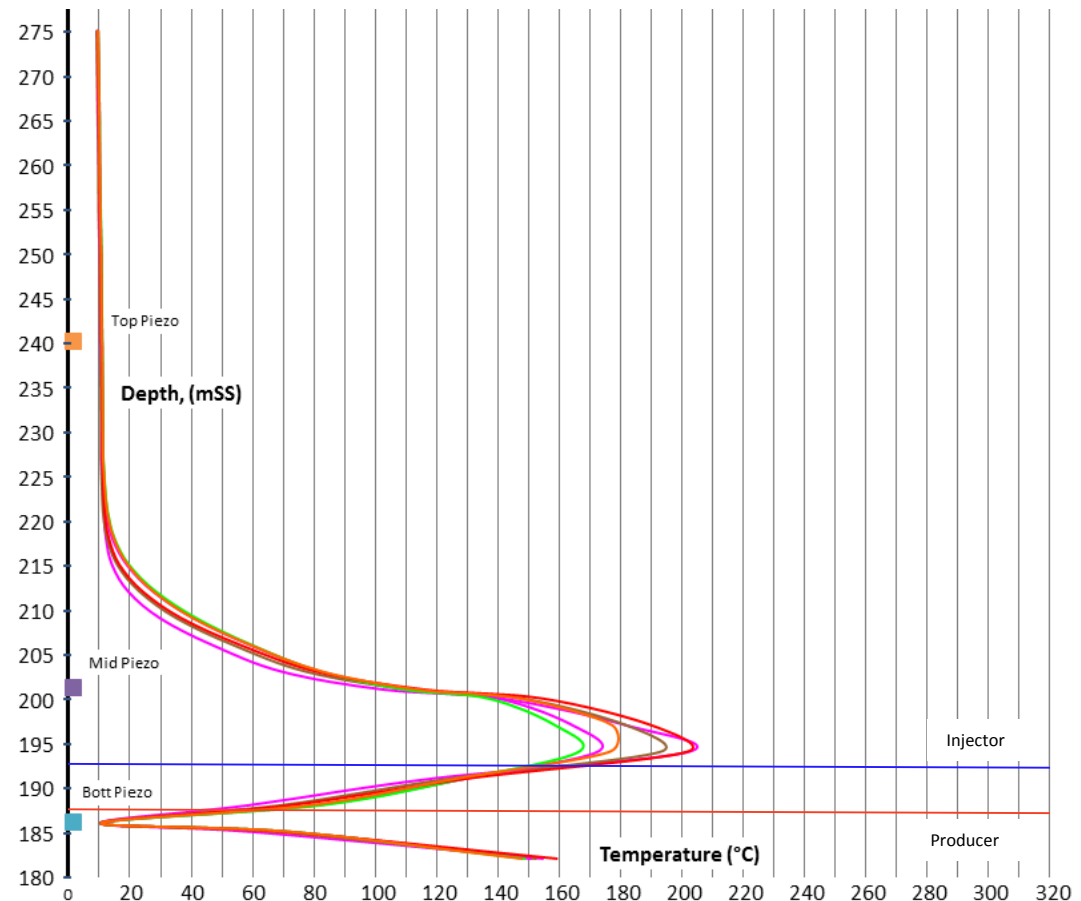
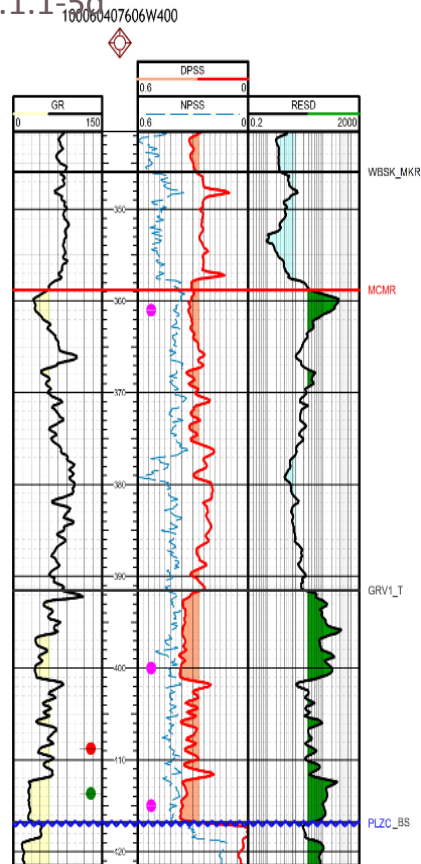
Pad E Toe Observation Well Pressure (32m from E6 well pair)

3.1.1-5d



Pad F Heel Observation Well Temp (17m from F8 well pair)

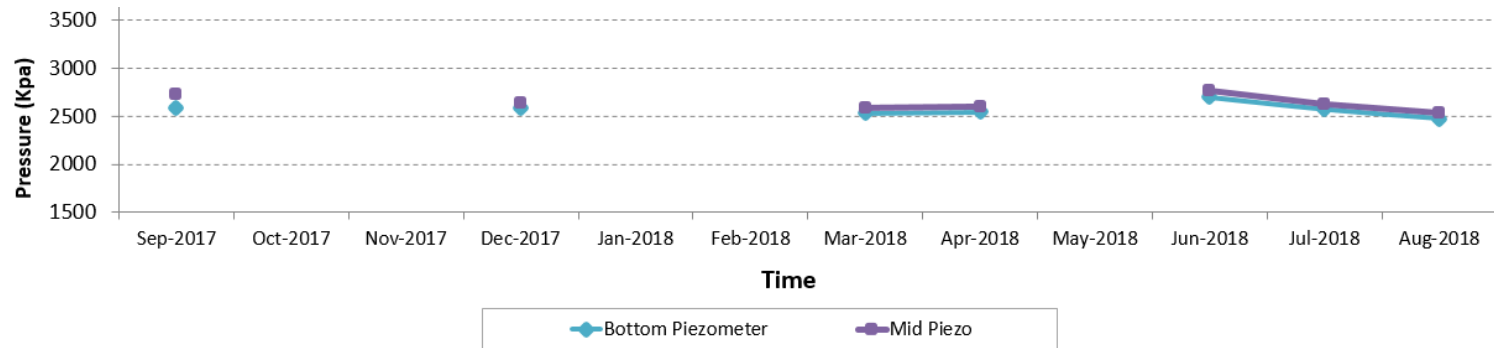
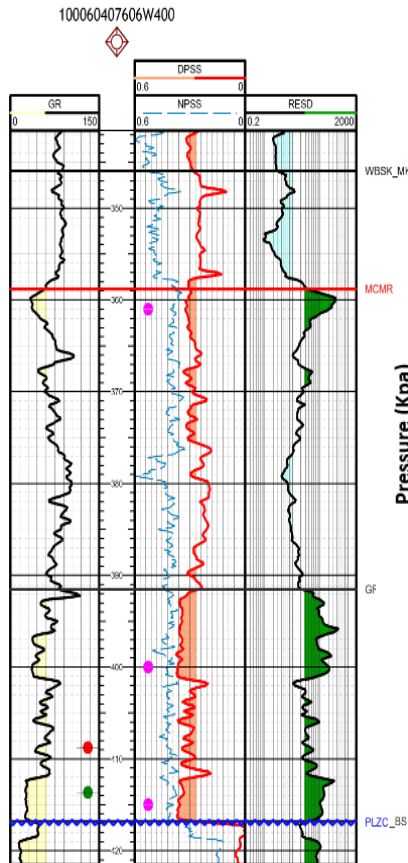
3.1.1-5d



—9/1/2017 —10/1/2017 —11/1/2017 —12/1/2017 —1/1/2018 —2/1/2018 —3/1/2018 —4/1/2018 —5/1/2018 —6/1/2018 —7/1/2018 —8/1/2018

Pad F Heel Observation Well Pressure (17m from F8 well pair)

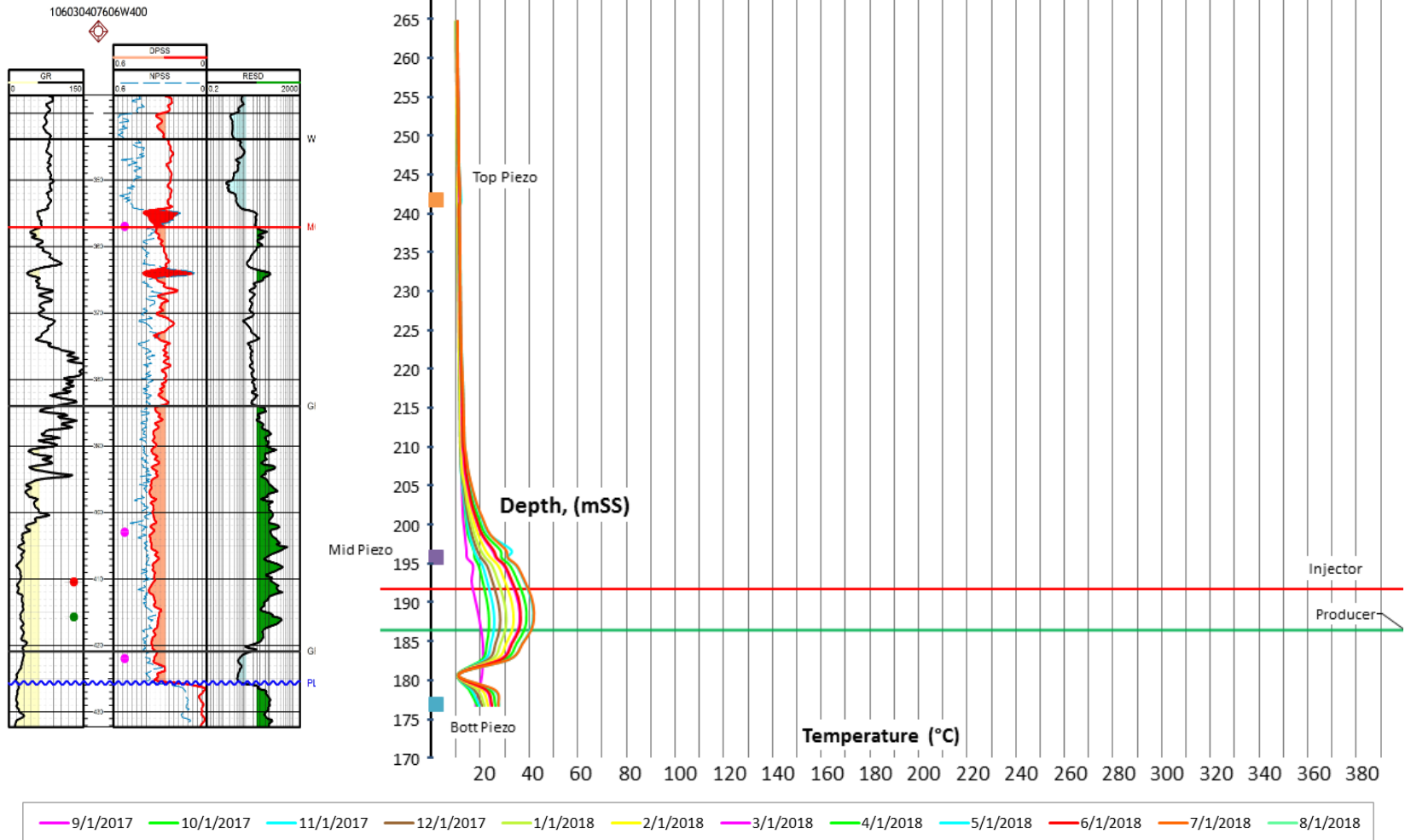
3.1.1-5d



* The top piezometer has failed

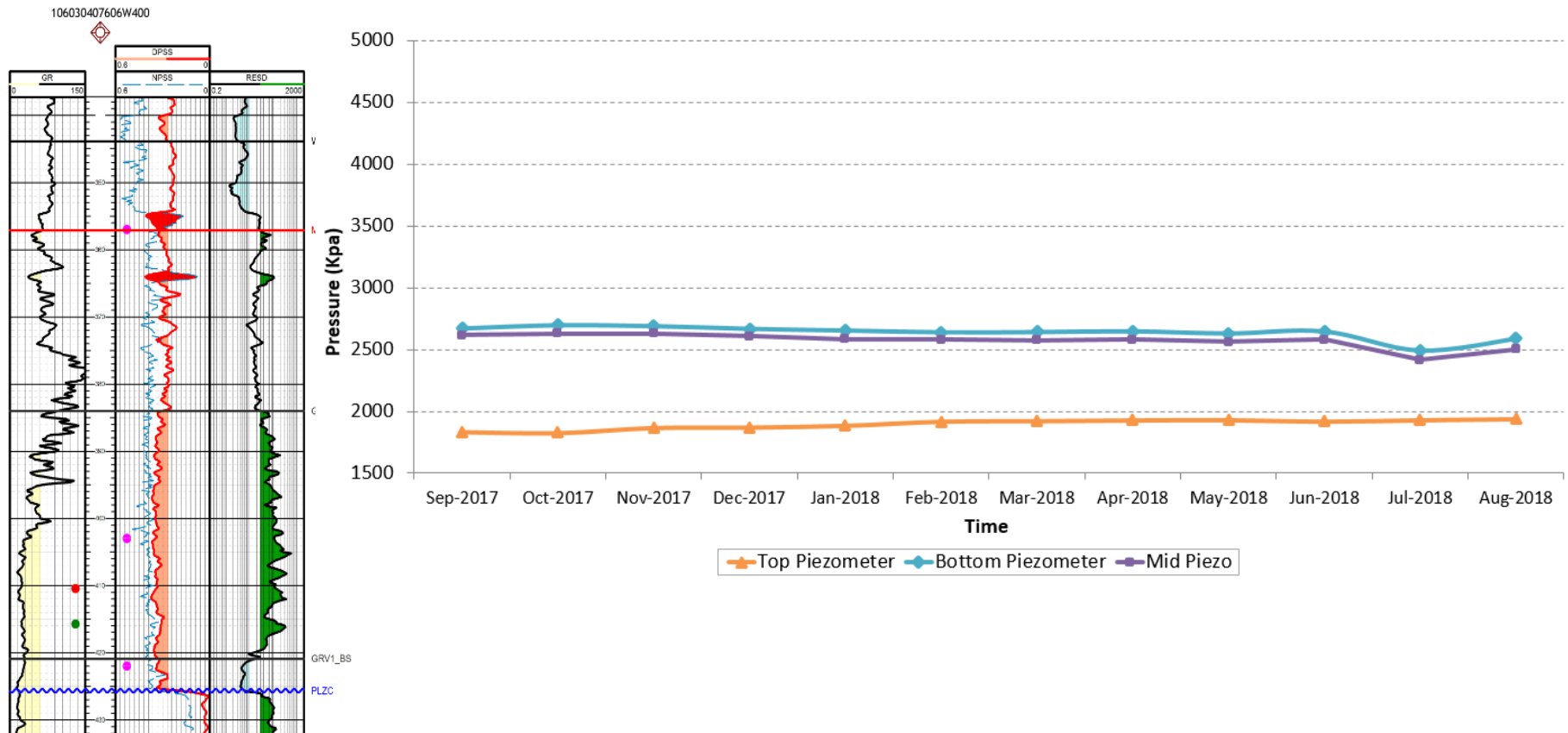
Pad F Toe Observation Well Temp (20m from F5 well pair)

3.1.1-5d



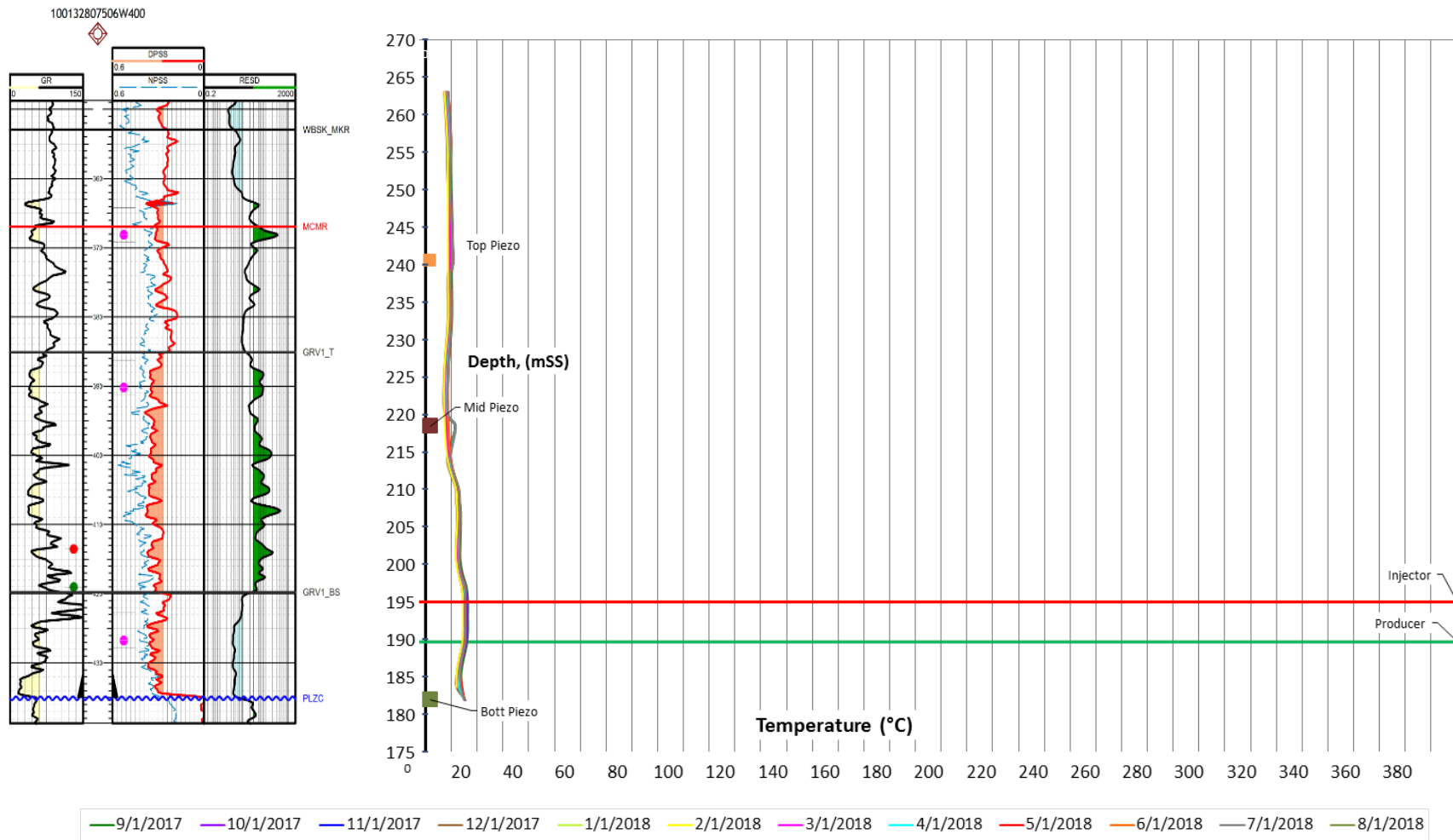
Pad F Toe Observation Well Pressure (20m from F5 well pair)

3.1.1-5d



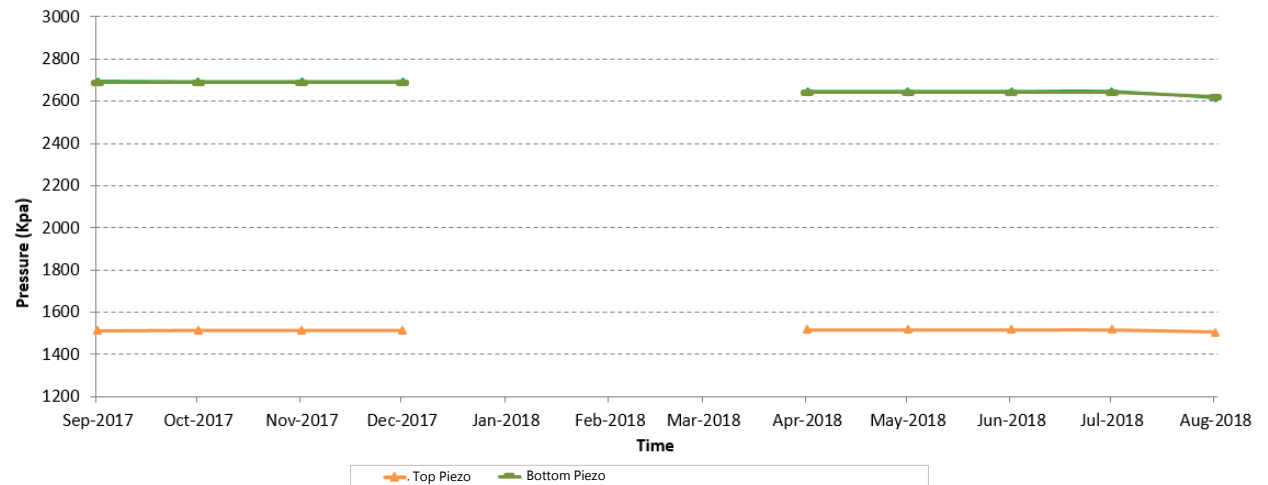
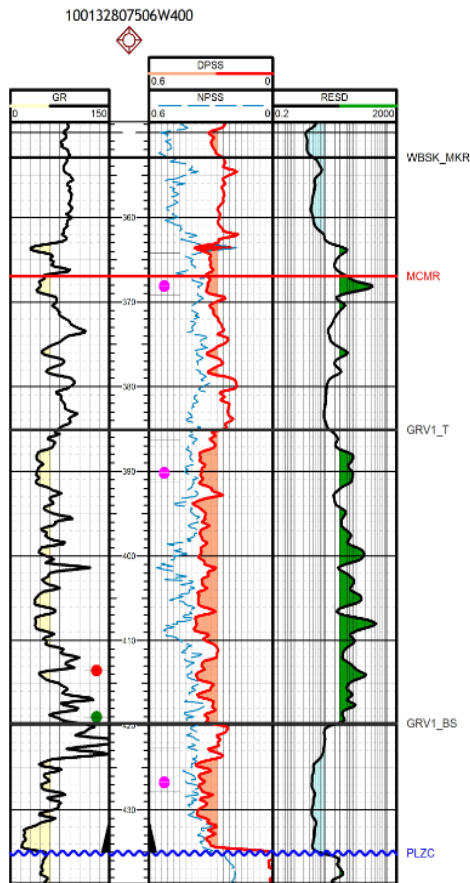
Pad G Heel Observation Well Temp (13m from G2 well pair)

3.1.1-5d



Pad G Heel Observation Well Pressure (13m from G2 well pair)

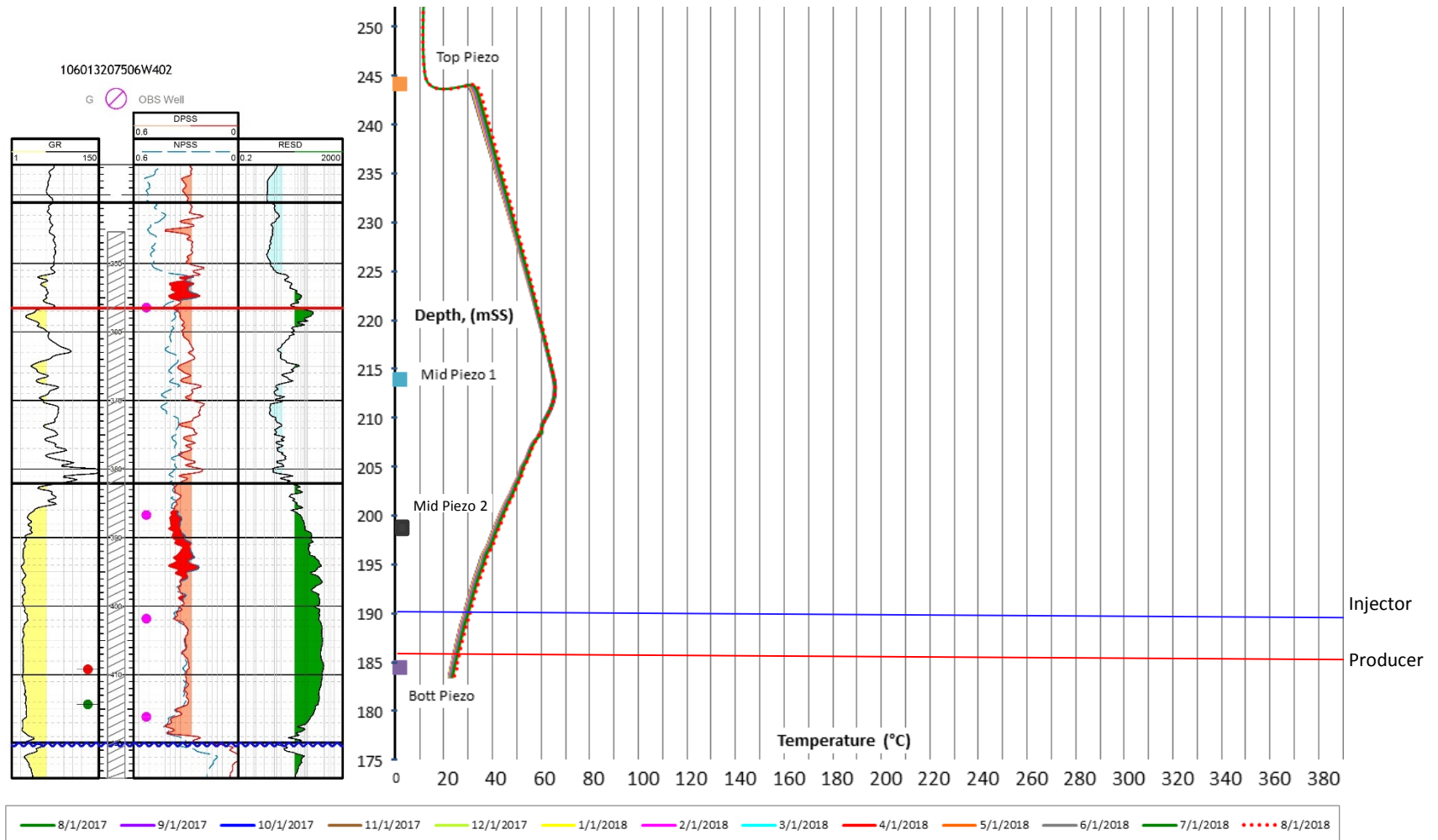
3.1.1-5d



* The middle piezometer has failed

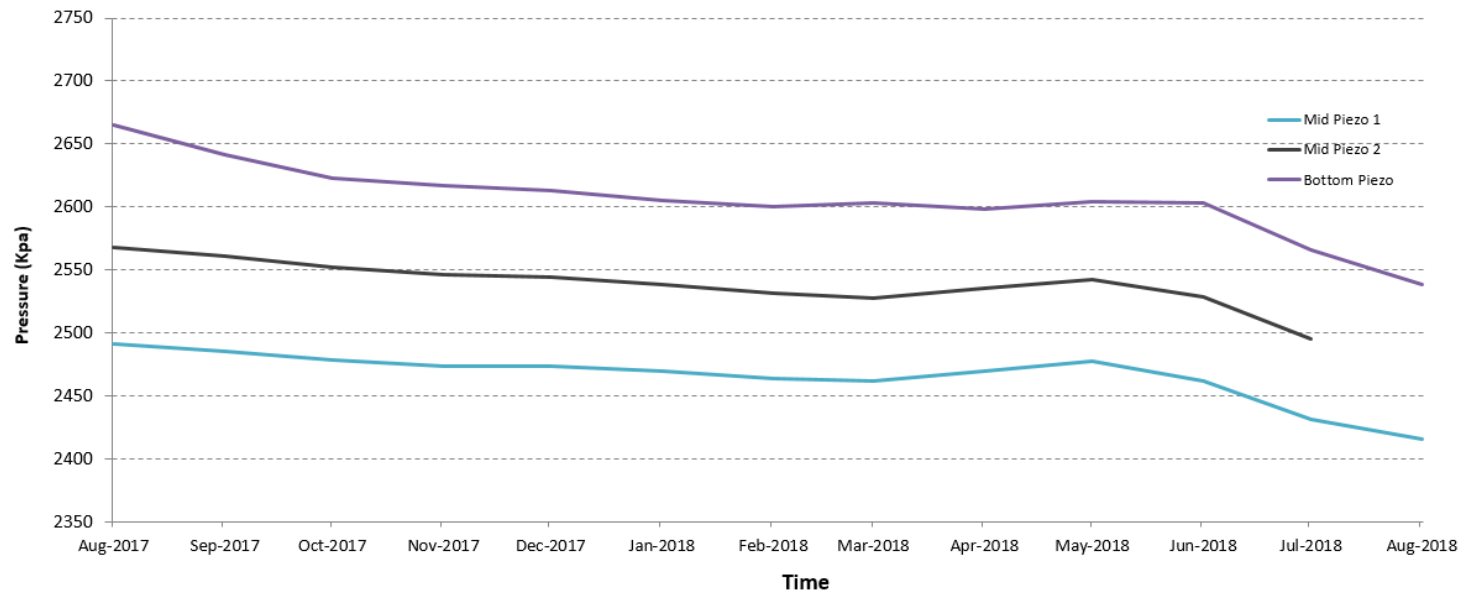
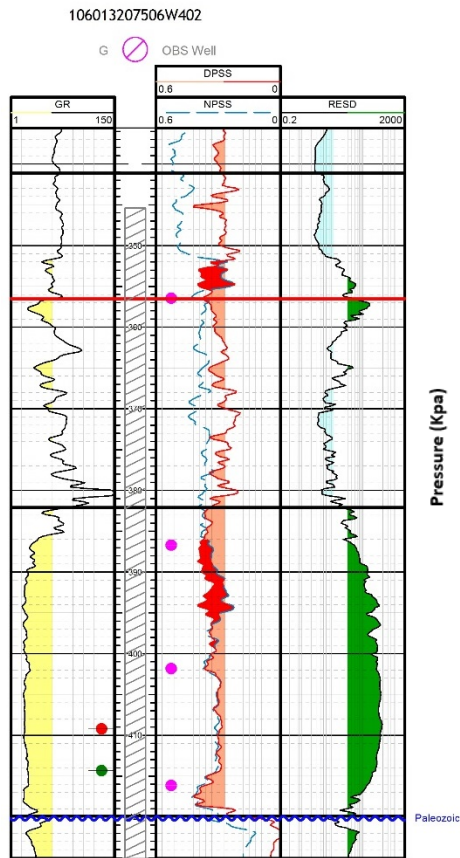
Pad G Mid Observation Well Temp (36m from G6 well pair)

3.1.1-5d



Pad G Mid Observation Well Pressure (36m from G6 well pair)

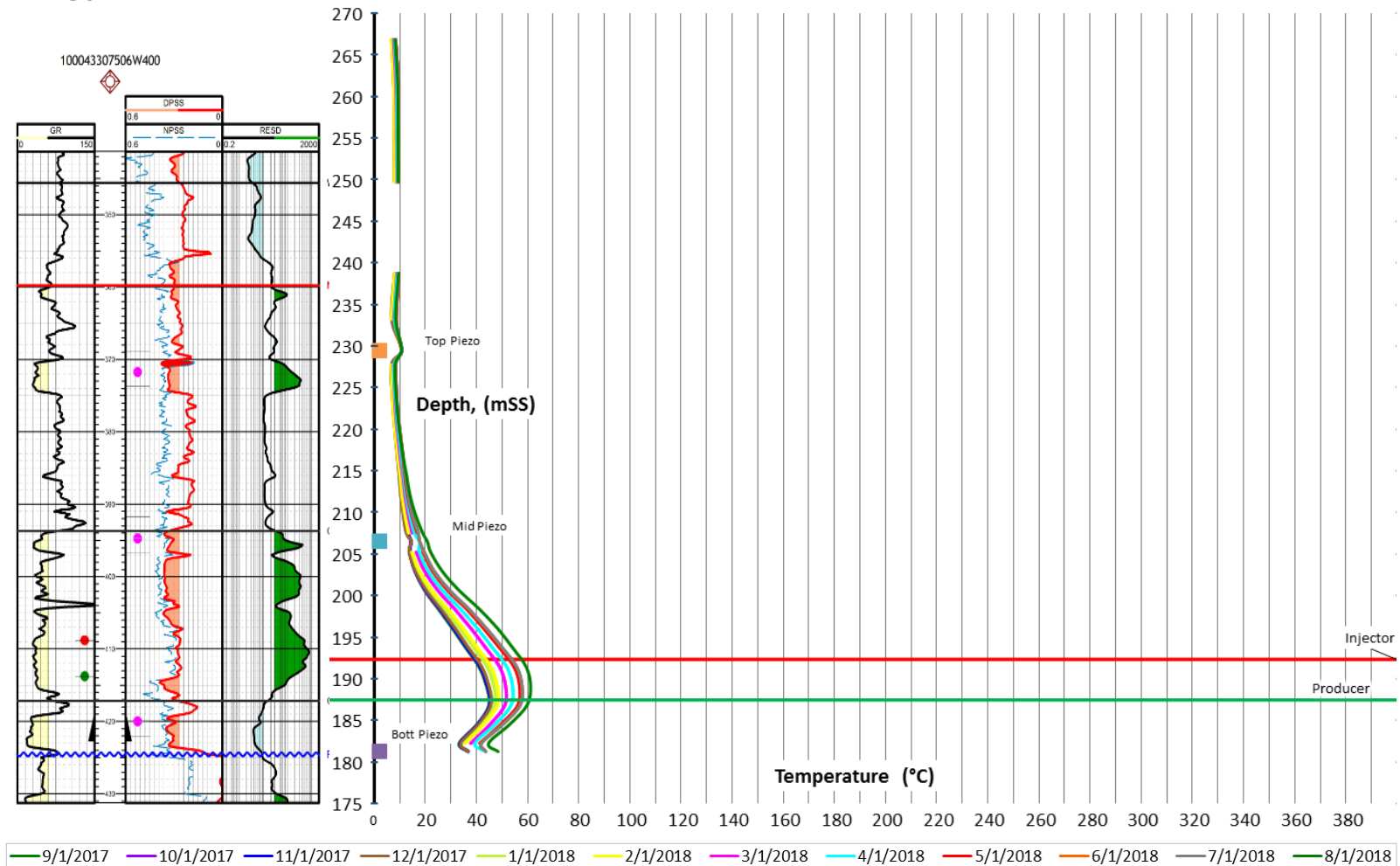
3.1.1-5d



* The top piezometer has failed

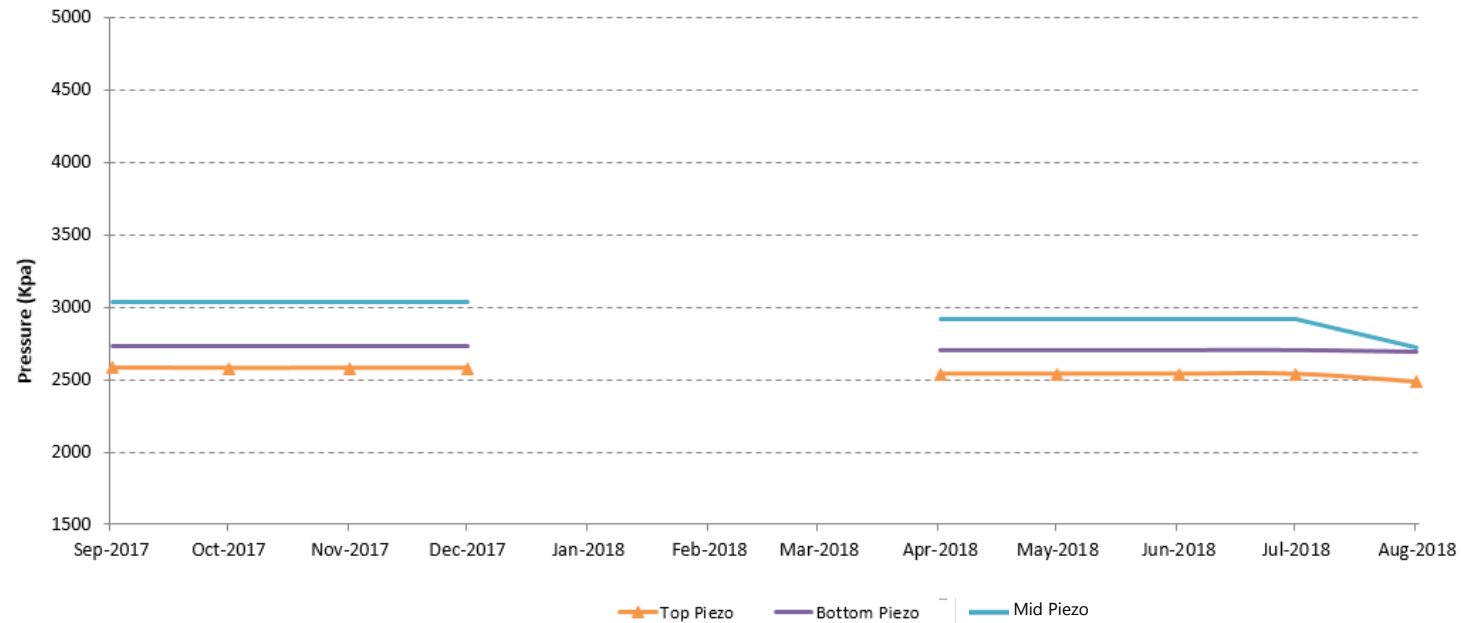
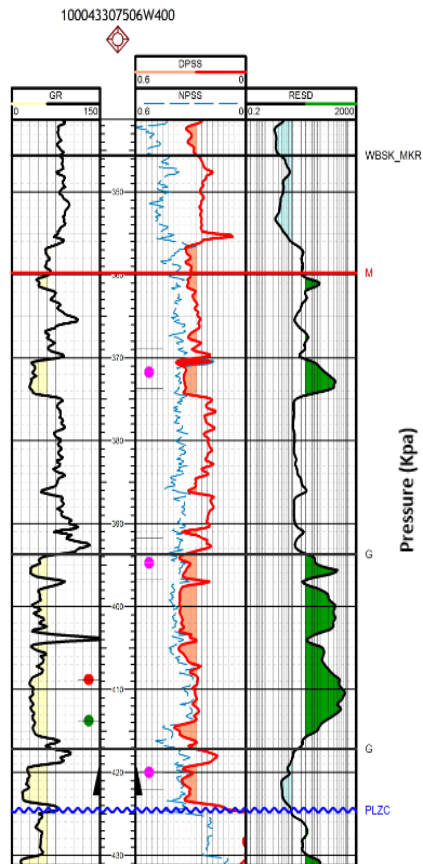
Pad G Toe Observation Well Temp (4m from G1 well pair)

3.1.1-5d



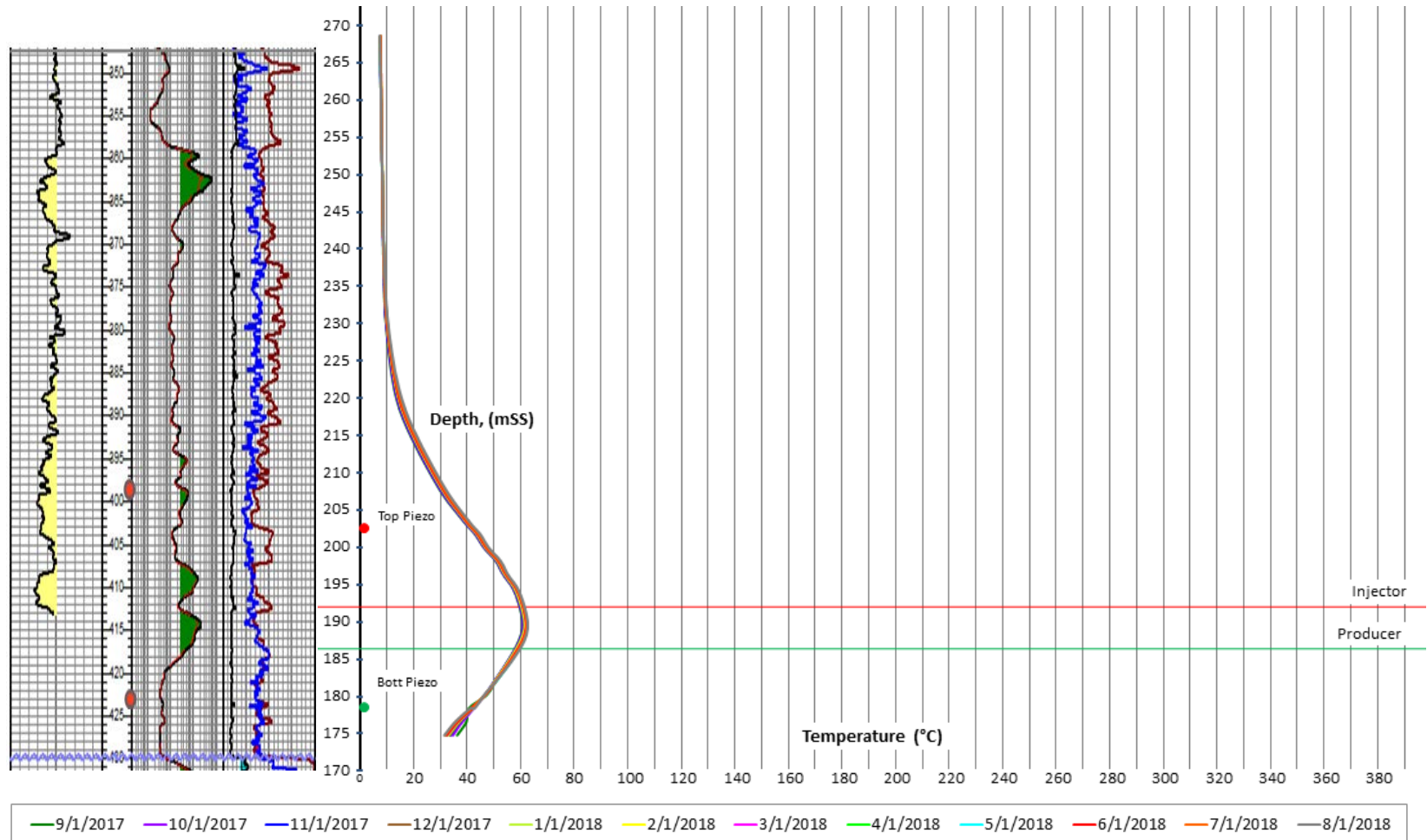
Pad G Toe Observation Well Pressure (4m from G1 well pair)

3.1.1-5d



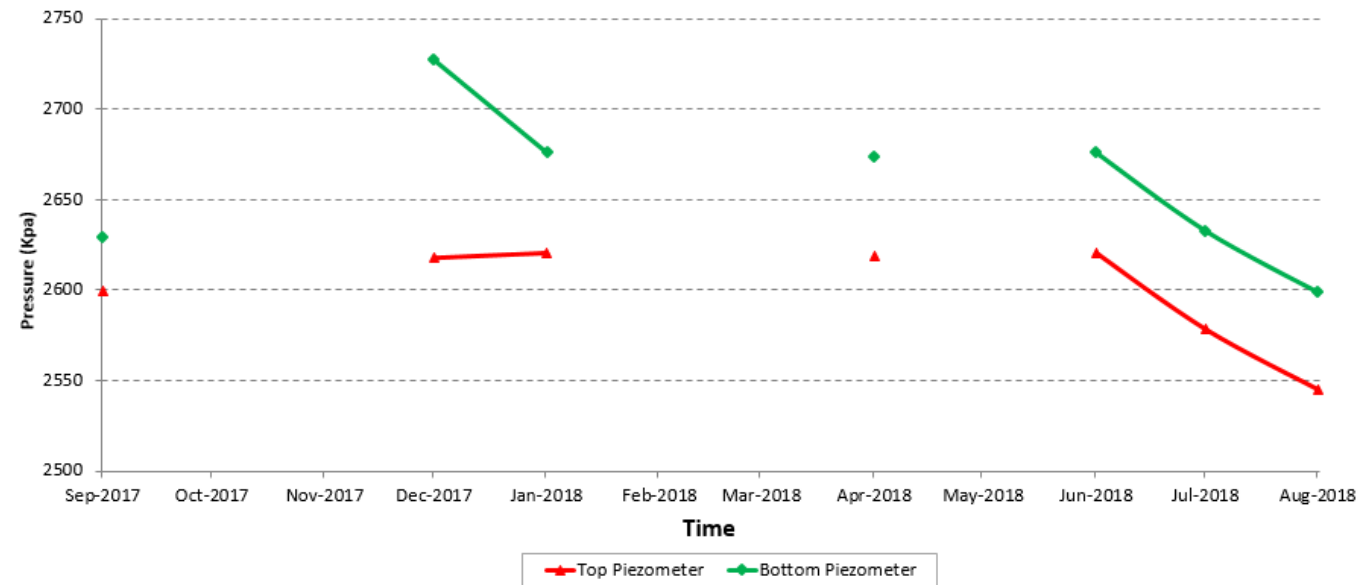
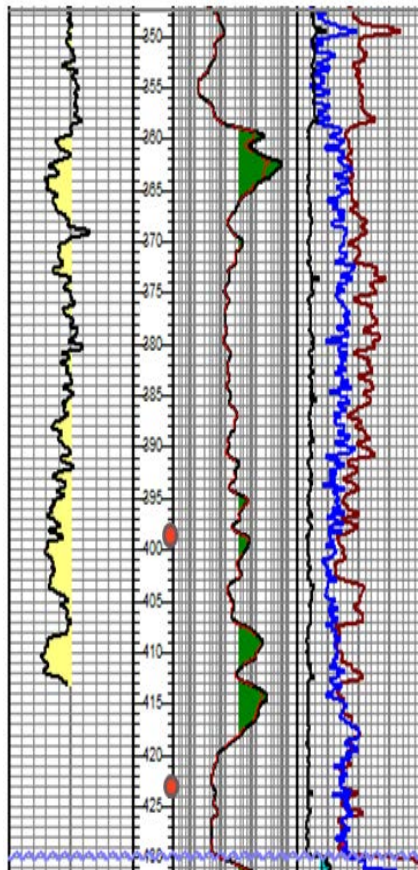
Pad H Heel Observation Well Temp (11.4m from H7 well pair)

3.1.1-5d



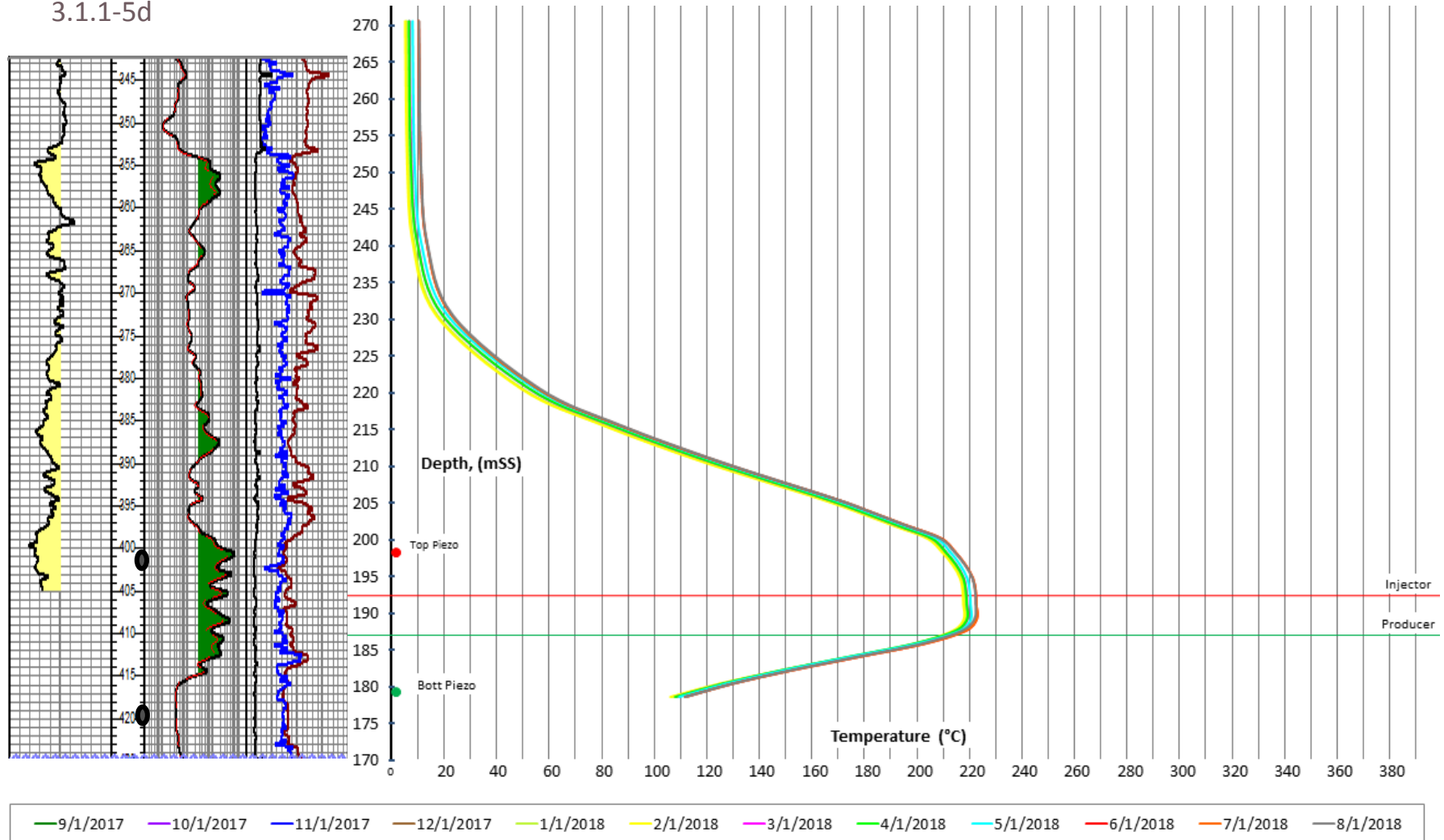
Pad H Heel Observation Well Pressure (11.4m from H7 well pair)

3.1.1-5d



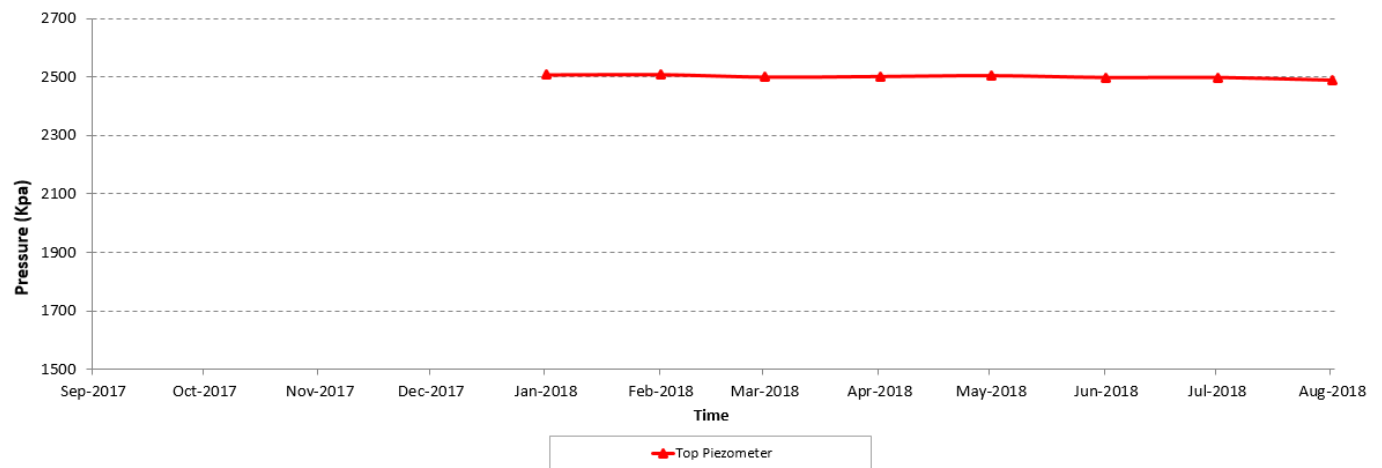
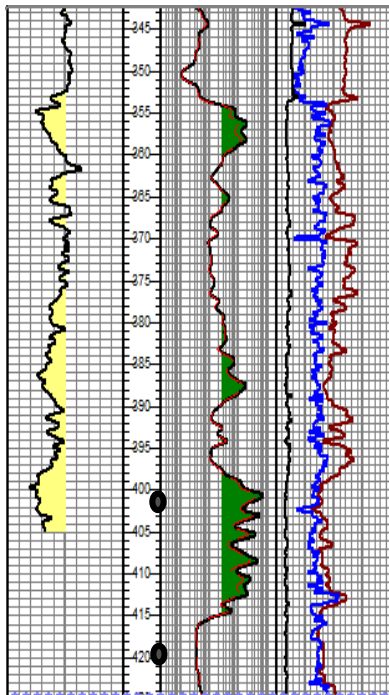
Pad H Toe Observation Well Temp (7.4m from H4 well pair)

3.1.1-5d



Pad H Toe Observation Well Pressure (7.4m from H4 well pair)

3.1.1-5d



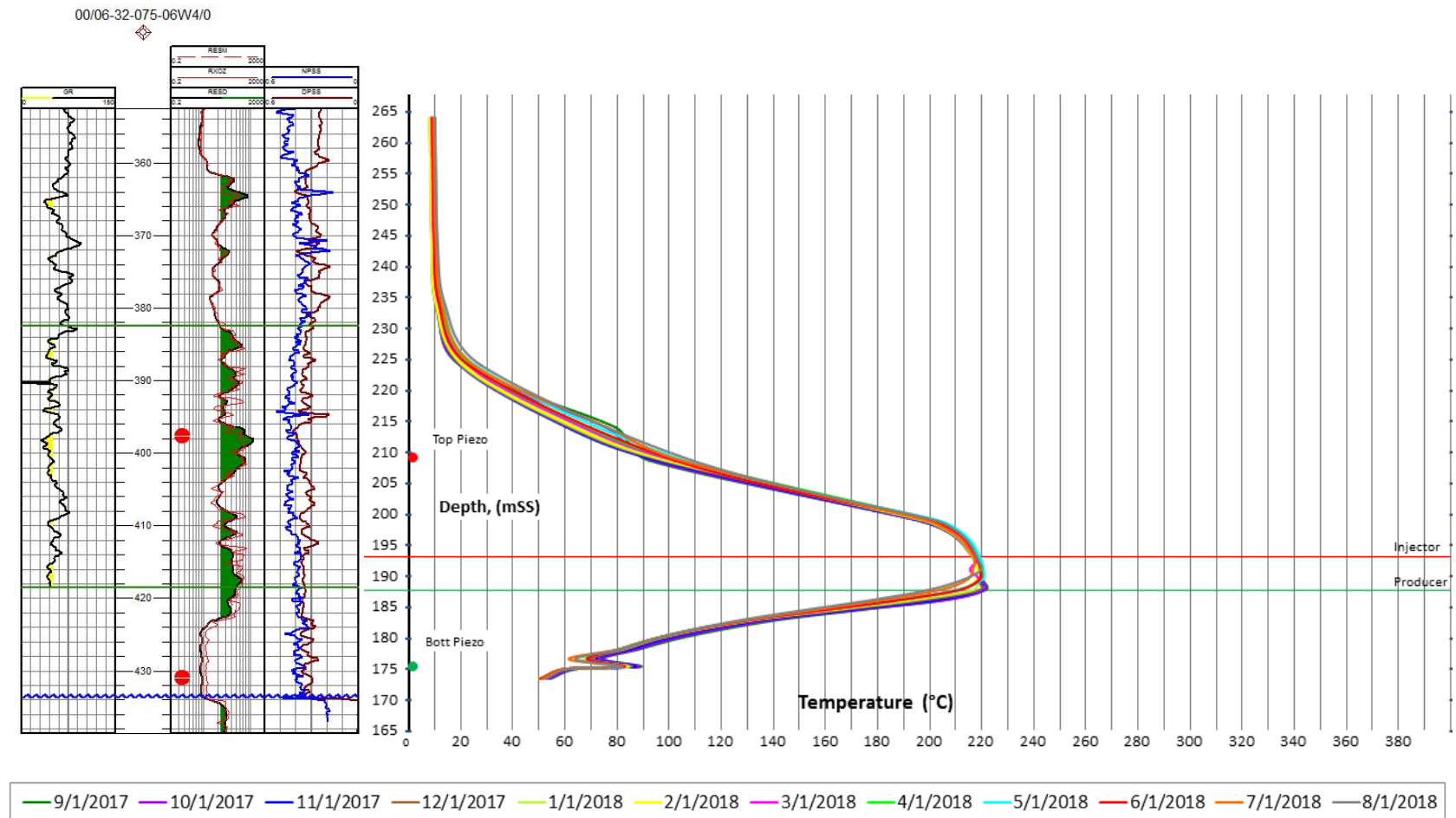
* The bottom piezometer has failed

Pad I Toe* Observation Well Temp

*Both pad observation wells at toe of Pad I

(7m from I5 well pair)

3.1.1-5d

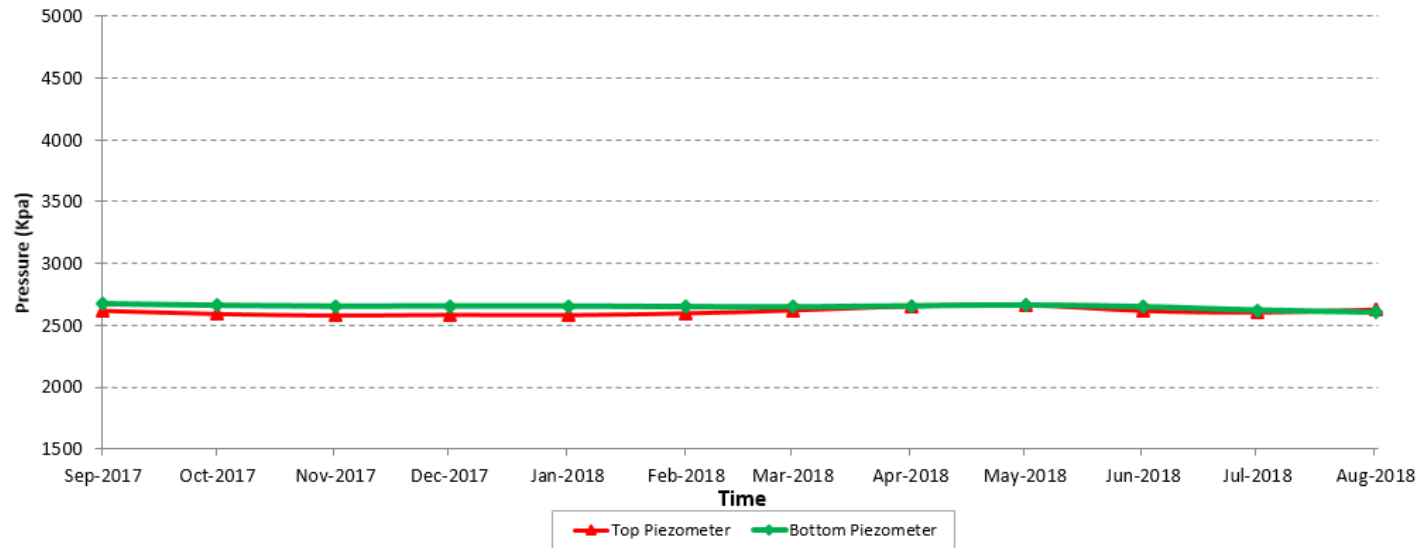
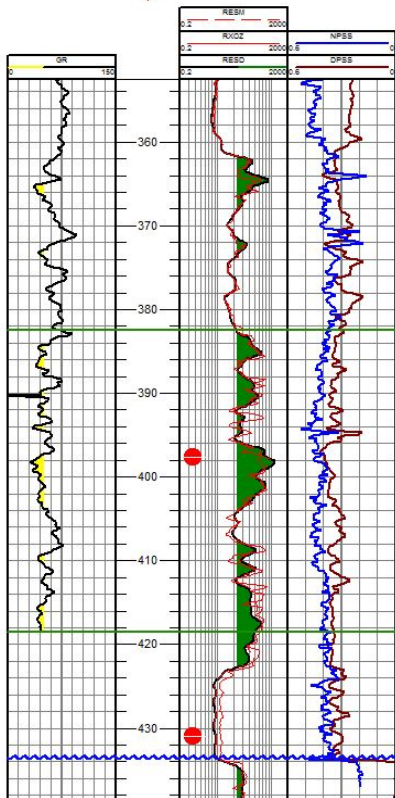


Pad I Toe* Observation Well Pressure

*Both pad observation wells at toe of Pad I
(7m from I5 well pair)

3.1.1-5d

00/06-32-075-06W4/0

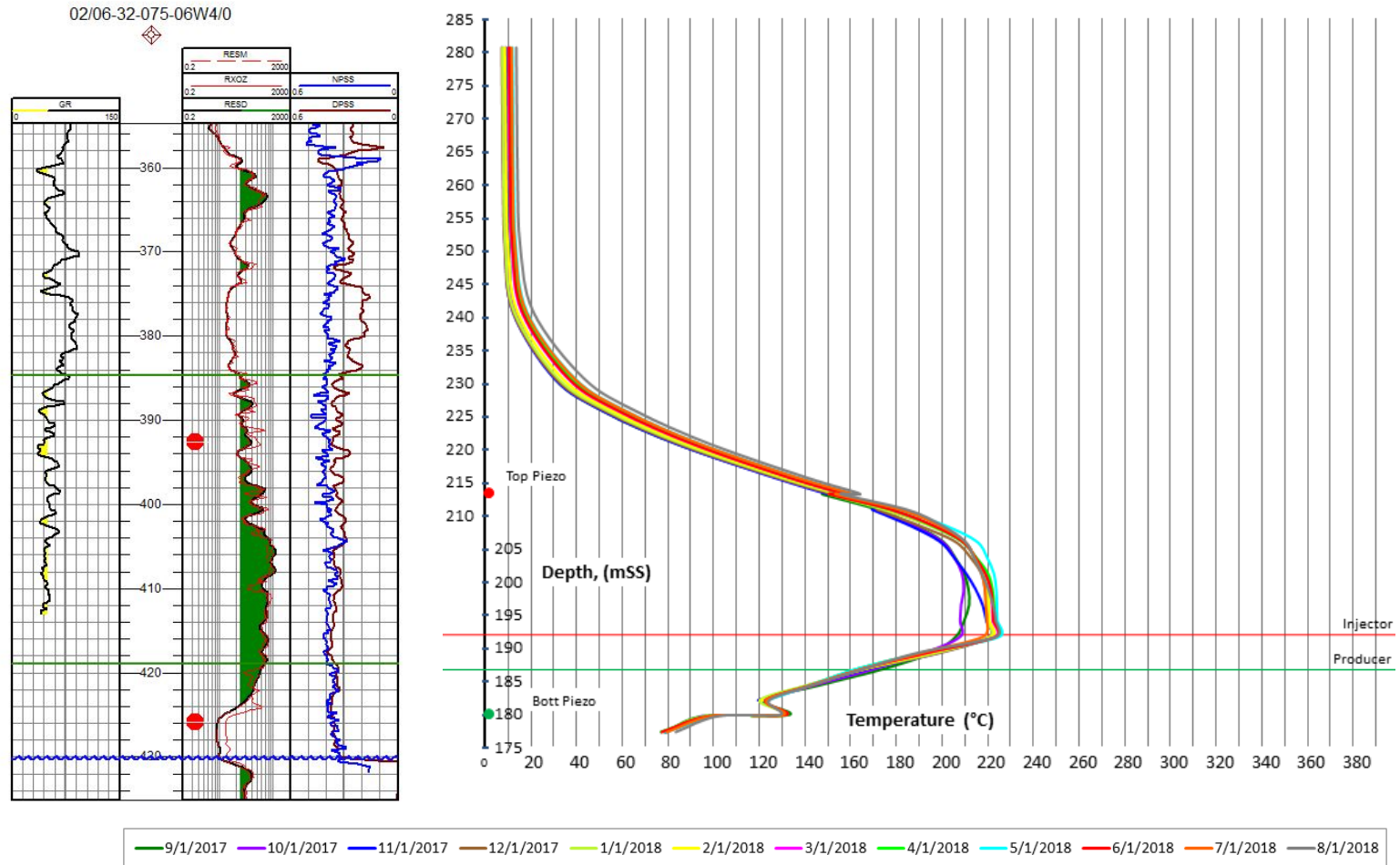


Pad I Toe* Observation Well Temp

*Both pad observation wells at toe of Pad I

(6m from I2 well pair)

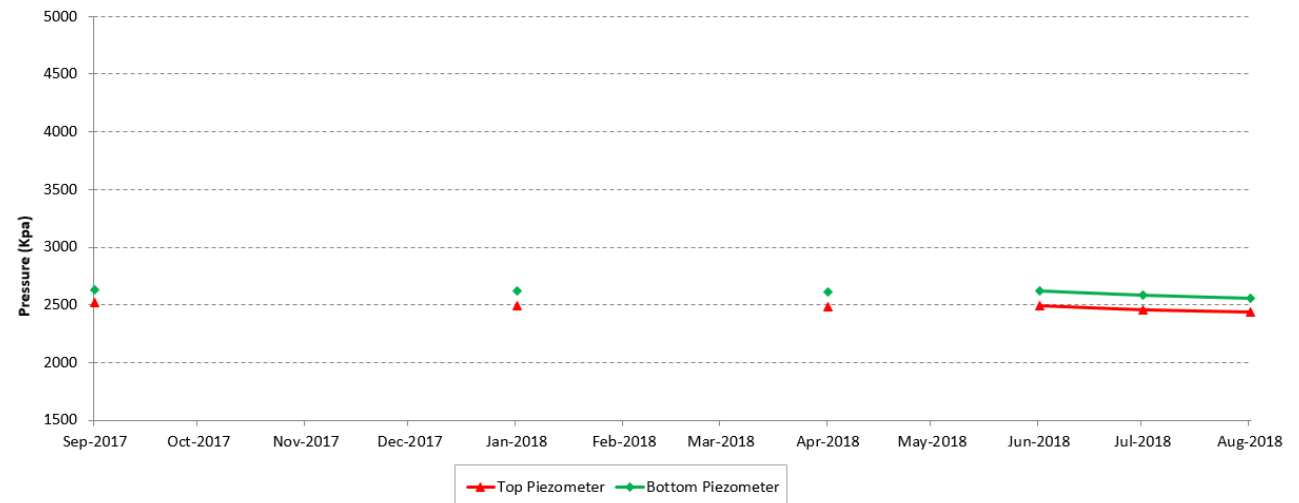
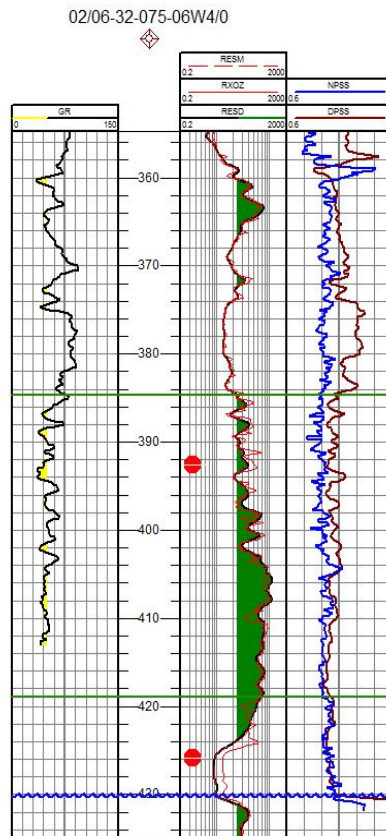
3.1.1-5d



Pad I Toe* Observation Well Pressure

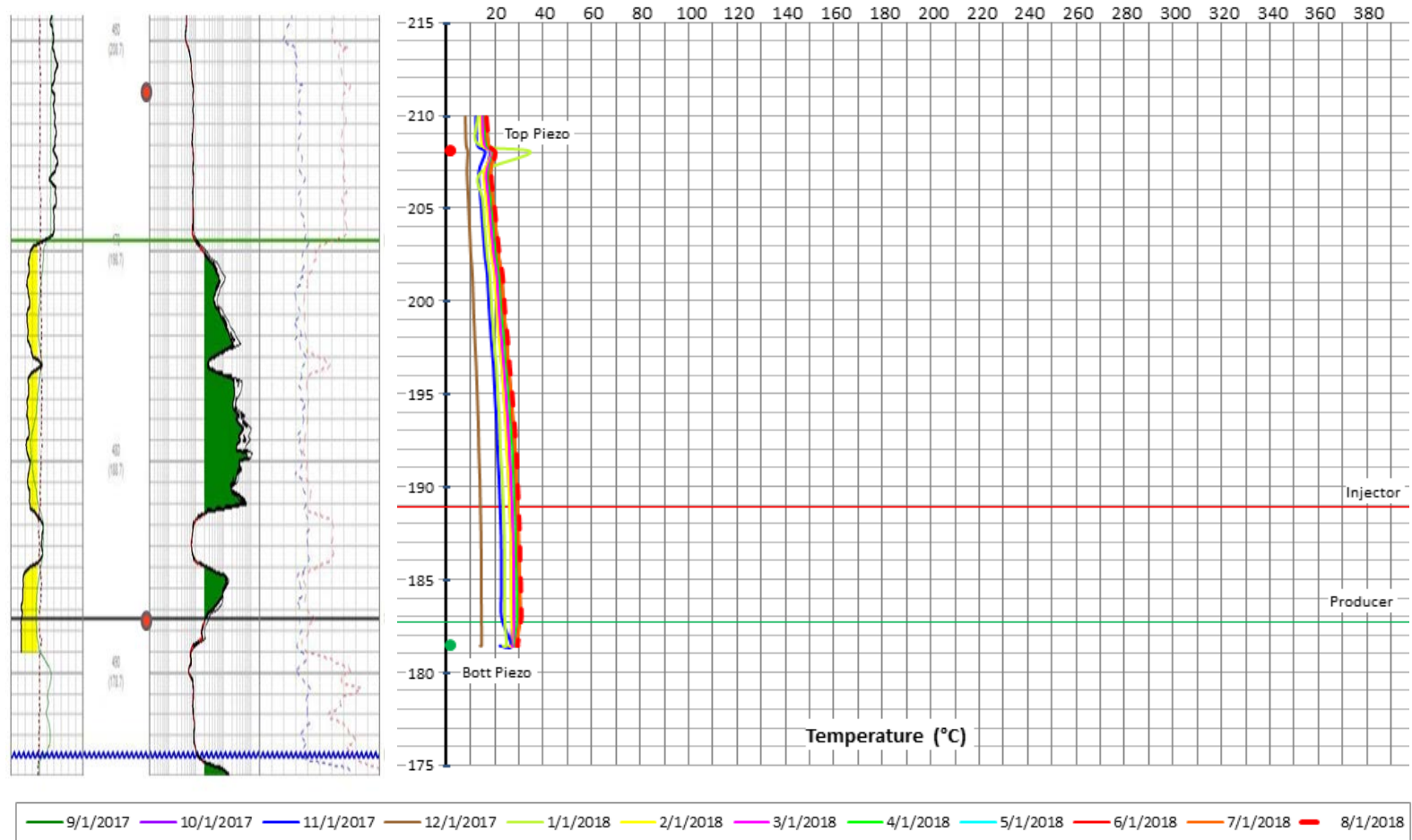
*Both pad observation wells at toe of Pad I
(6m from I2 well pair)

3.1.1-5d



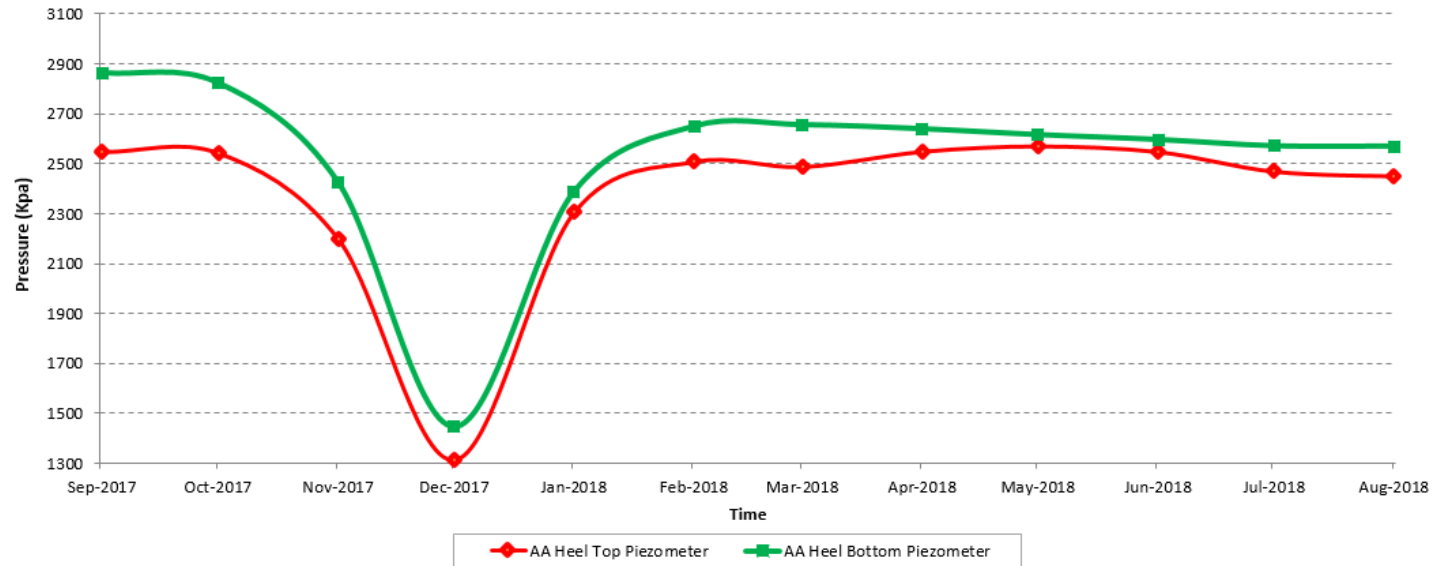
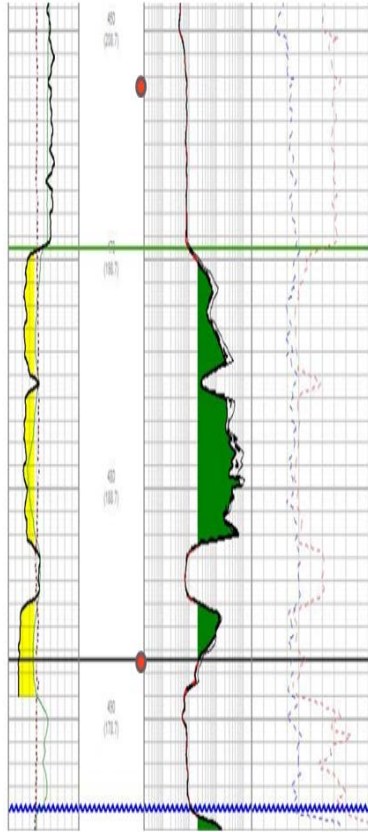
Pad AA Heel Observation Well Temp (36.5m from AA4 well pair)

3.1.1-5d



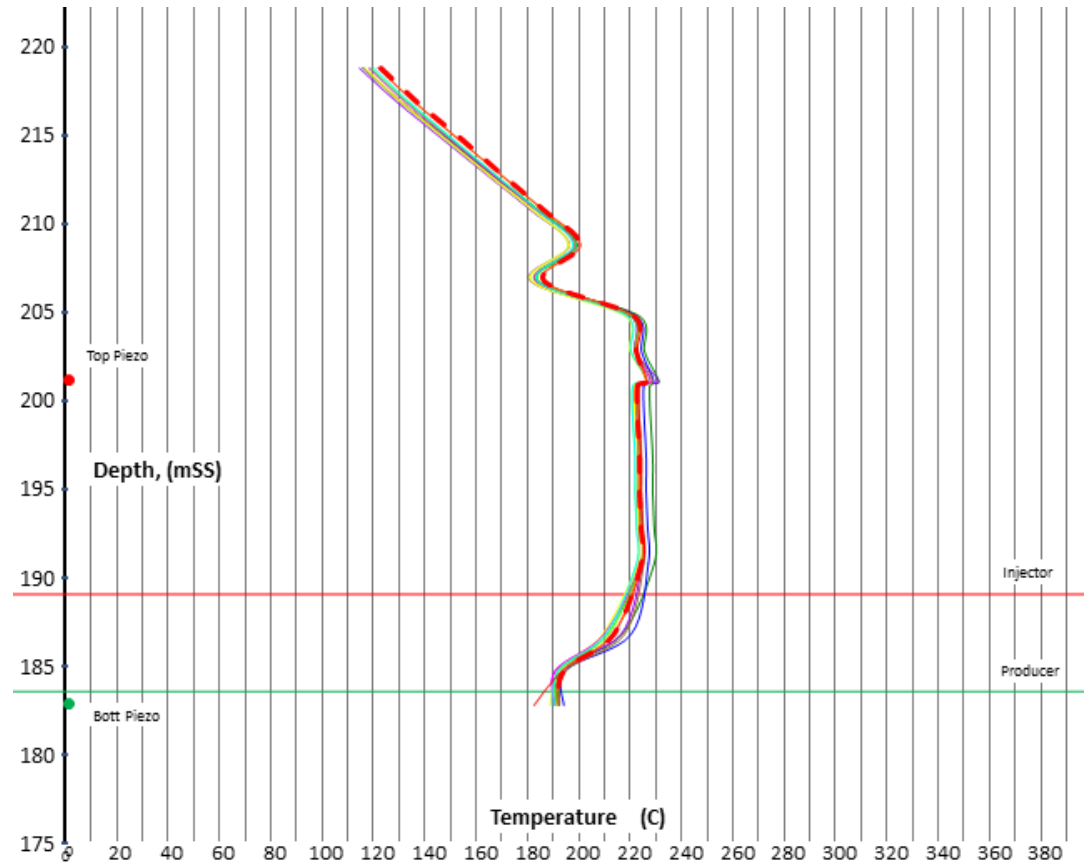
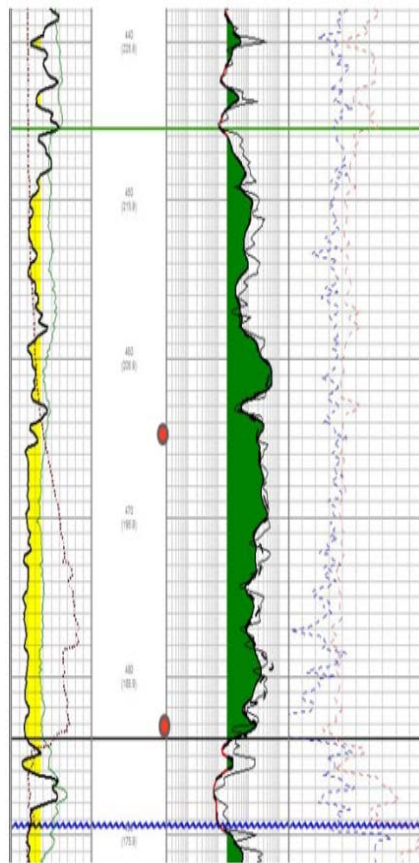
Pad AA Heel Observation Well Pressure (36.5m from AA4 well pair)

3.1.1-5d



Pad AA Toe Observation Well Temp (42.8m from AA4 well pair)

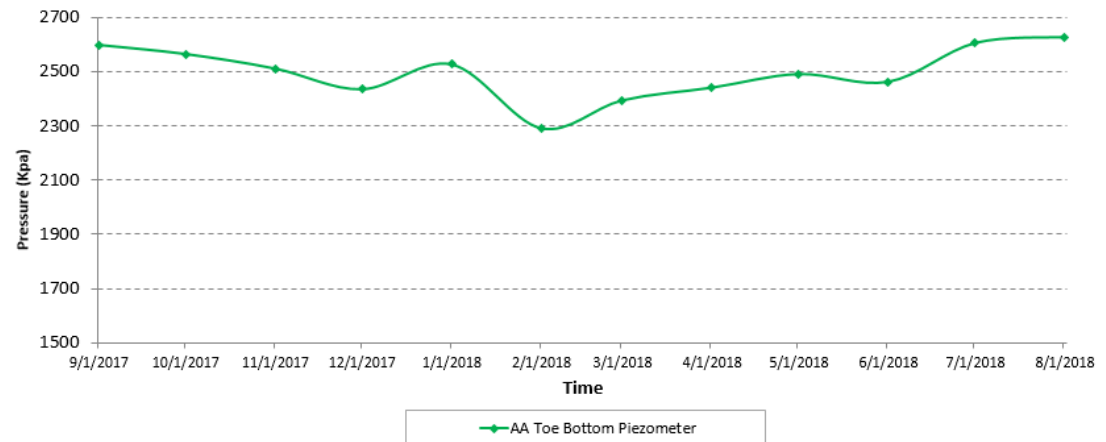
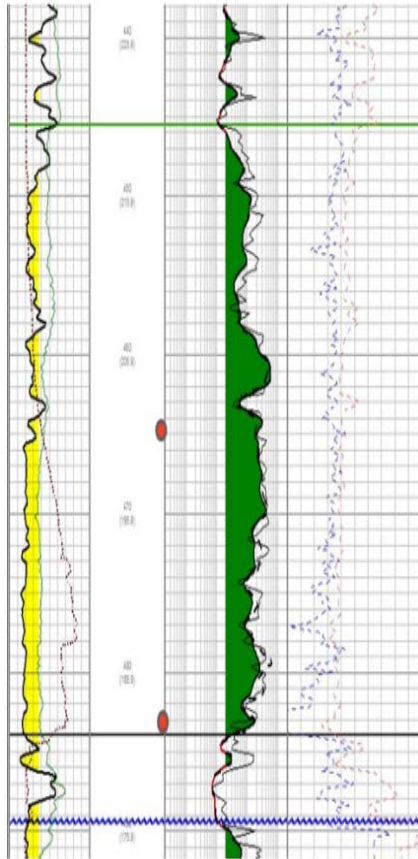
3.1.1-5d



9/1/2017 10/1/2017 11/1/2017 12/1/2017 1/1/2018 2/1/2018 3/1/2018 4/1/2018 5/1/2018 6/1/2018 7/1/2018 8/1/2018

Pad AA Toe Observation Well Pressure (42.8m from AA4 well pair)

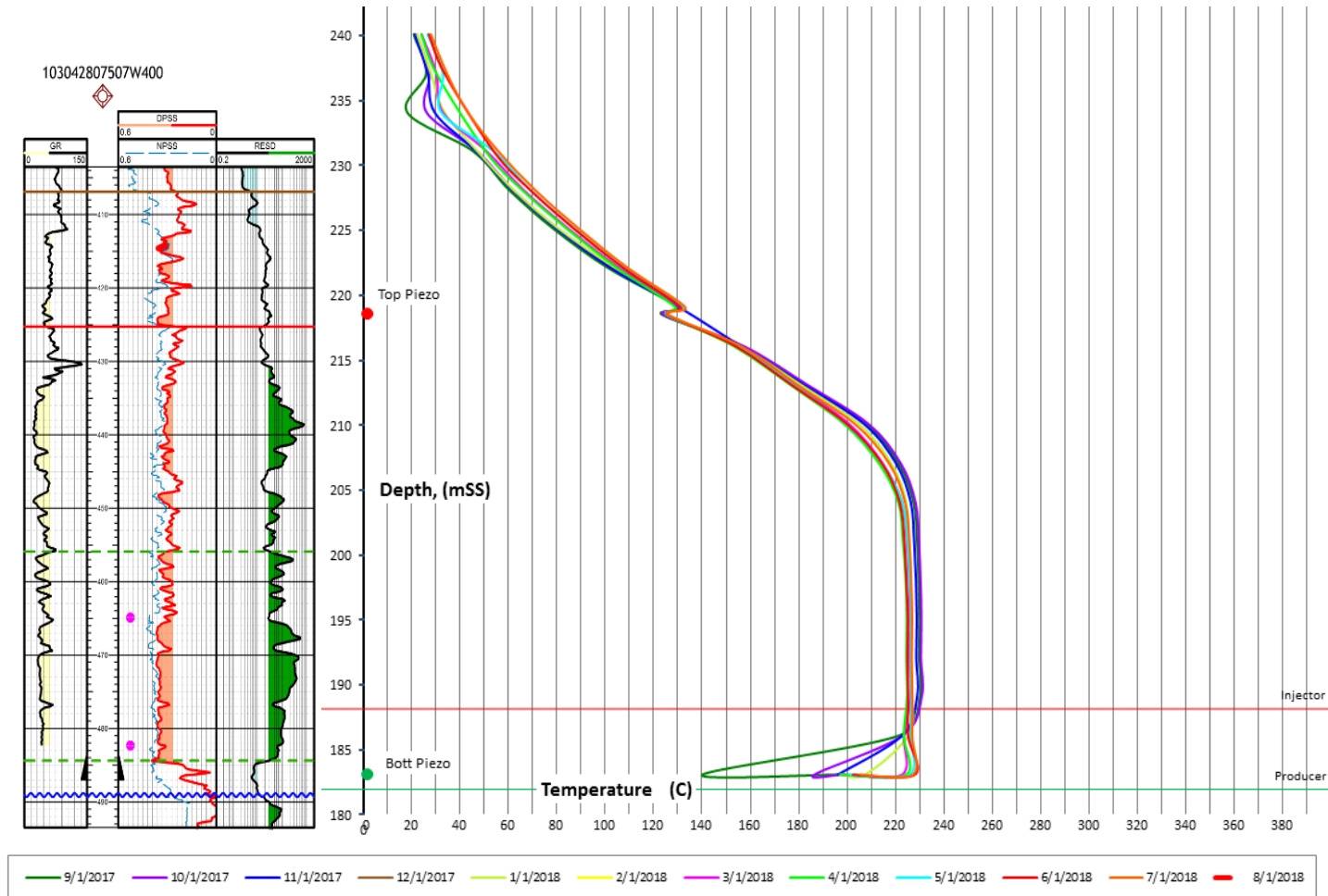
3.1.1-5d



* The top piezometer has failed

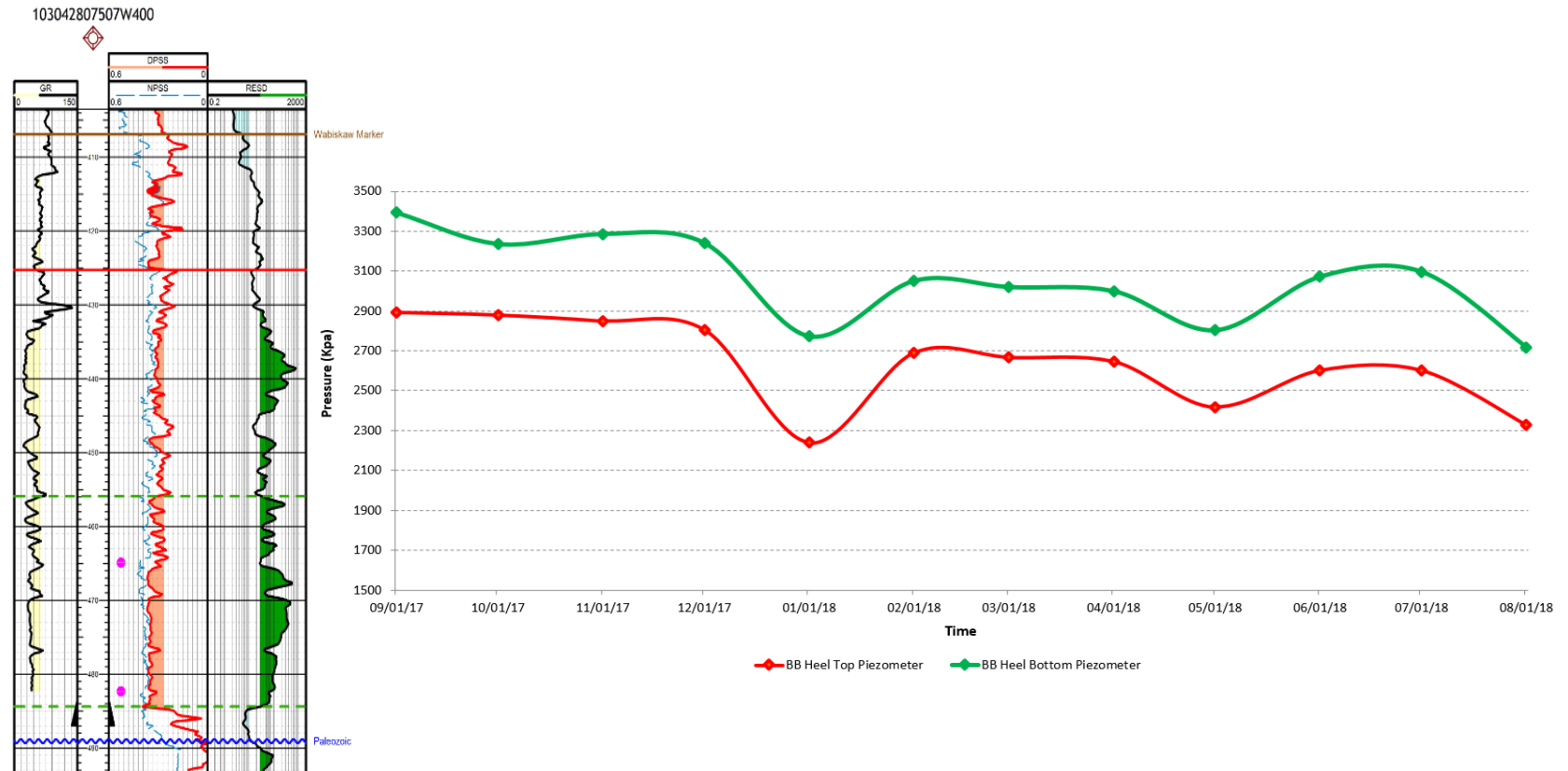
Pad BB Heel Observation Well Temp (13.5m from BB4 well pair)

3.1.1-5d



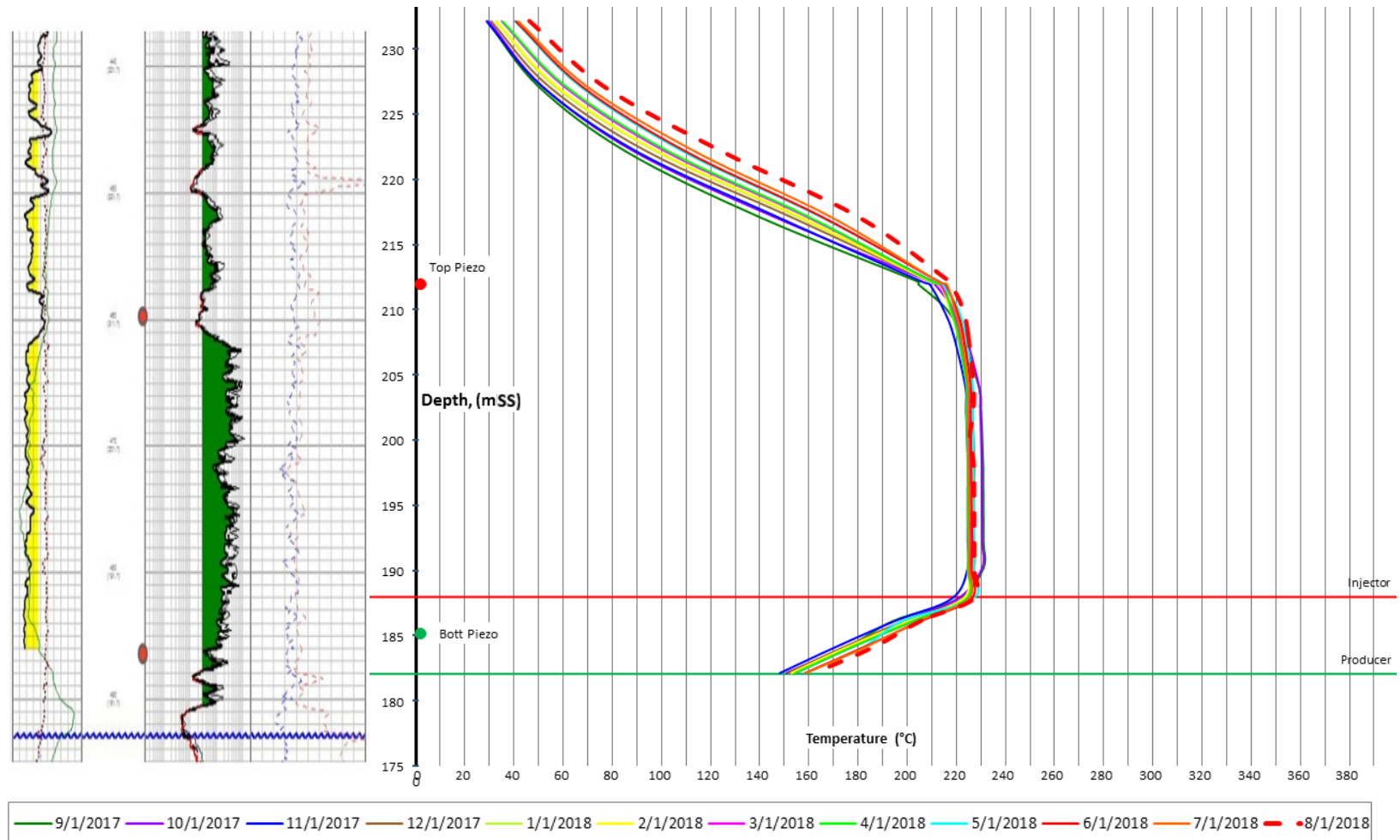
Pad BB Heel Observation Well Pressure (13.5m from BB4 well pair)

3.1.1-5d



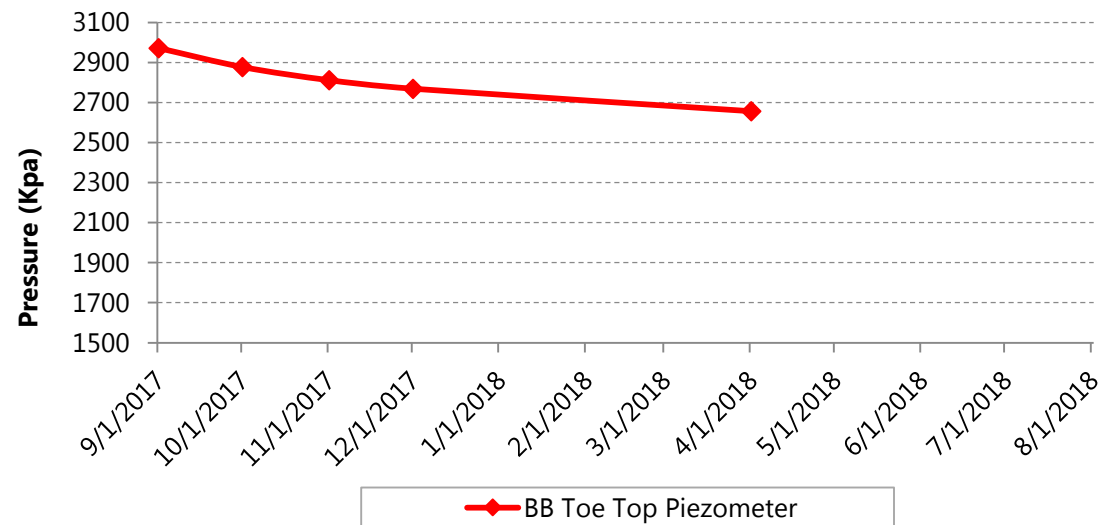
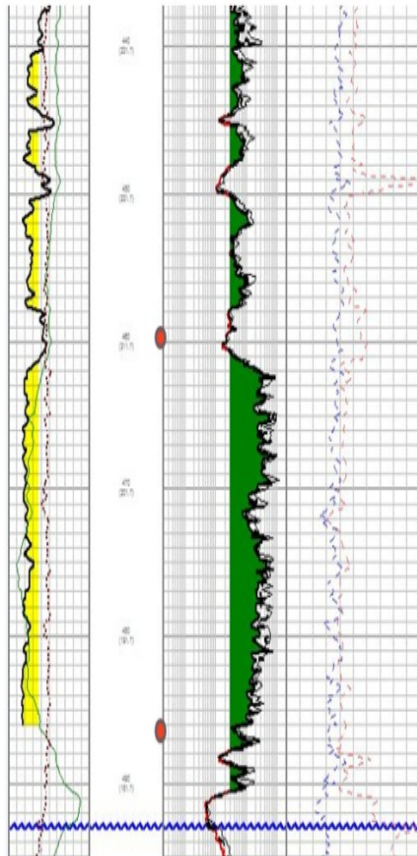
Pad BB Toe Observation Well Temp (11.5m from BB4 well pair)

3.1.1-5d



Pad BB Toe Observation Well Pressure (11.5m from BB4 well pair)

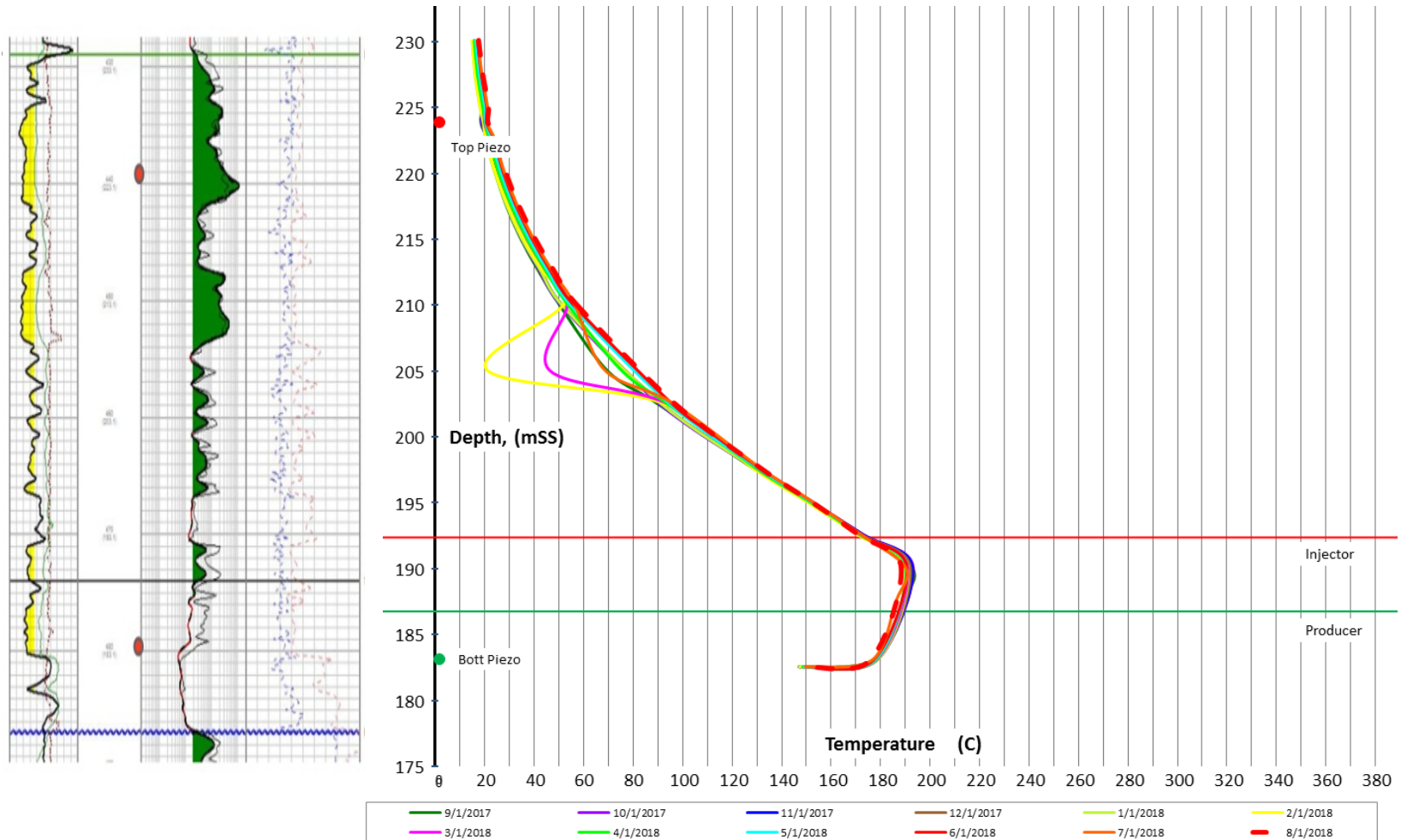
3.1.1-5d



* The bottom piezometer has failed

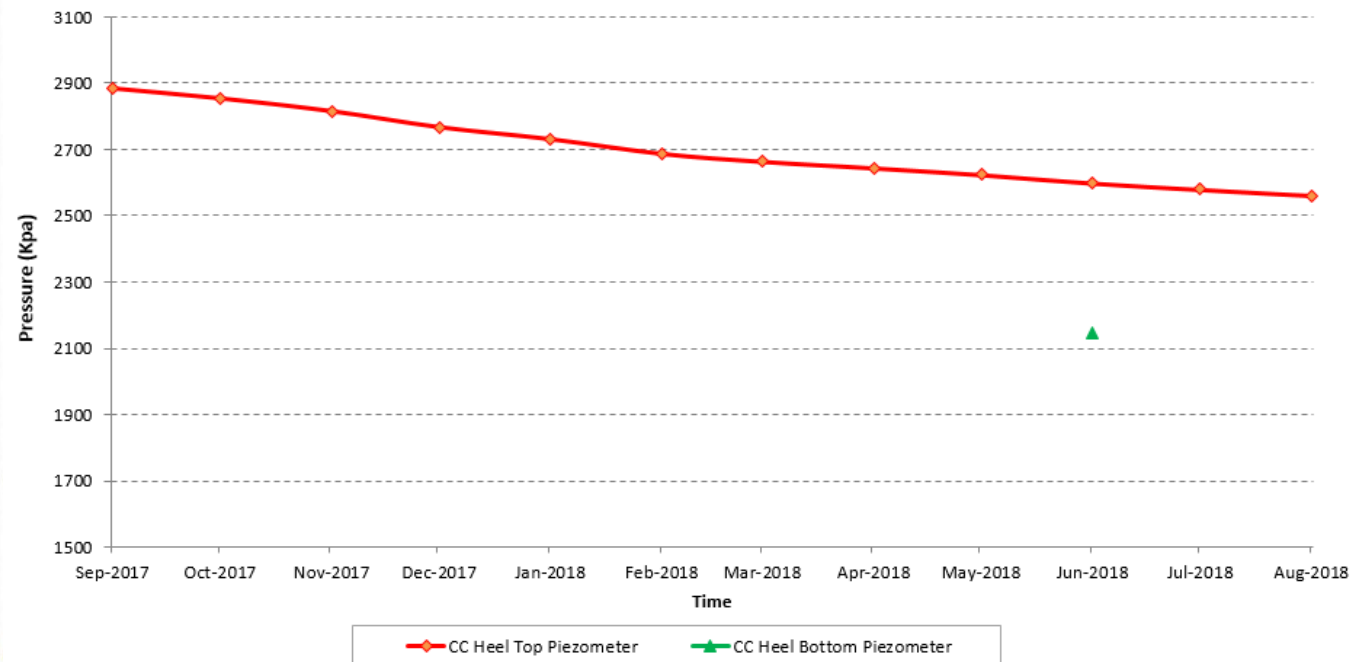
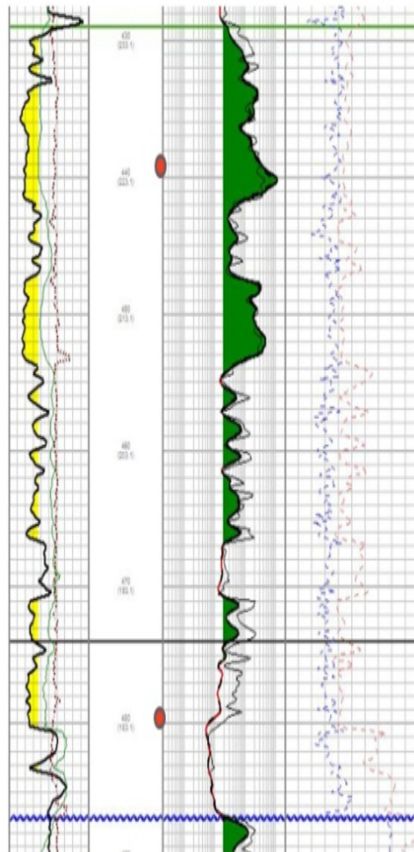
Pad CC Heel Observation Well Temp (8m from CC4 well pair)

3.1.1-5d



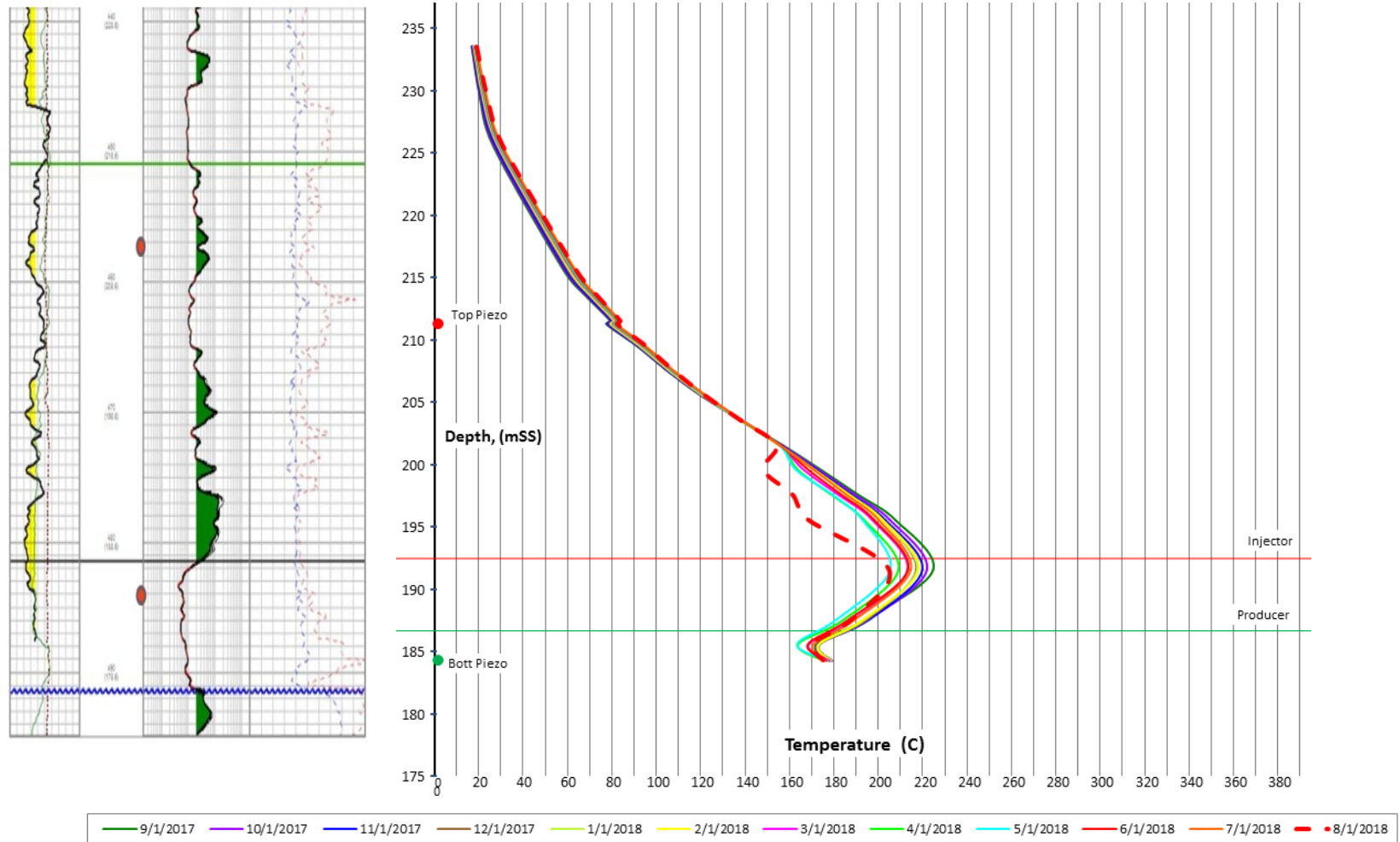
Pad CC Heel Observation Well Pressure (8m from CC4 well pair)

3.1.1-5d

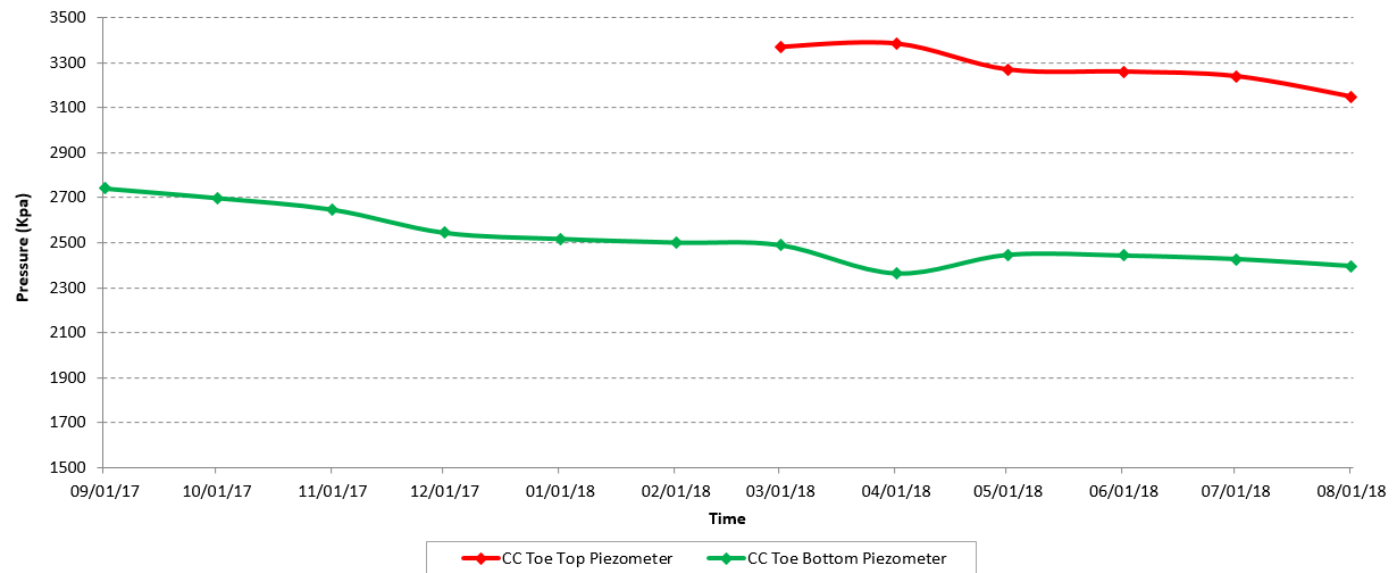


Pad CC Toe Observation Well Temp (11.7m from CC4 well pair)

3.1.1-5d

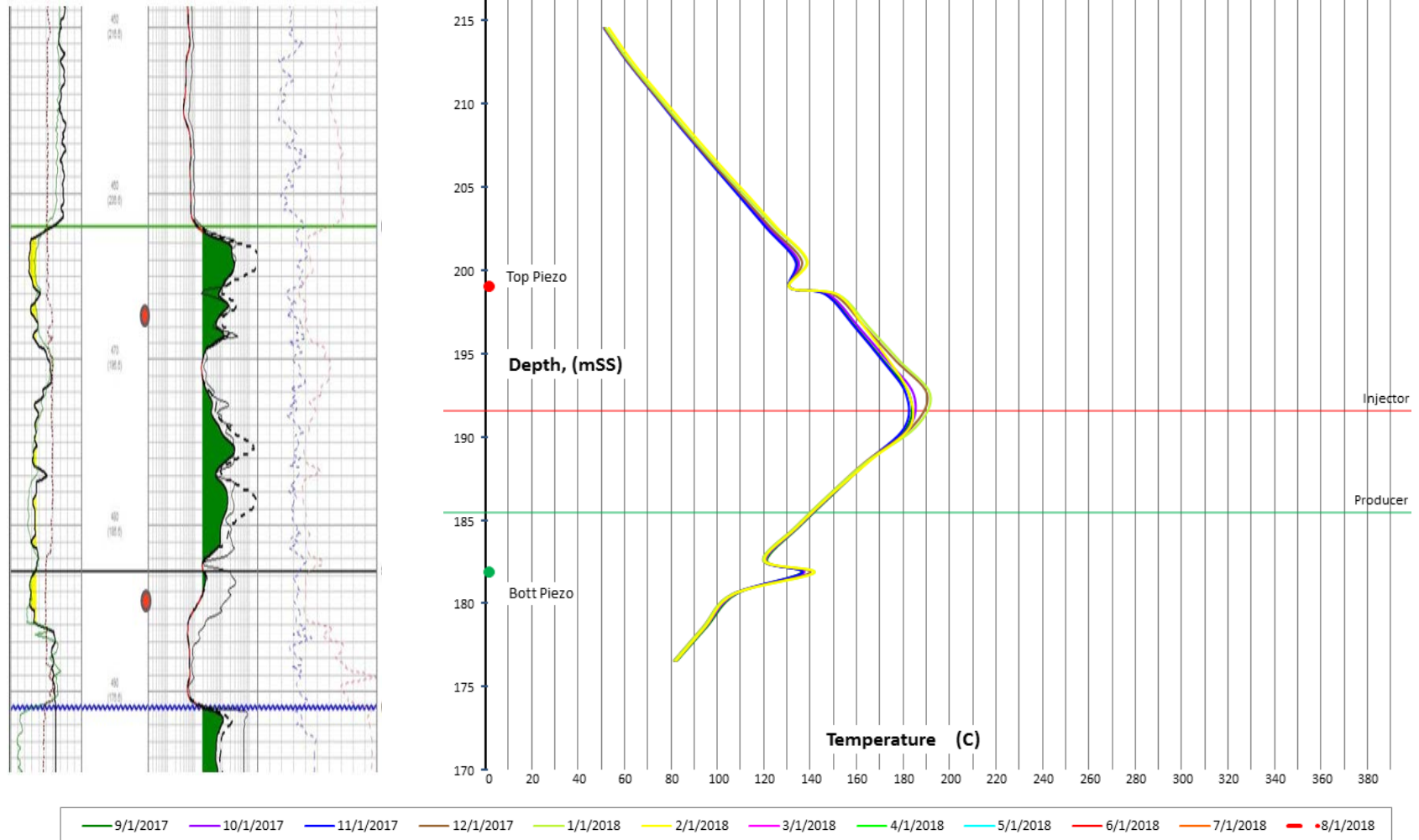


3.1.1-5d



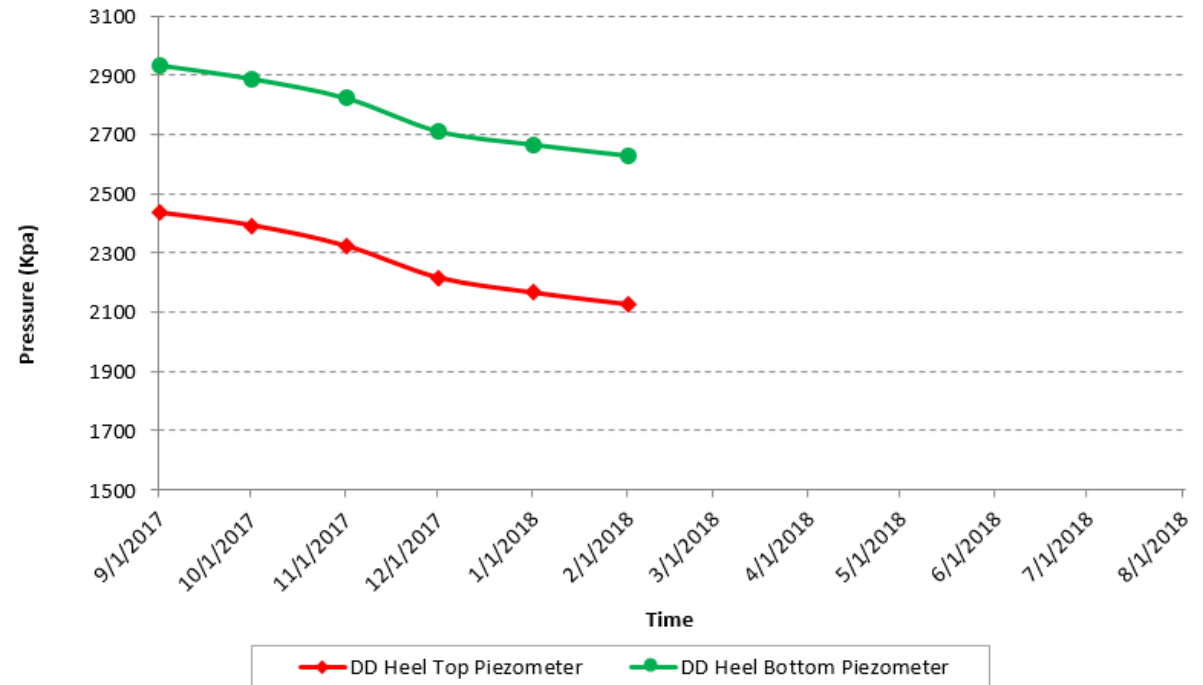
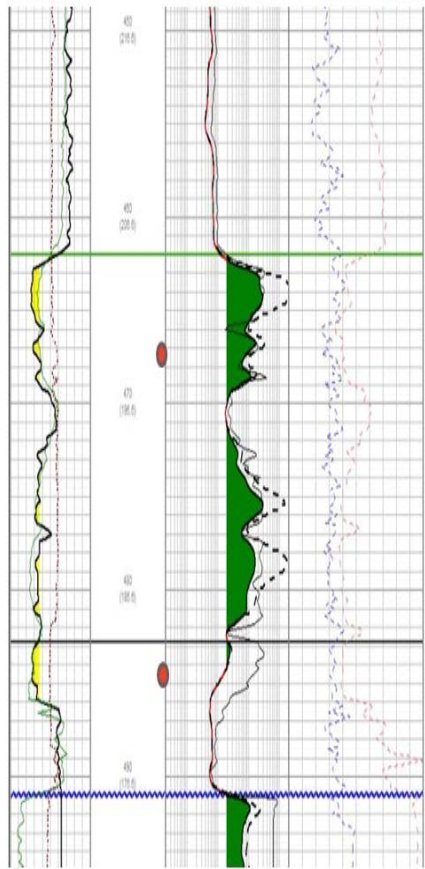
Pad DD Heel Observation Well Temp (10.4m from DD3 well pair)

3.1.1-5d



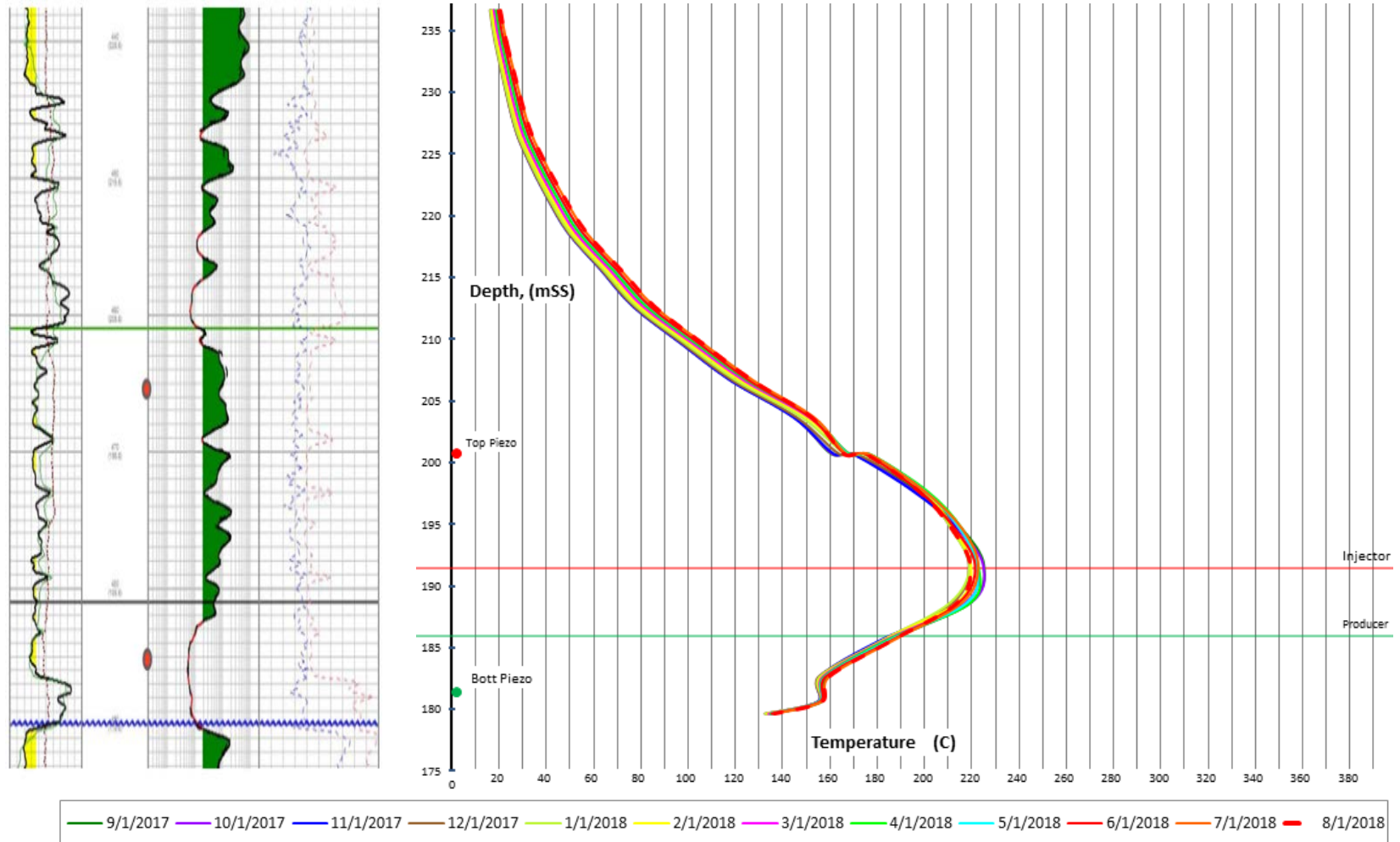
Pad DD Heel Observation Well Pressure (10.4m from DD3 well pair)

3.1.1-5d



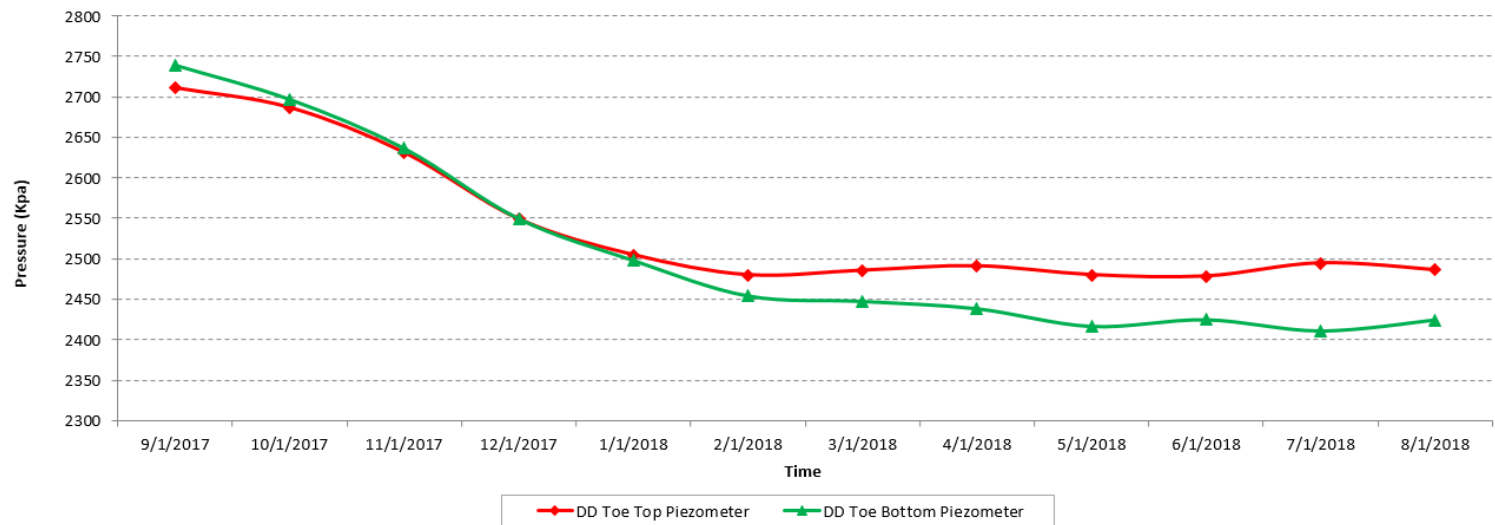
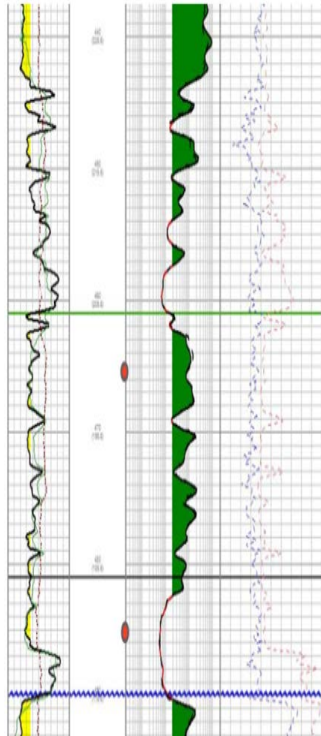
Pad DD Toe Observation Well Temp (10.5m from DD3 well pair)

3.1.1-5d



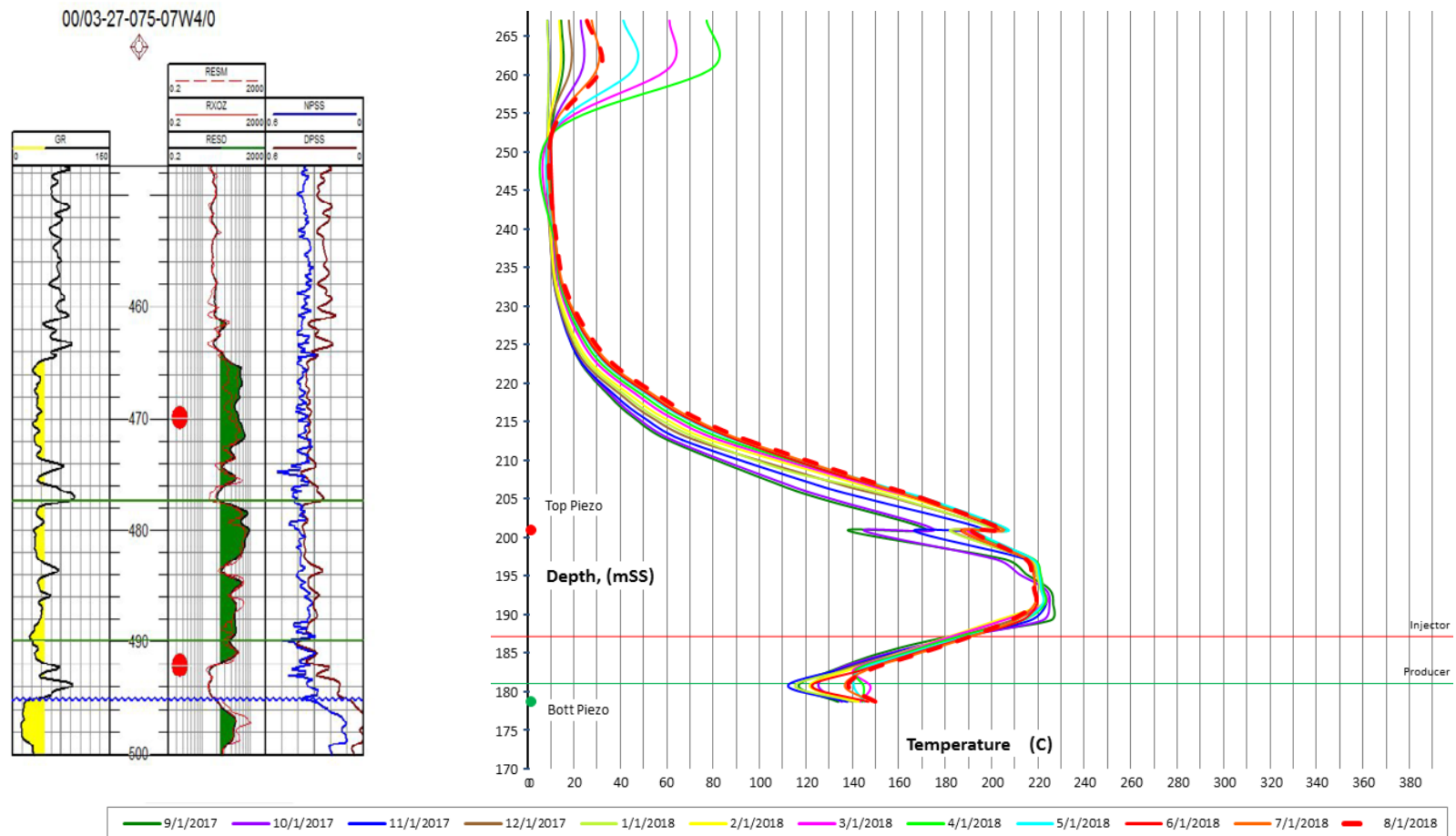
Pad DD Toe Observation Well Pressure (10.5m from DD3 well pair)

3.1.1-5d



Pad FF Mid Heel Observation Well Temp (12m from FF5 well pair)

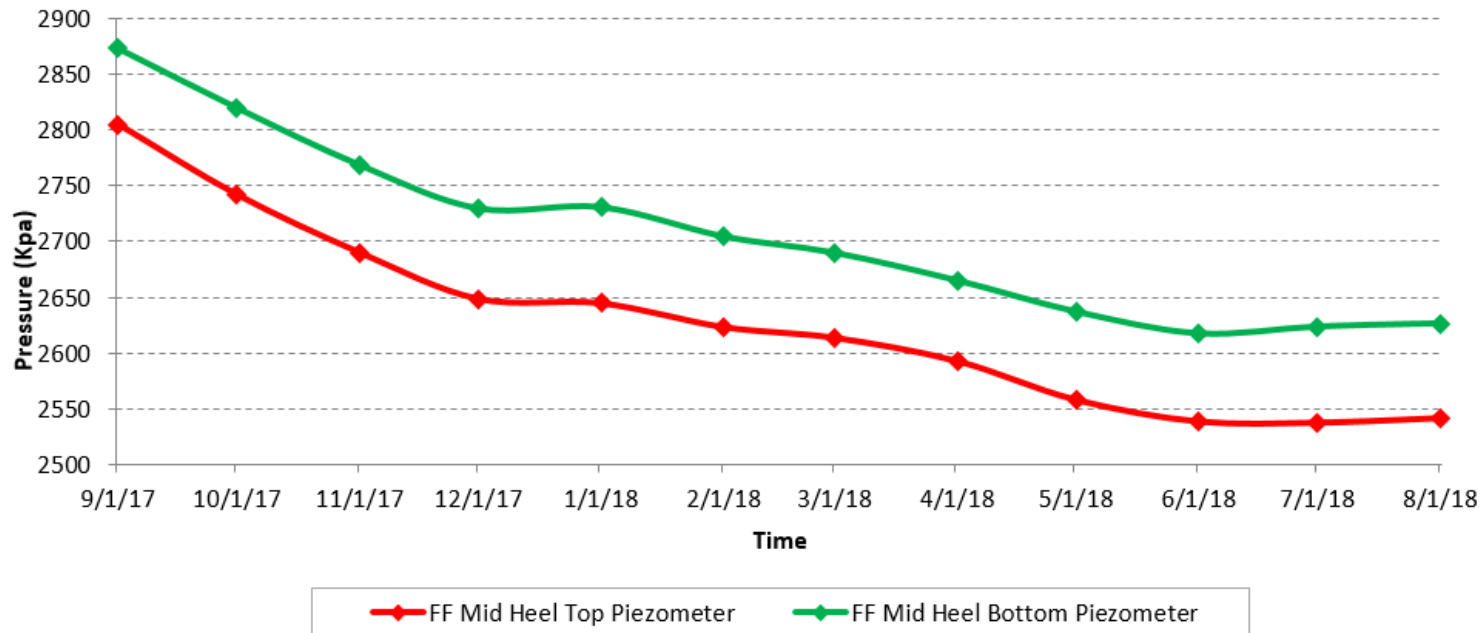
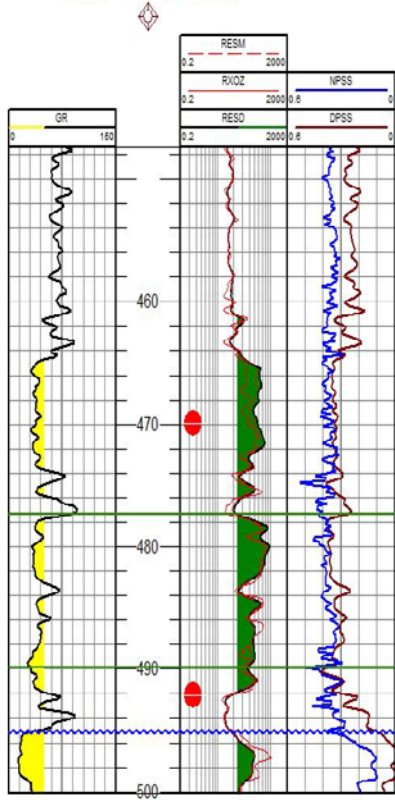
3.1.1-5d



Pad FF Mid Heel Observation Well Pressure (12m from FF5 well pair)

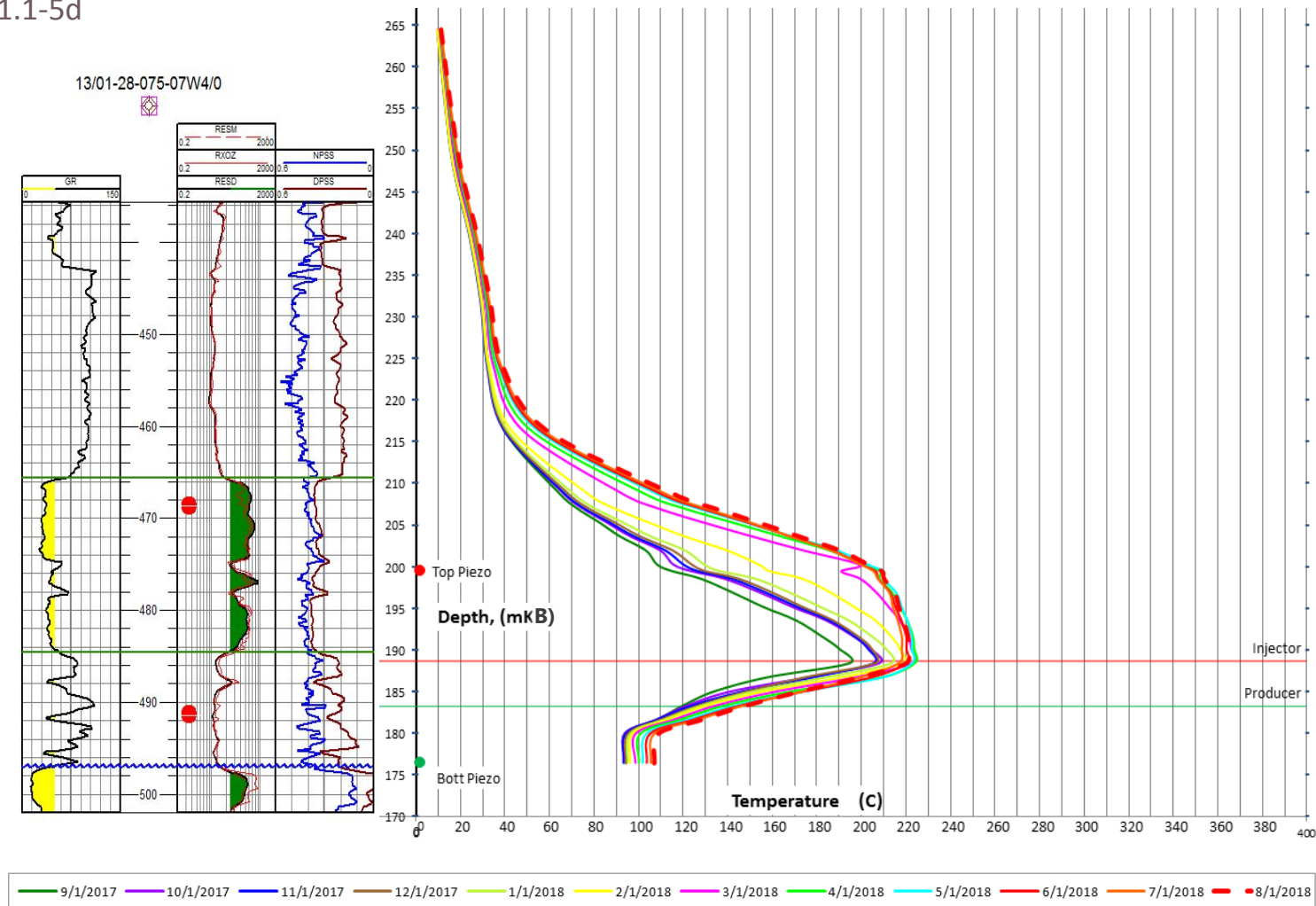
3.1.1-5d

00/03-27-075-07W4/0



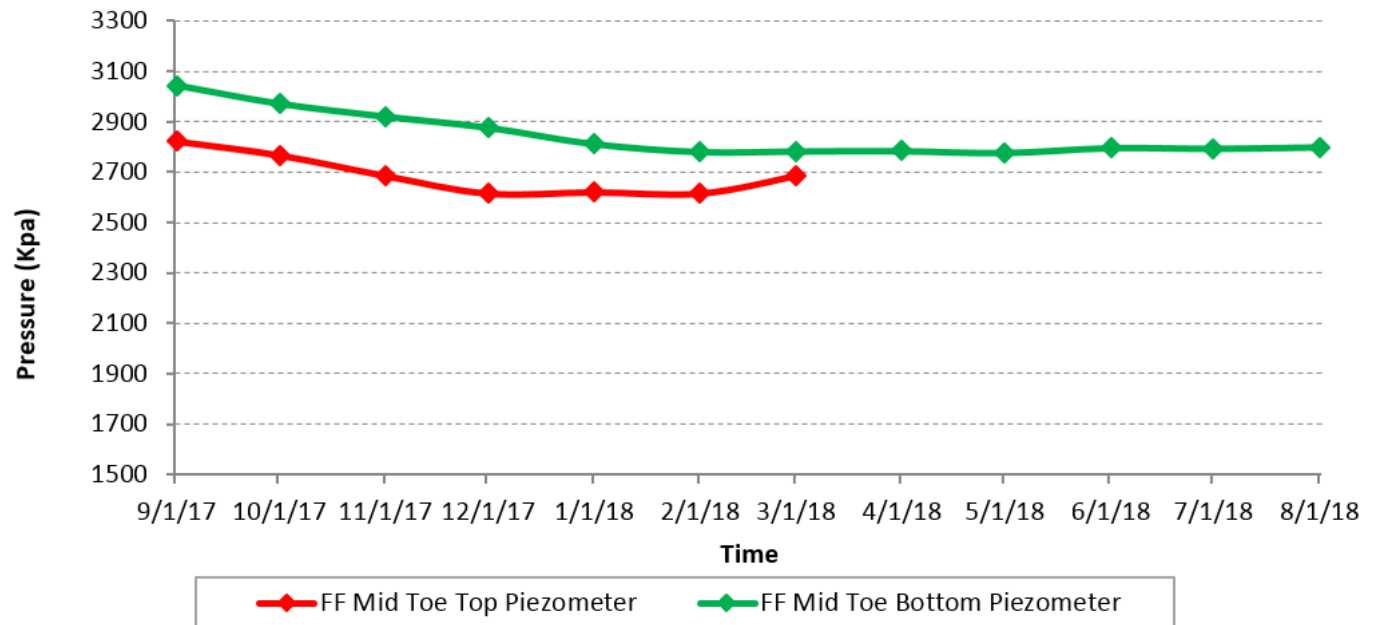
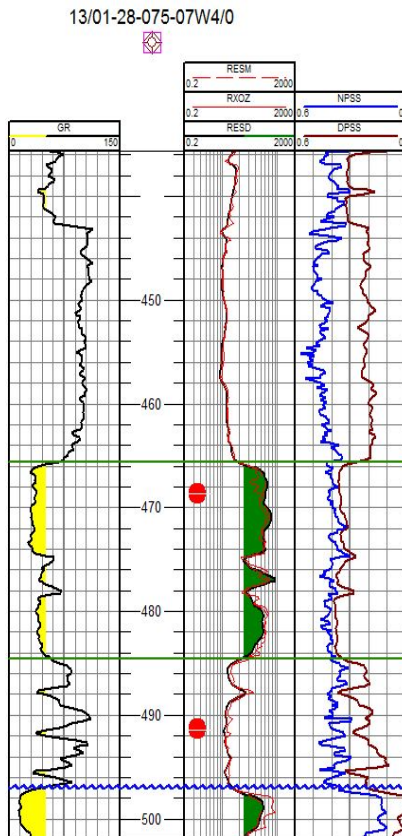
Pad FF Mid Toe Observation Well Temp (3m from FF5 well pair)

3.1.1-5d



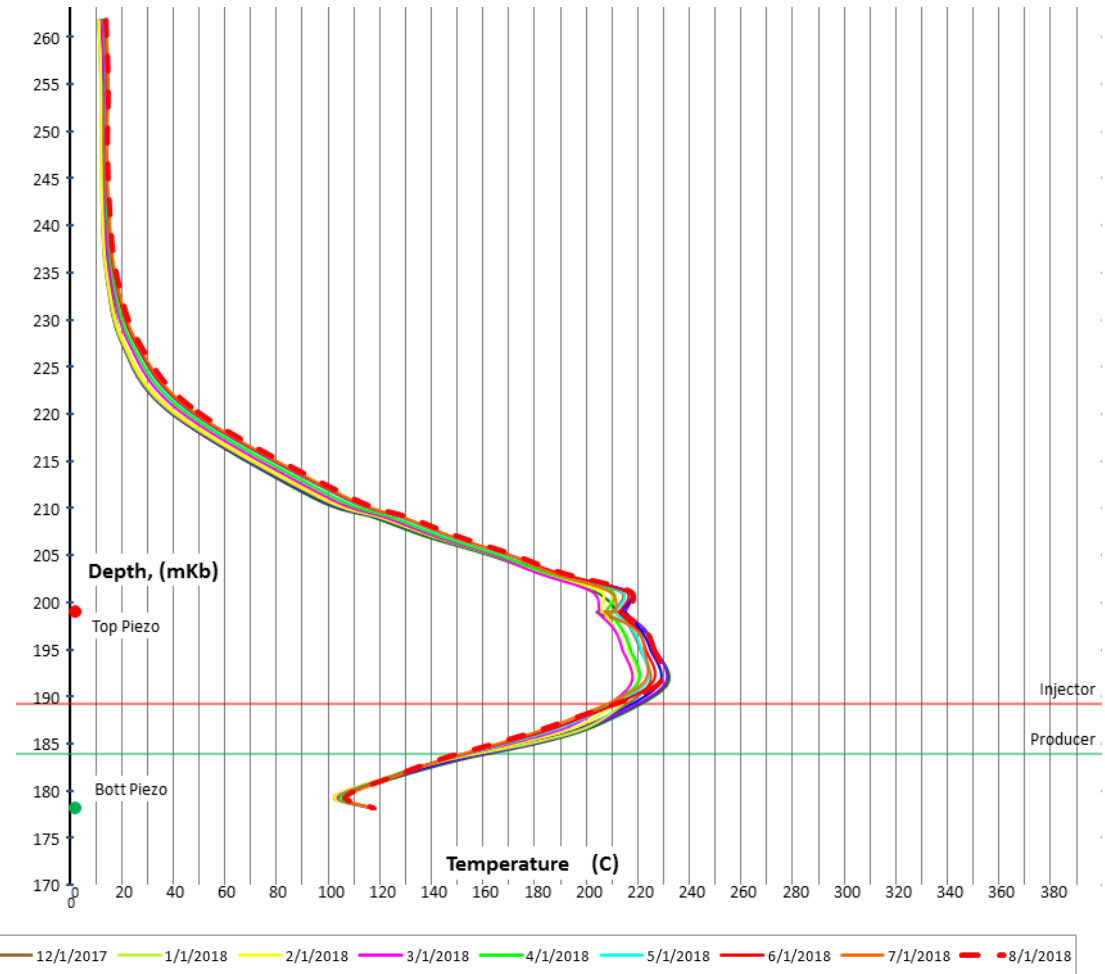
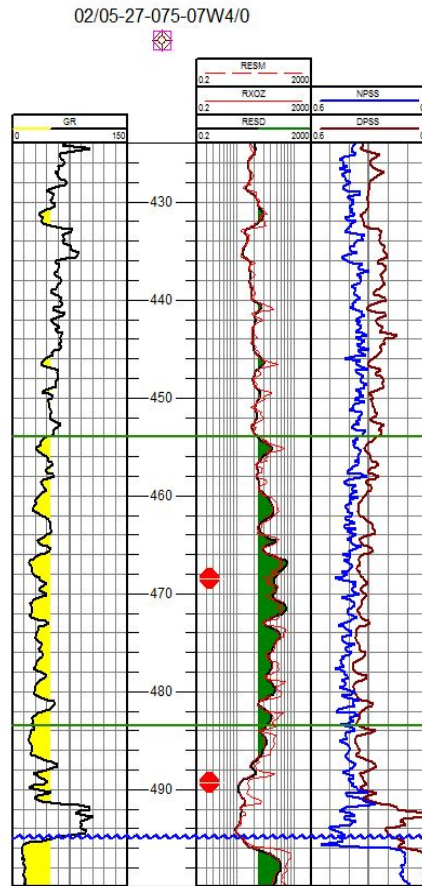
Pad FF Mid Toe Observation Well Pressure (3m from FF5 well pair)

3.1.1-5d



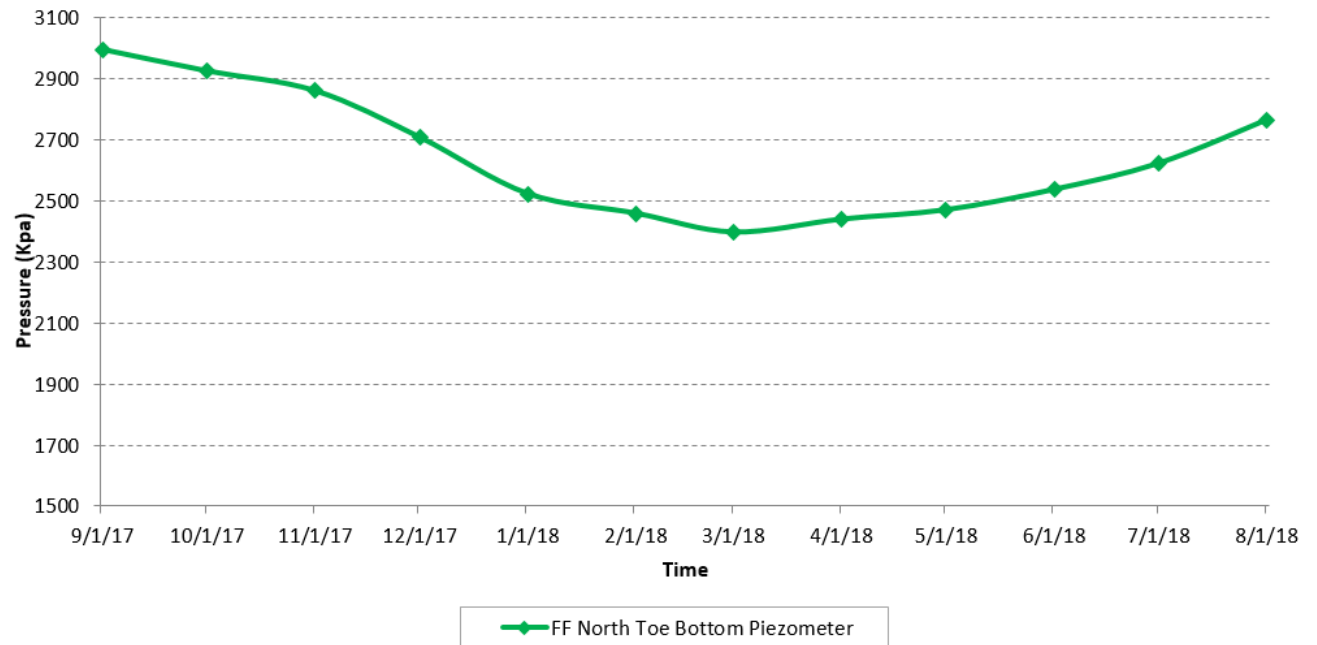
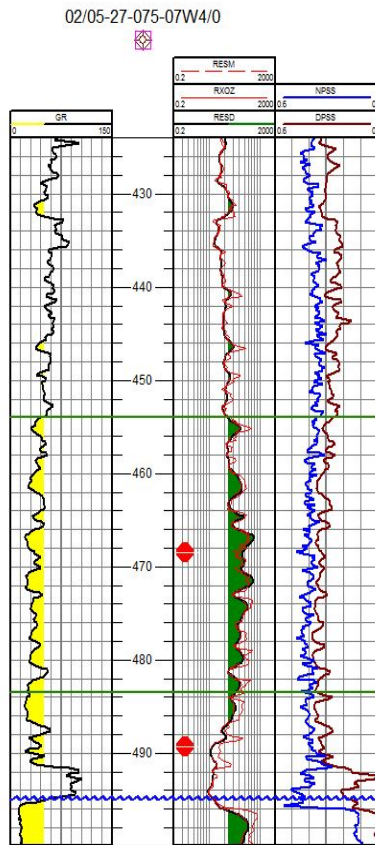
Pad FF North Toe Observation Well Temp (4.5m from FF2 well pair)

3.1.1-5d



Pad FF North Toe Observation Well Pressure (4.5m from FF2 well pair)

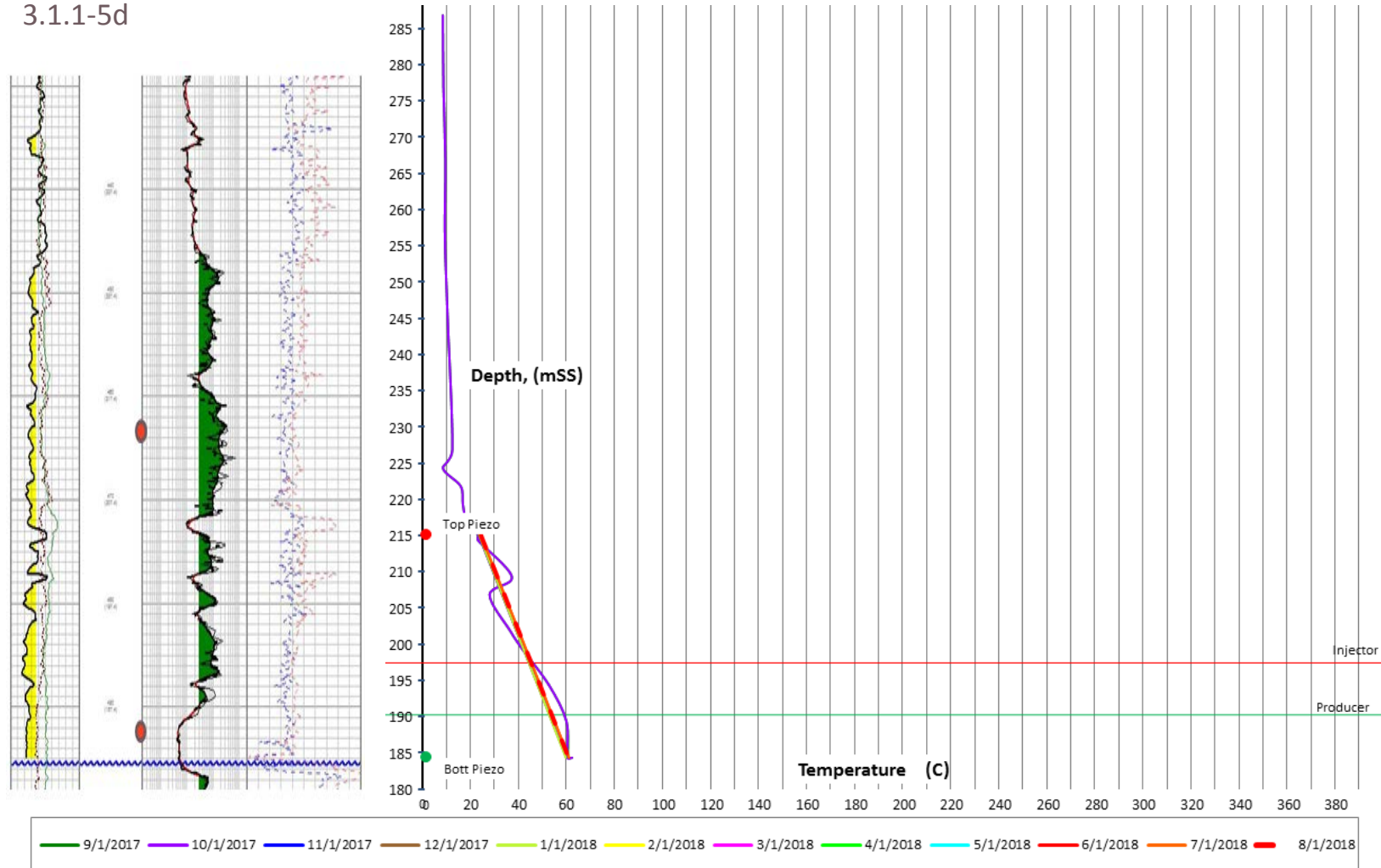
3.1.1-5d



* The top piezometer has failed

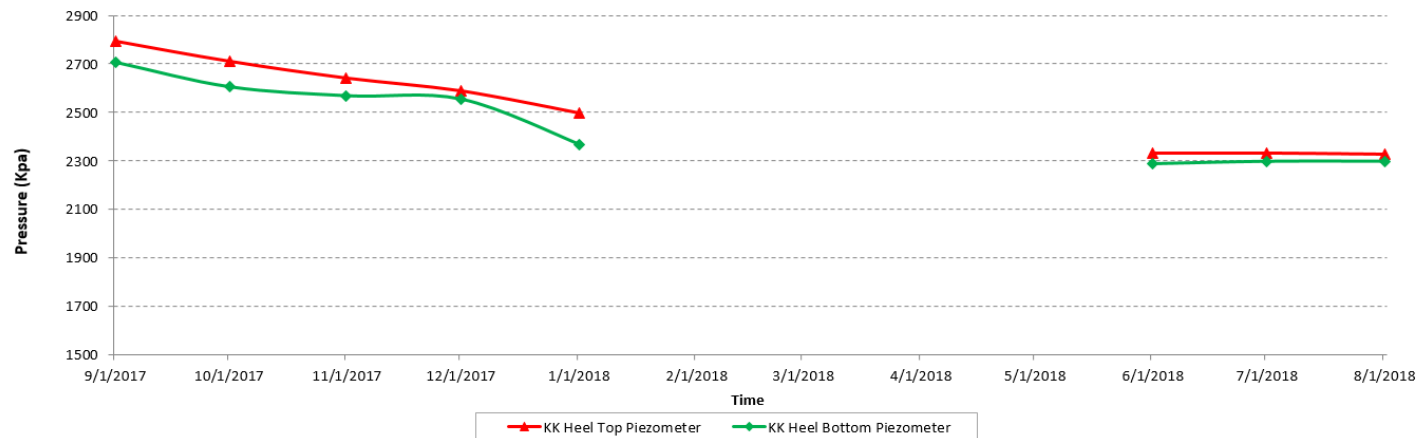
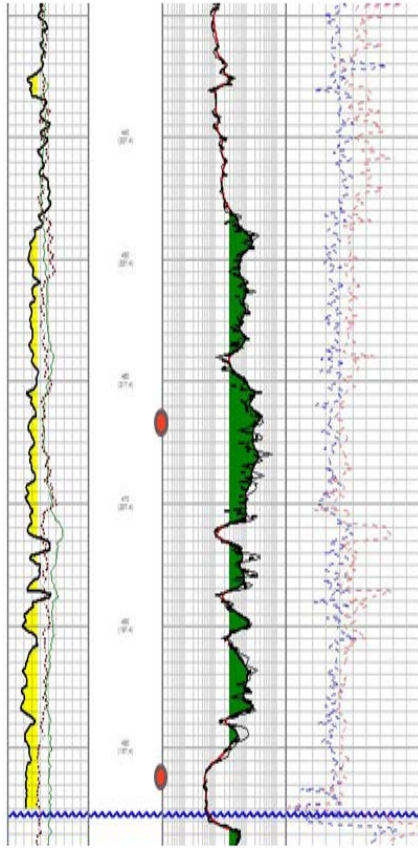
Pad KK Heel Observation Well Temp (8.5m from KK5 well pair)

3.1.1-5d



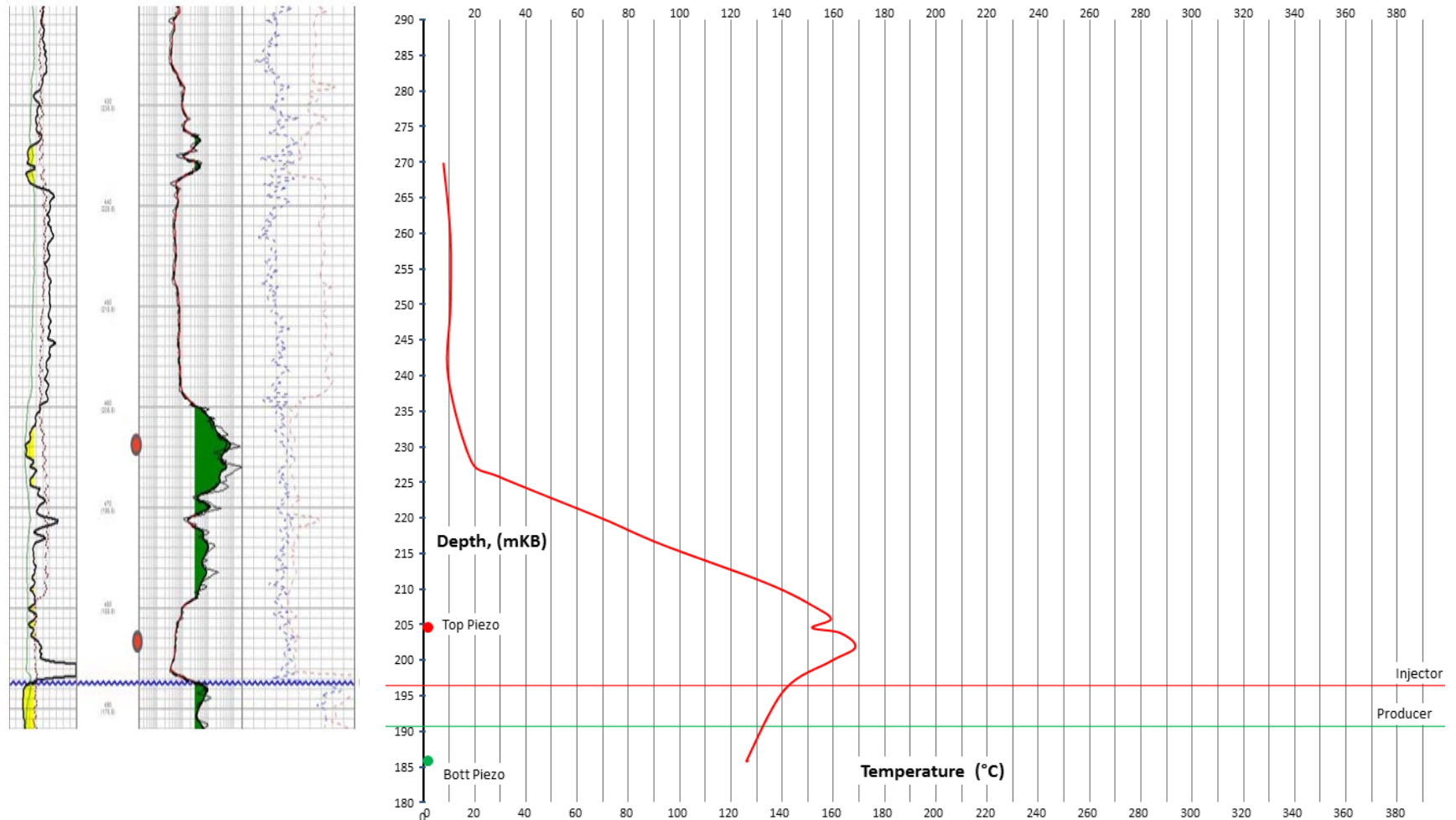
Pad KK Heel Observation Well Pressure (8.5m from KK5 well pair)

3.1.1-5d



Pad KK Toe Observation Well Temp (9m from KK5 well pair)

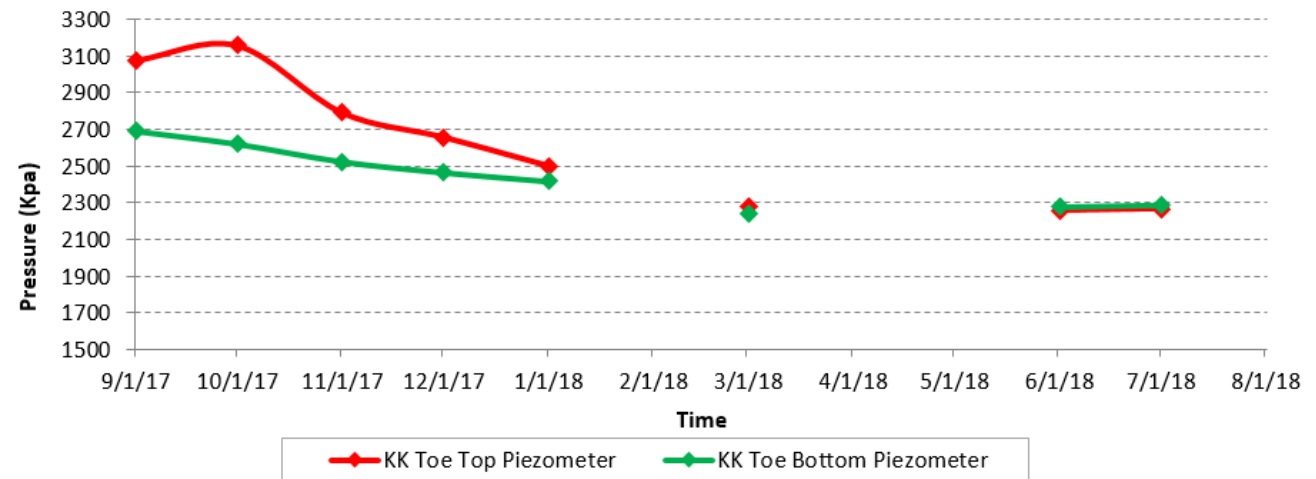
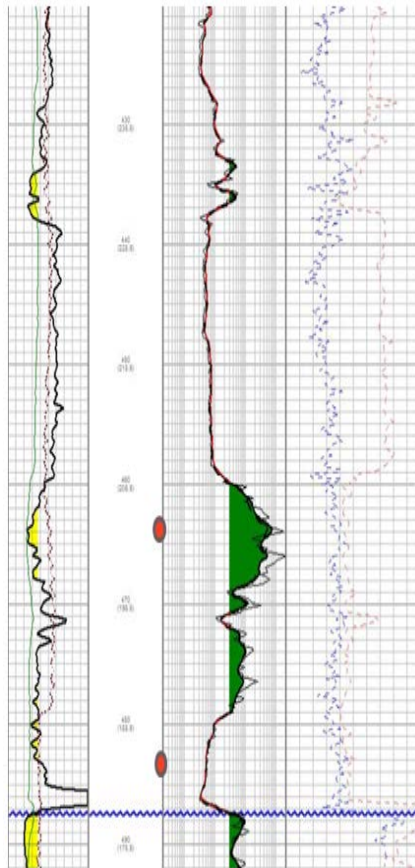
3.1.1-5d



**Only reliable temperature trend seen from thermocouples is June-2018*

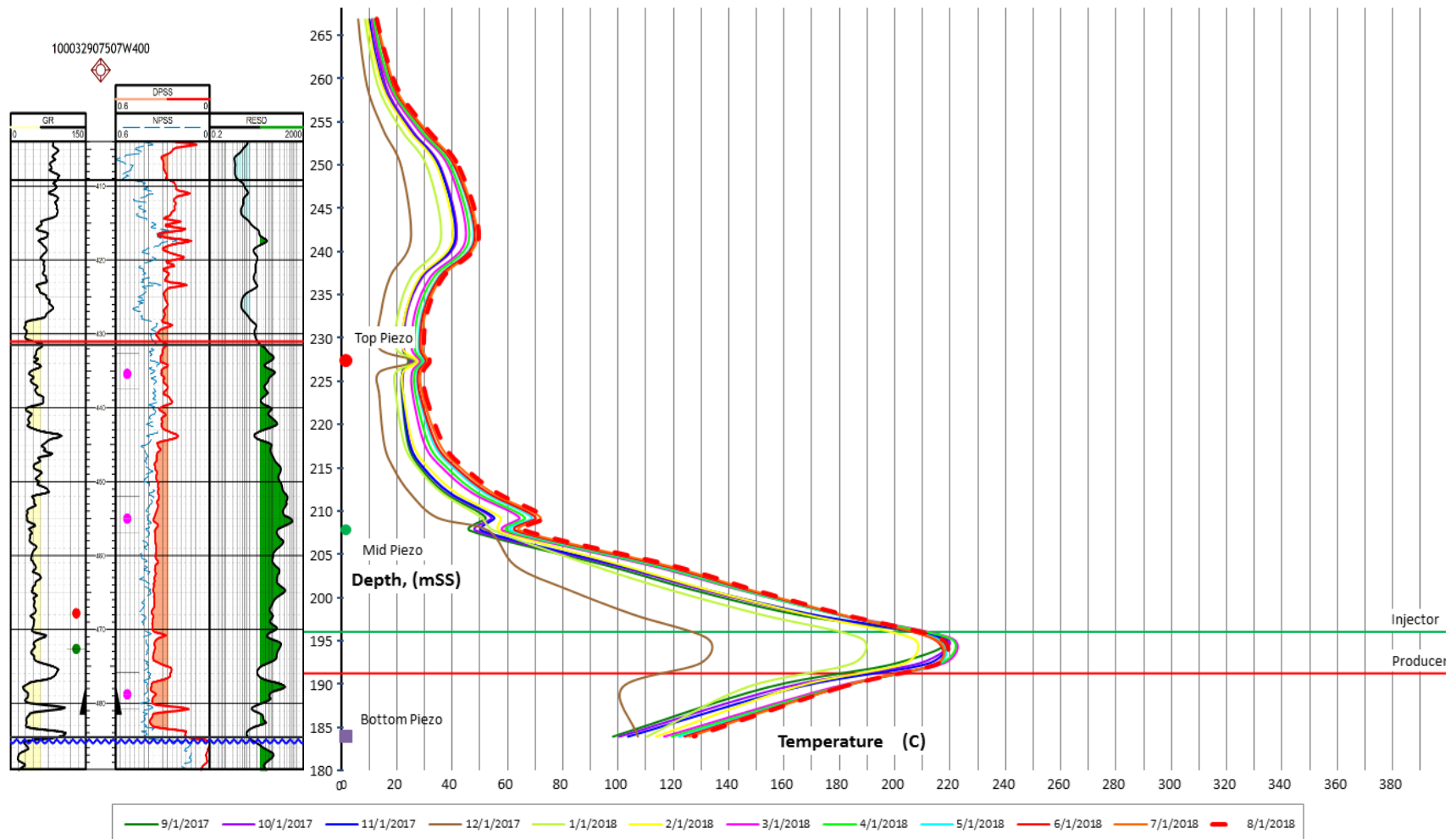
Pad KK Toe Observation Well Pressure (9m from KK5 well pair)

3.1.1-5d



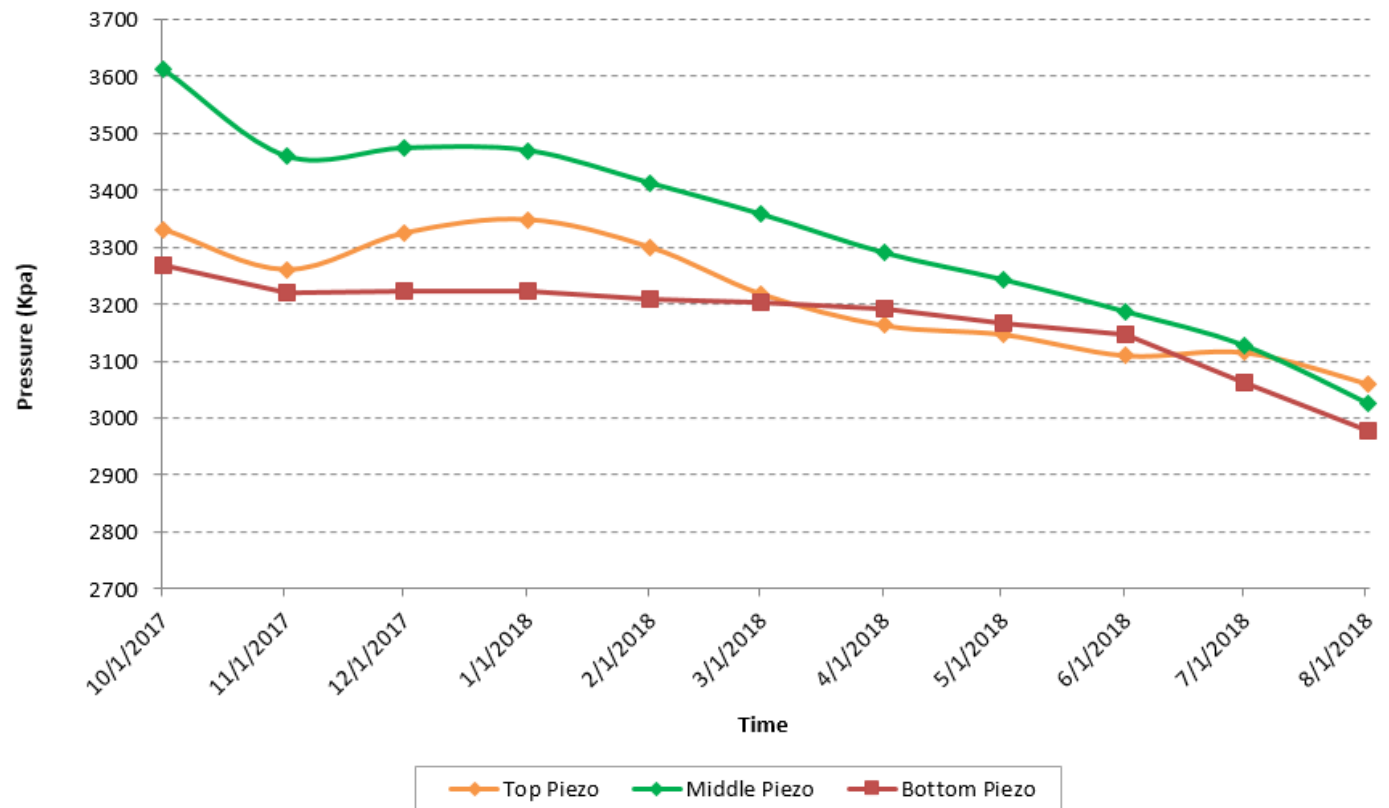
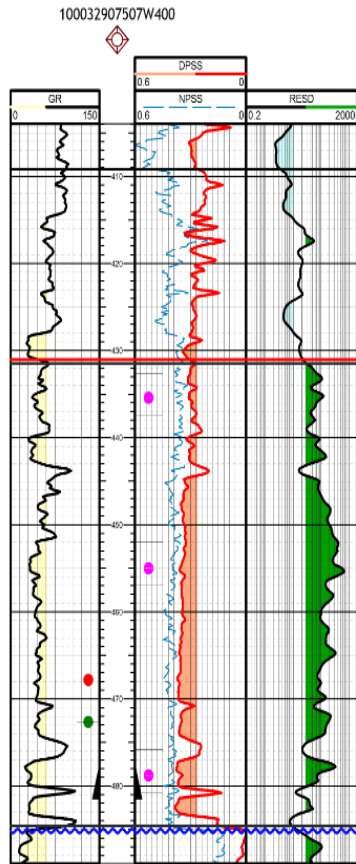
Pad OO Heel Observation Well Temp (5m from OO6 well pair)

3.1.1-5d



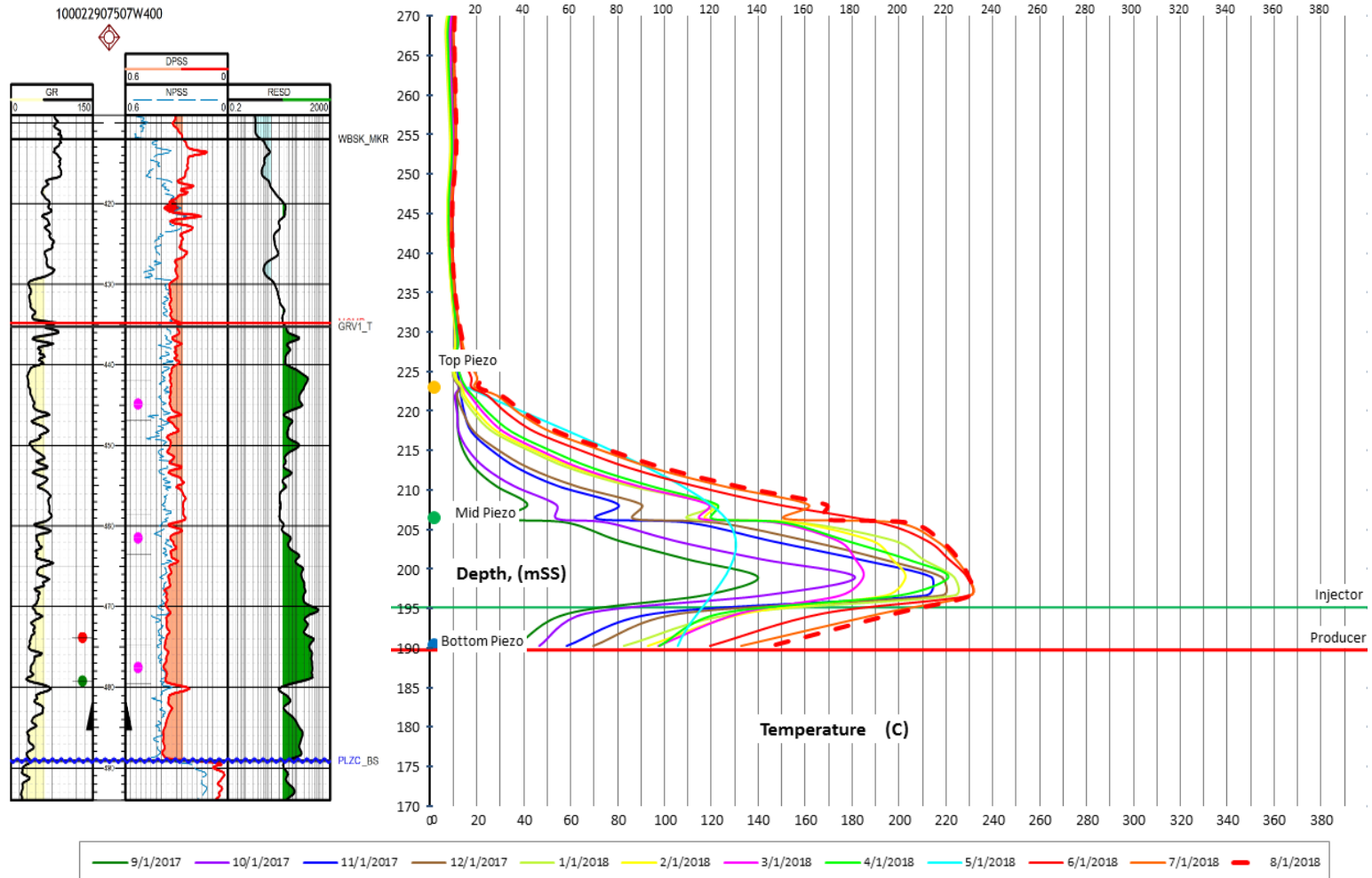
Pad OO Heel Observation Well Pressure (5m from OO6 well pair)

3.1.1-5d



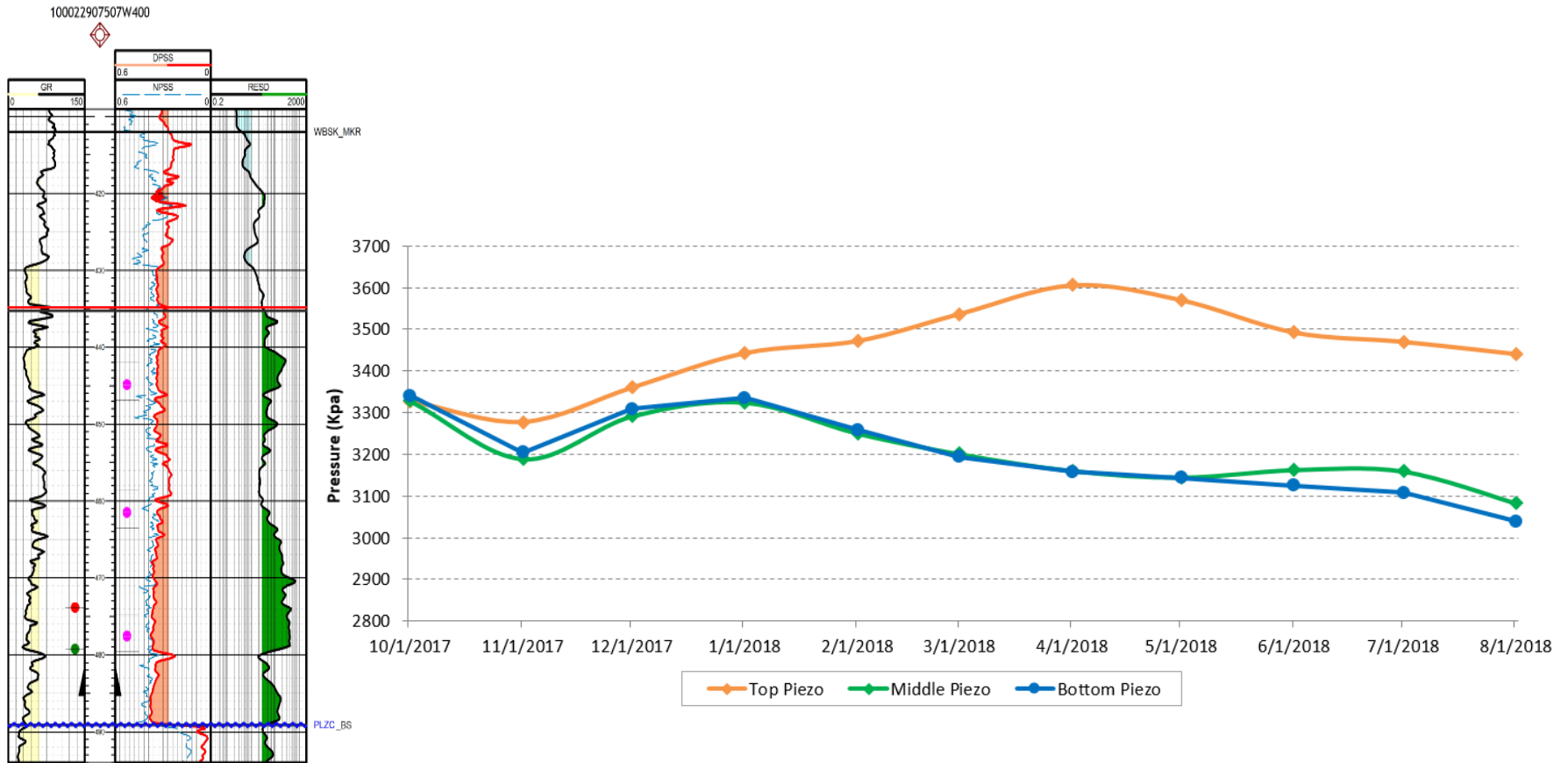
Pad OO Toe Observation Well Temp (32m from OO4 well pair)

3.1.1-5d



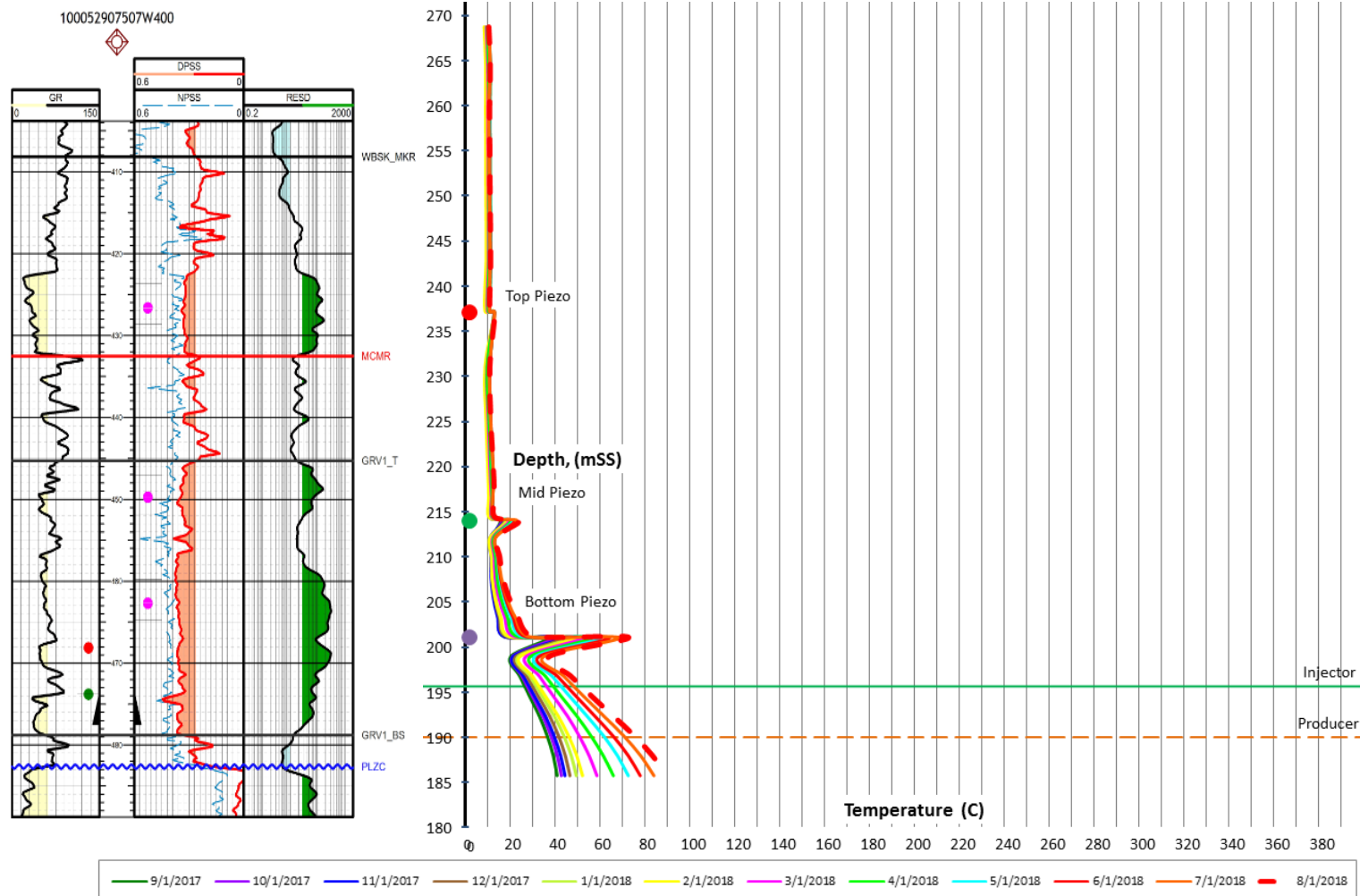
Pad OO Toe Observation Well Pressure (32m from OO4 well pair)

3.1.1-5d



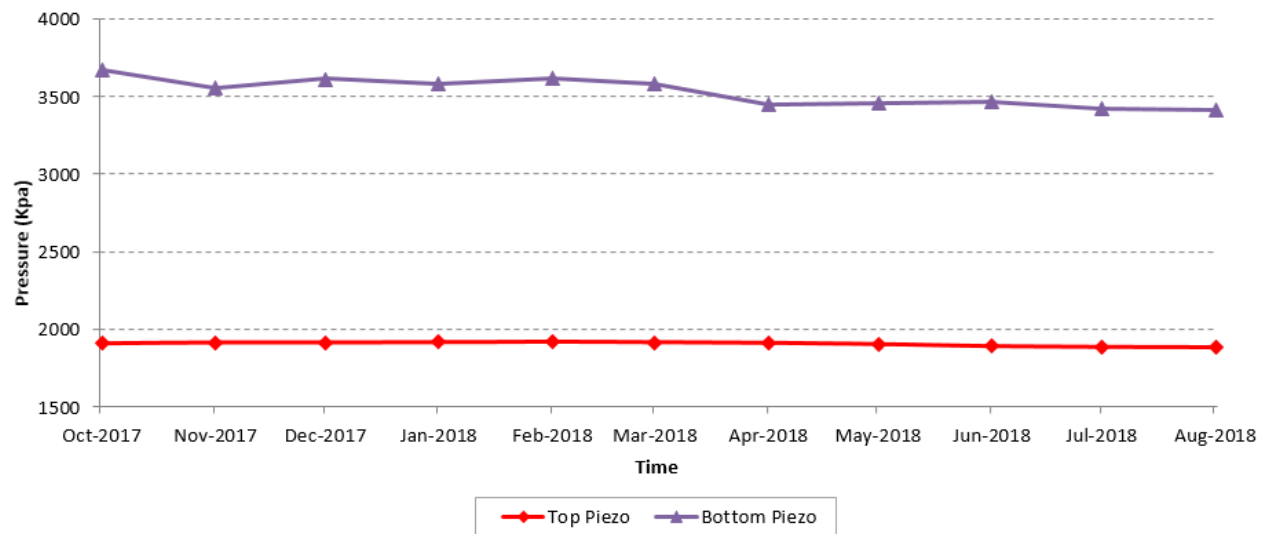
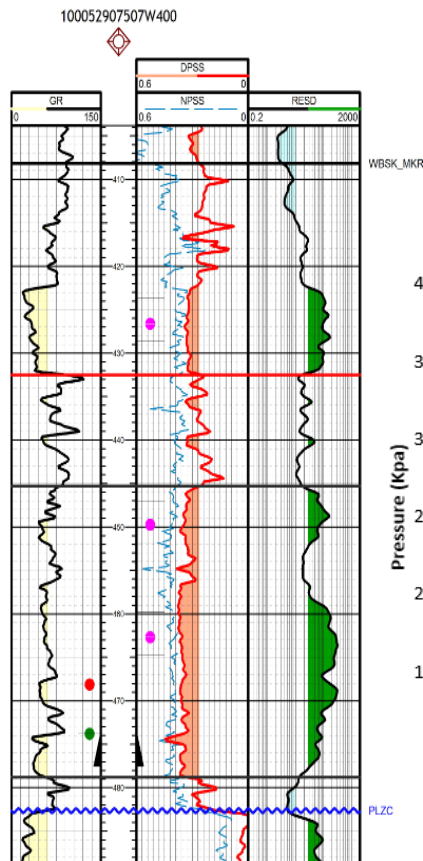
Pad PP Heel Observation Well Temp (14m from PP1 well pair)

3.1.1-5d



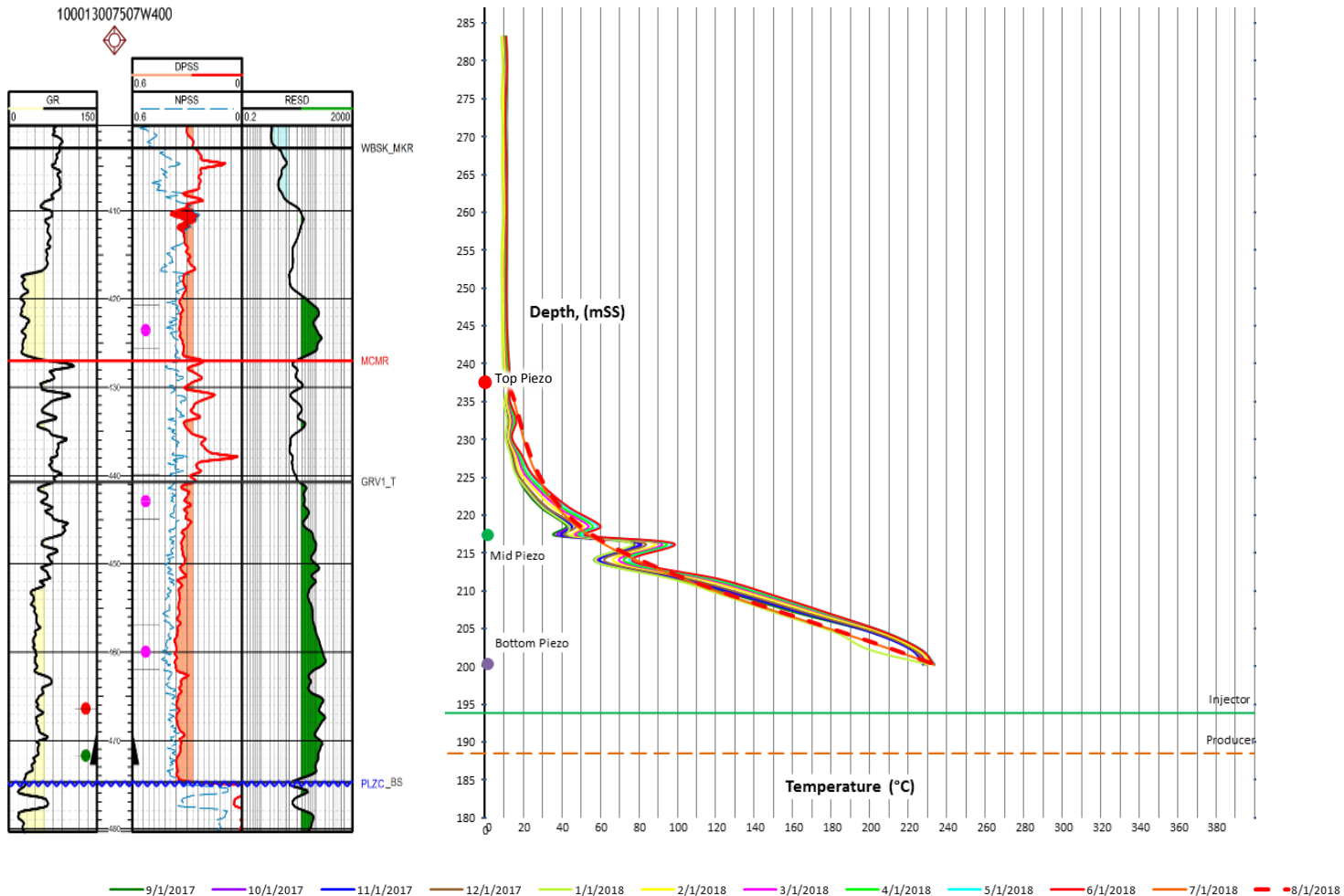
Pad PP Heel Observation Well Pressure (14m from PP1 well pair)

3.1.1-5d



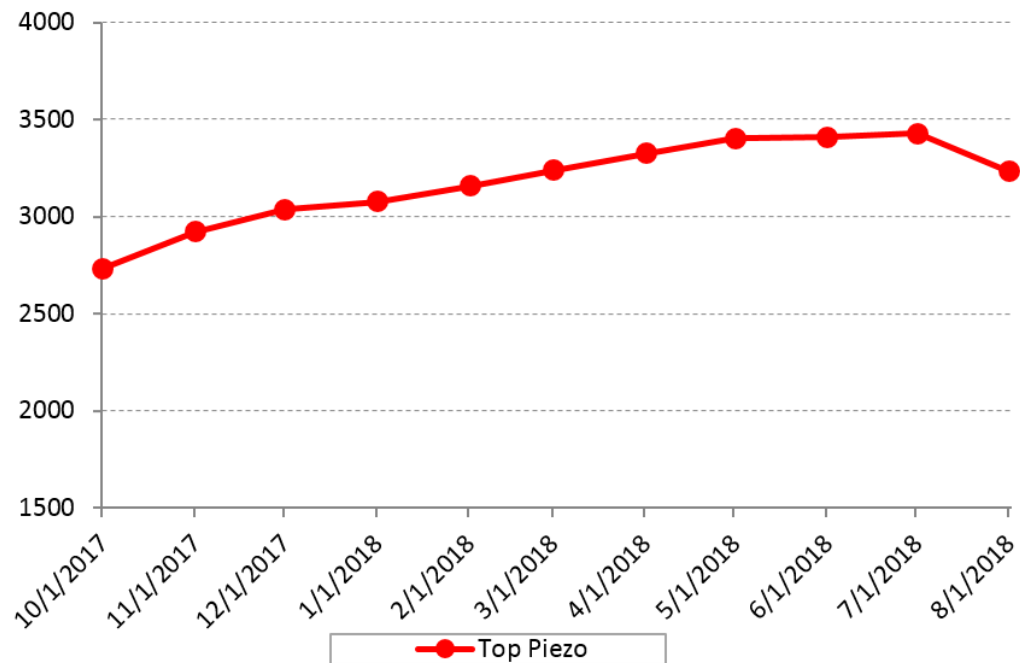
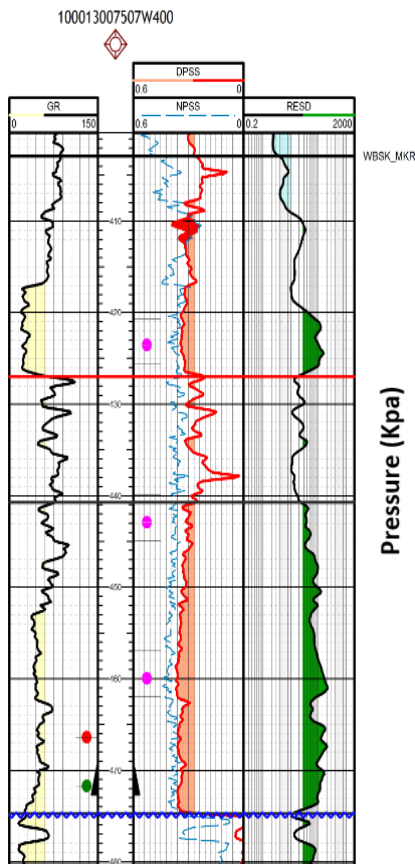
Pad PP Mid Observation Well Temp (12m from PP5 well pair)

3.1.1-5d



Pad PP Mid Observation Well Pressure (12m from PP5 well pair)

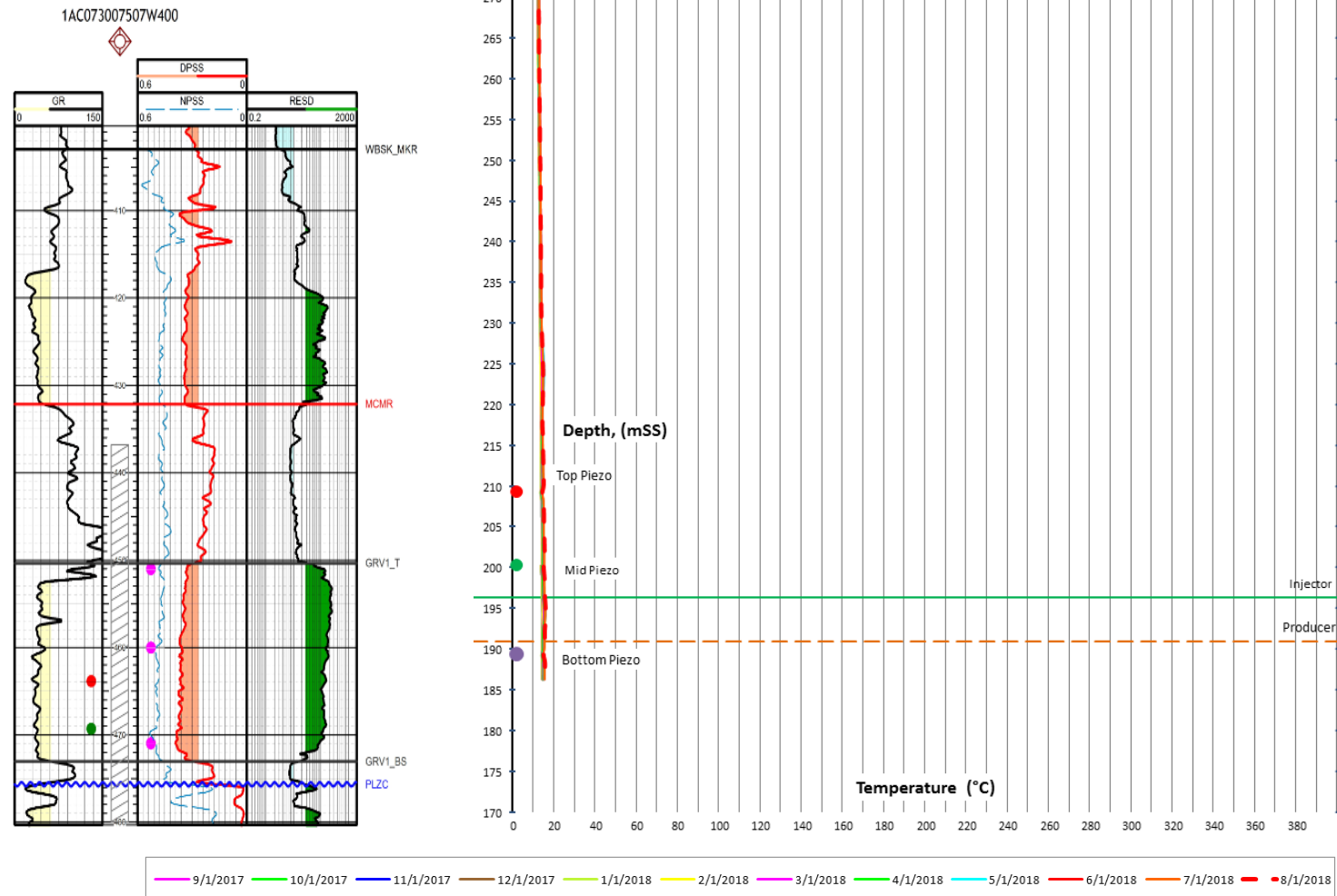
3.1.1-5d



* The middle and bottom piezometer has failed

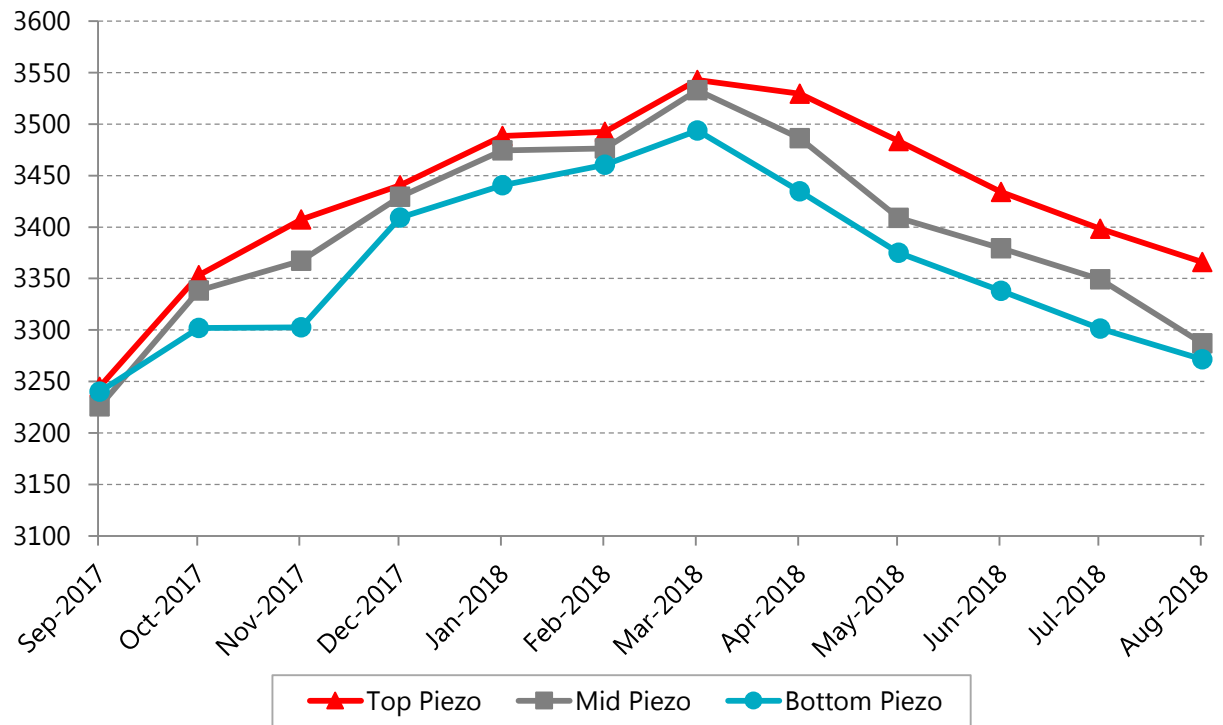
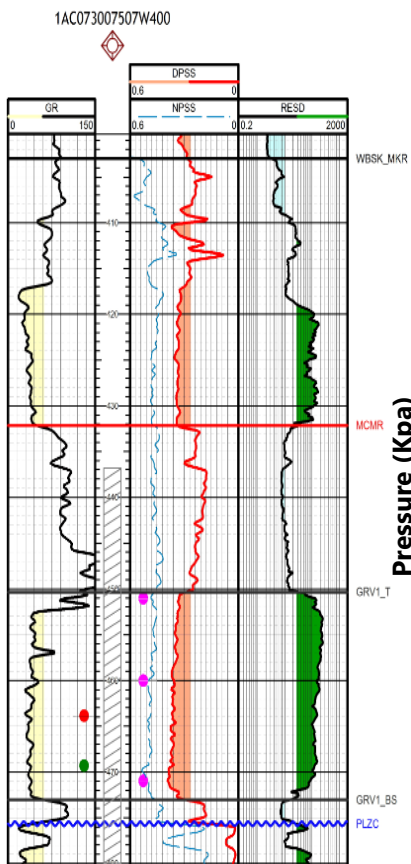
Pad PP Toe Observation Well Temp (39m from PP3 well pair)

3.1.1-5d



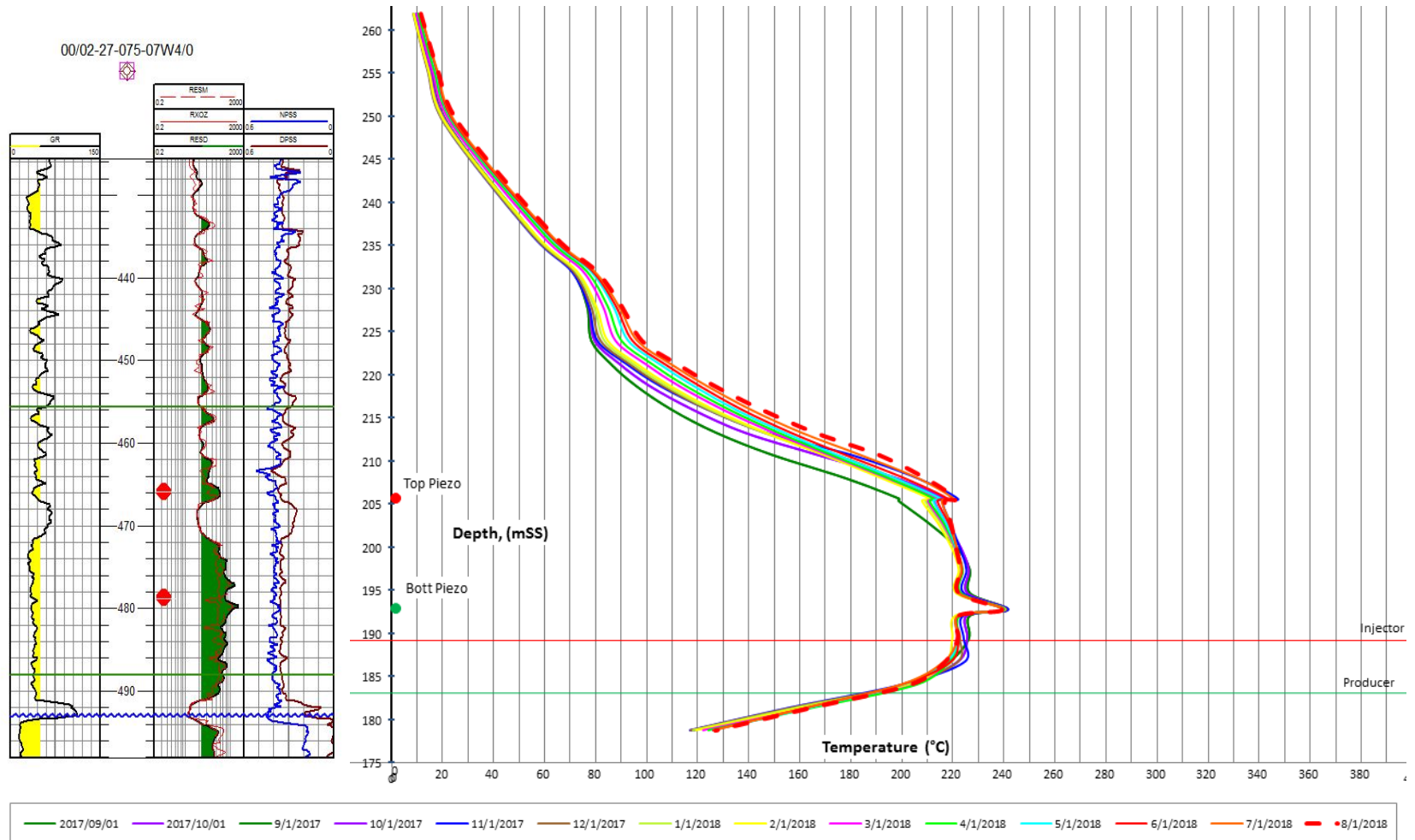
Pad PP Toe Observation Well Pressure (39m from PP3 well pair)

3.1.1-5d



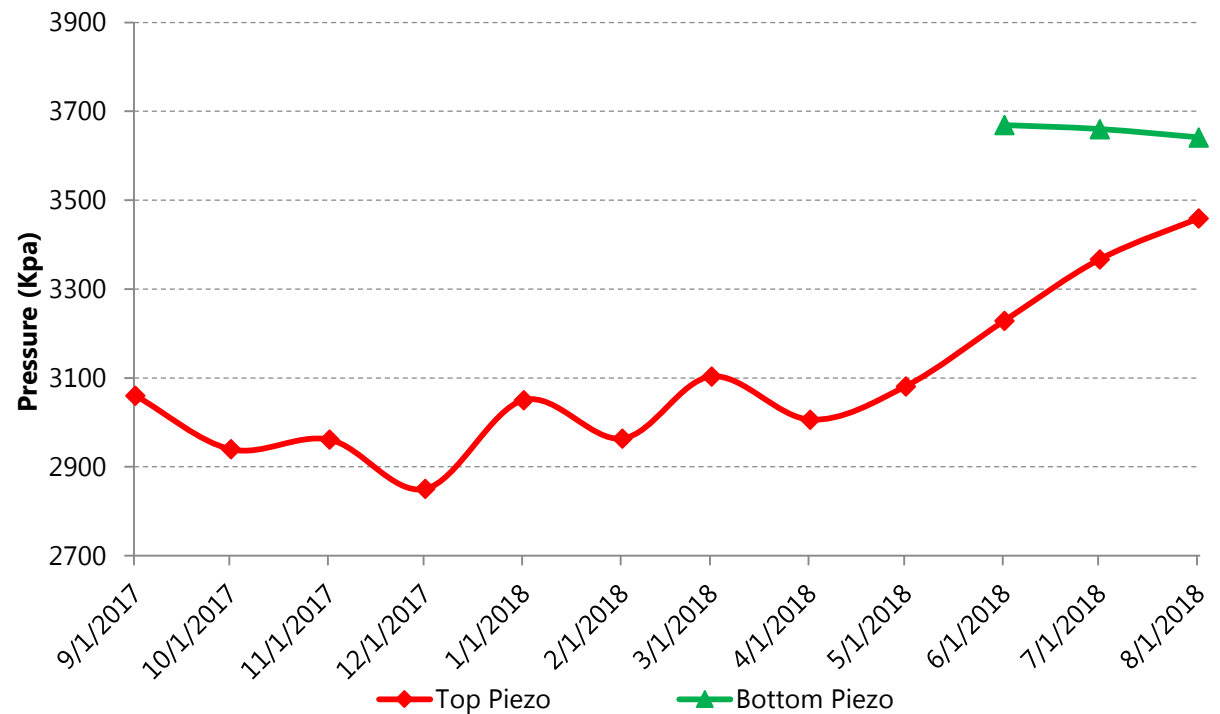
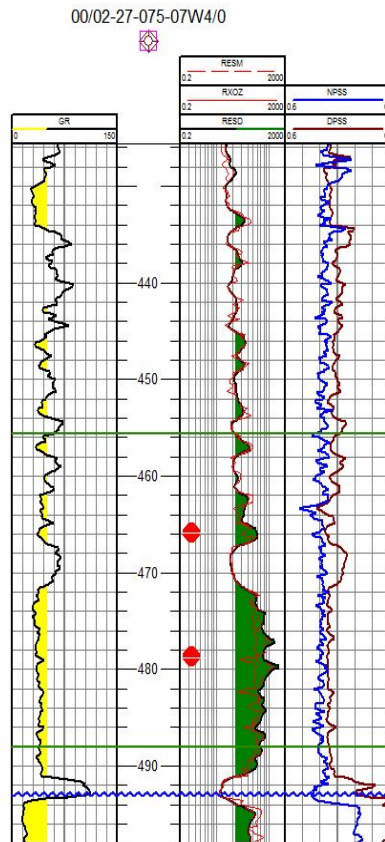
Pad EE Heel Observation Well Temp (4.8m from EE5 well pair)

3.1.1-5d



Pad EE Heel Observation Well Pressure (4.8m from EE5 well pair)

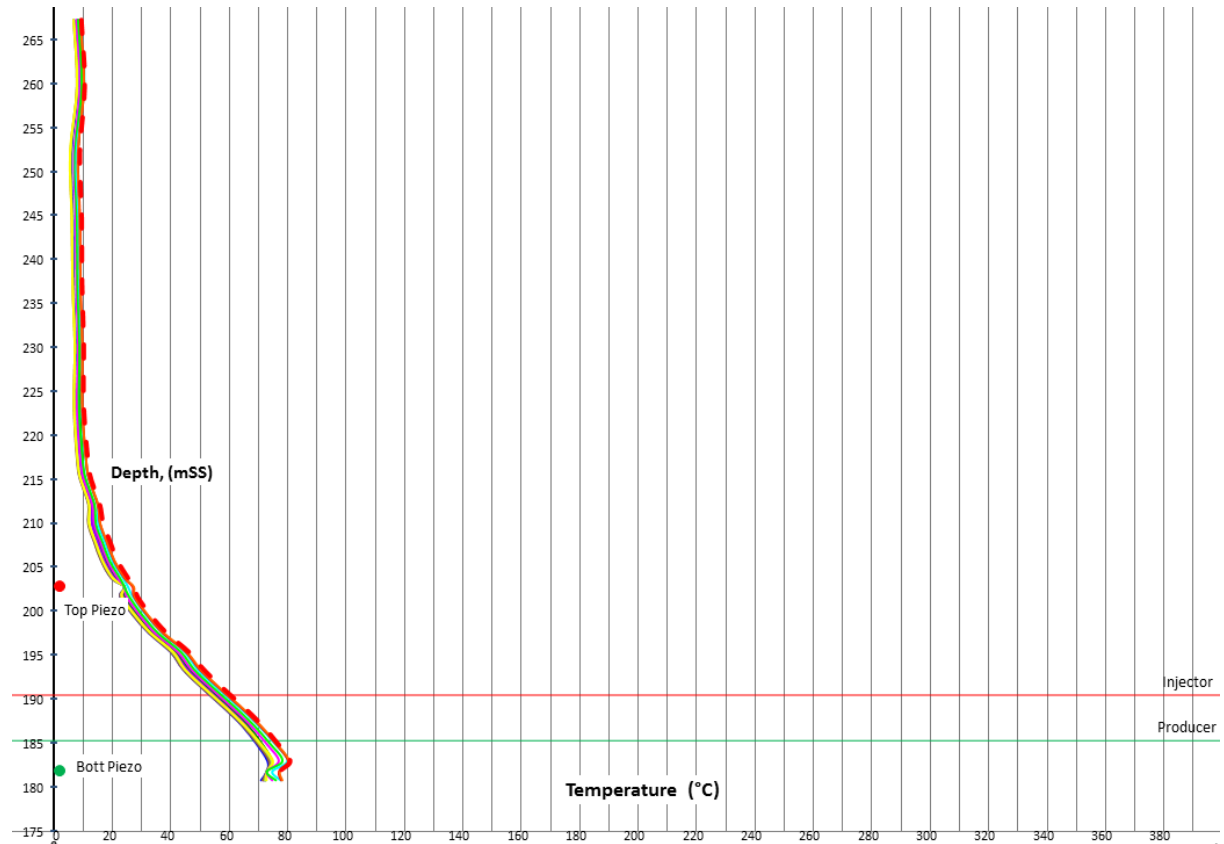
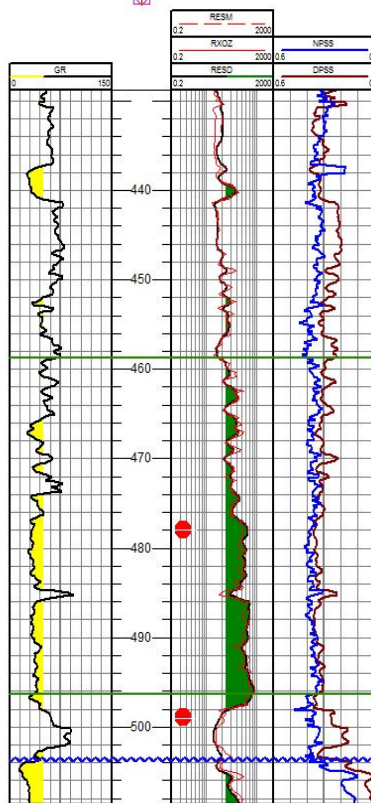
3.1.1-5d



Pad EE Toe Observation Well Temp (11.2m from EE2 well pair)

3.1.1-5d

02/01-27-075-07W4/0

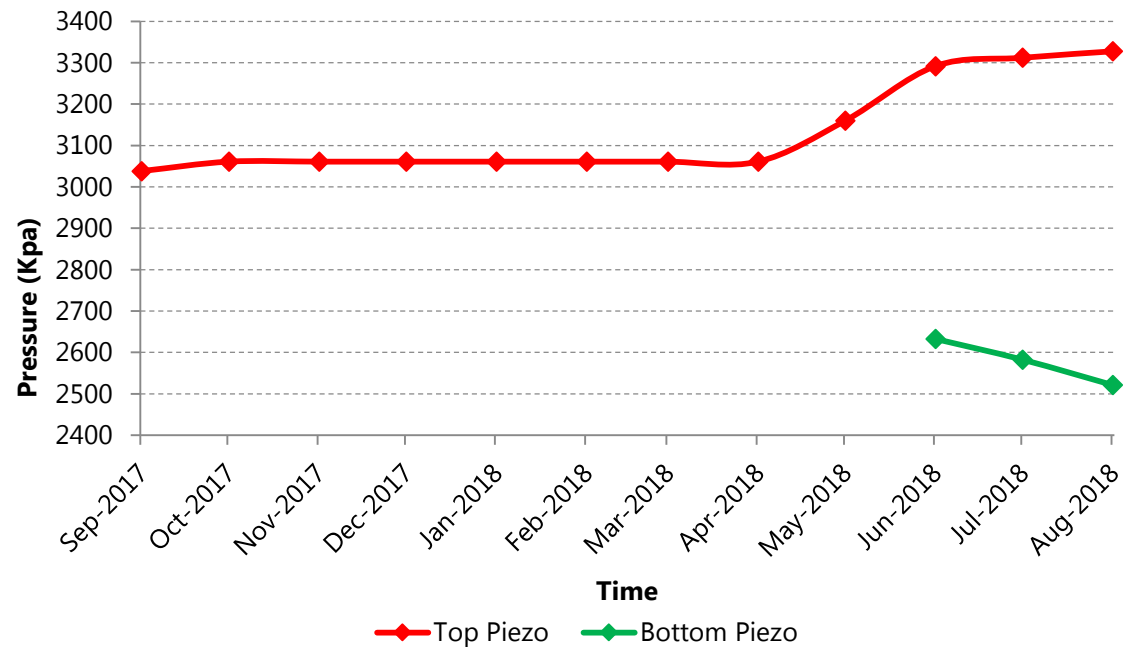
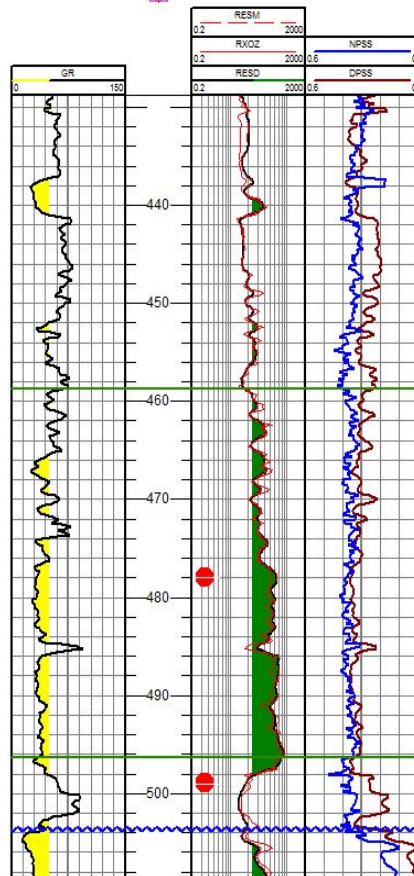


2017/09/01 2017/10/01 9/1/2017 10/1/2017 11/1/2017 12/1/2017 1/1/2018 2/1/2018 3/1/2018 4/1/2018 5/1/2018 6/1/2018 7/1/2018 8/1/2018

Pad EE Toe Observation Well Pressure (11.2m from EE2 well pair)

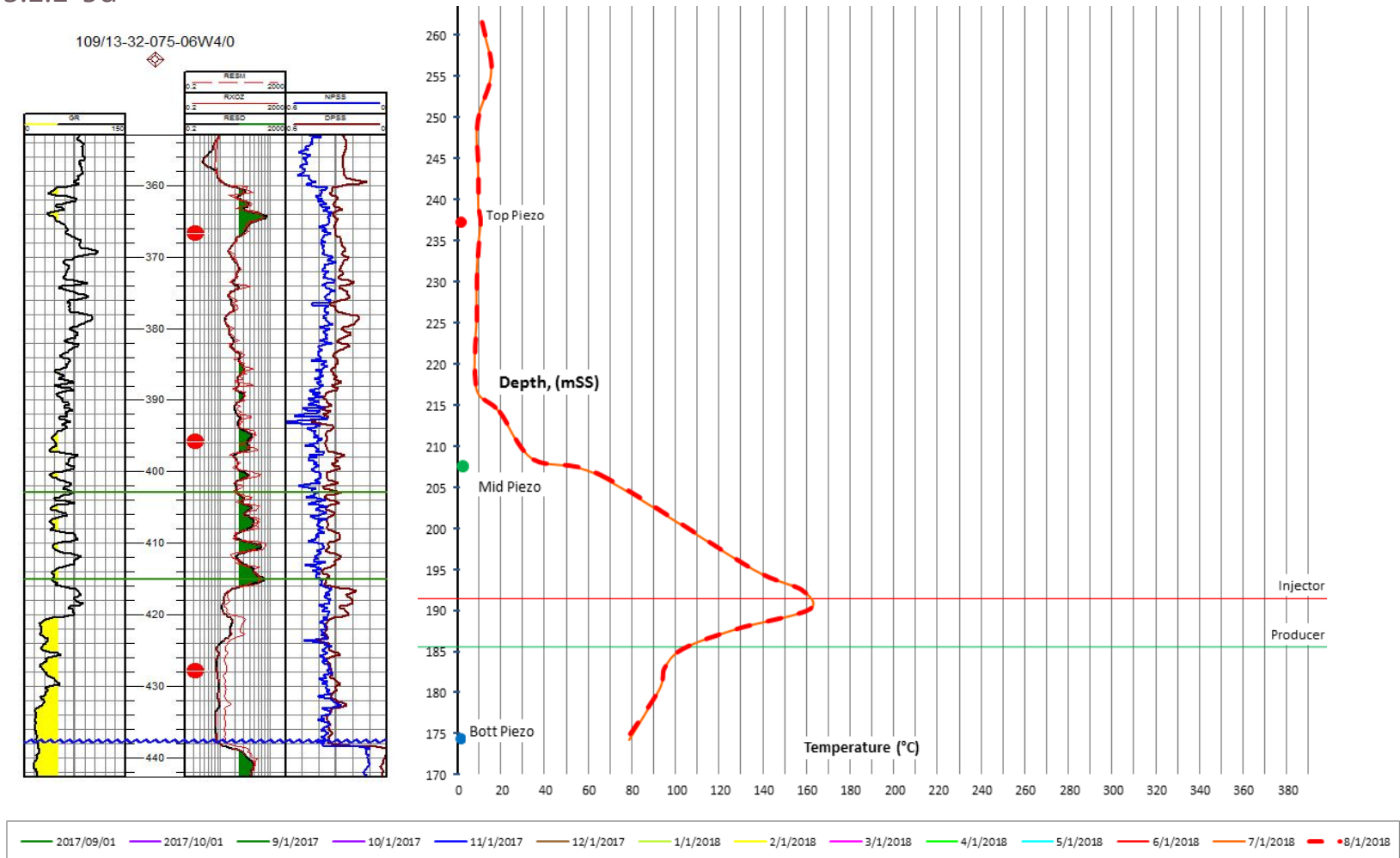
3.1.1-5d

02/01-27-075-07W4/0



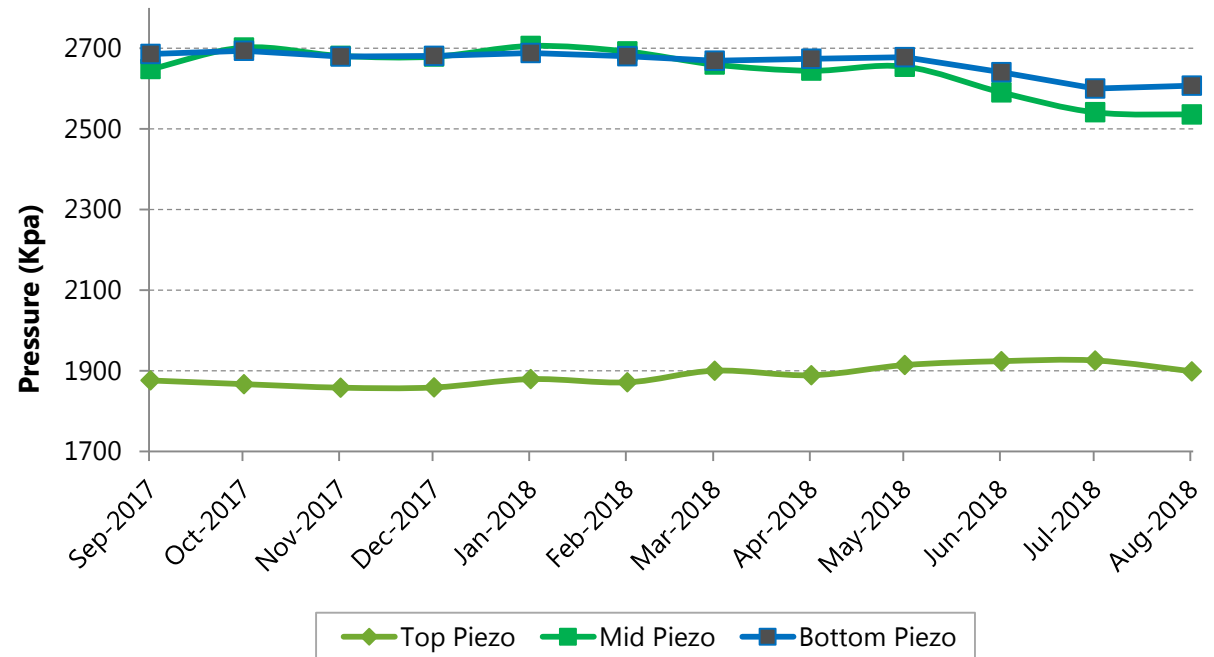
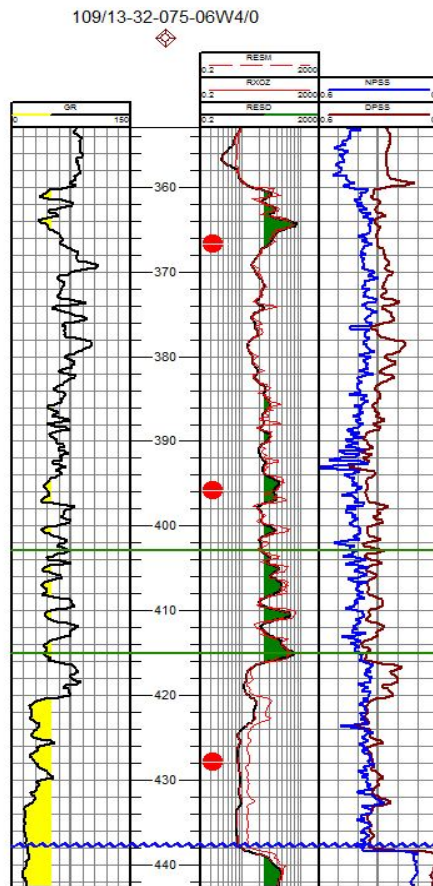
Pad J Mid Heel Observation Well Temp (5.6m from J5 well pair)

3.1.1-5d



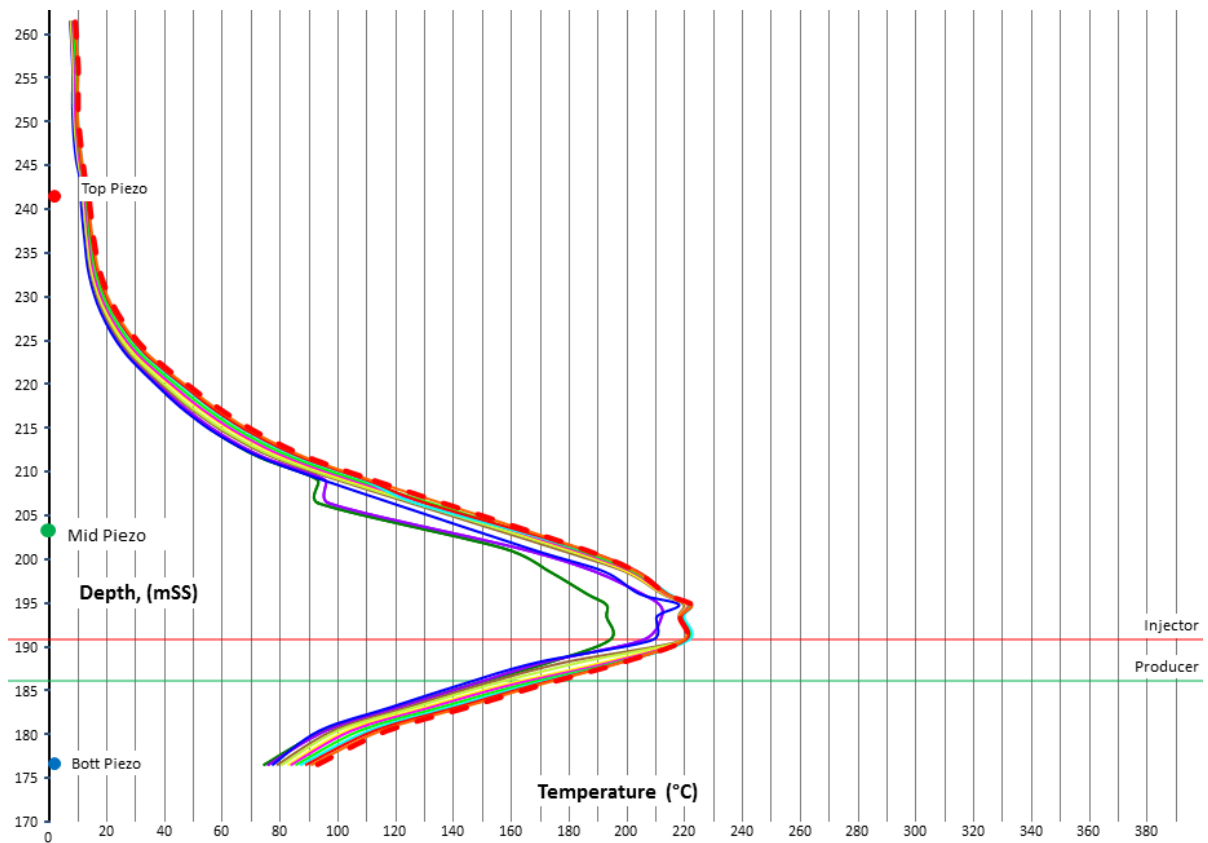
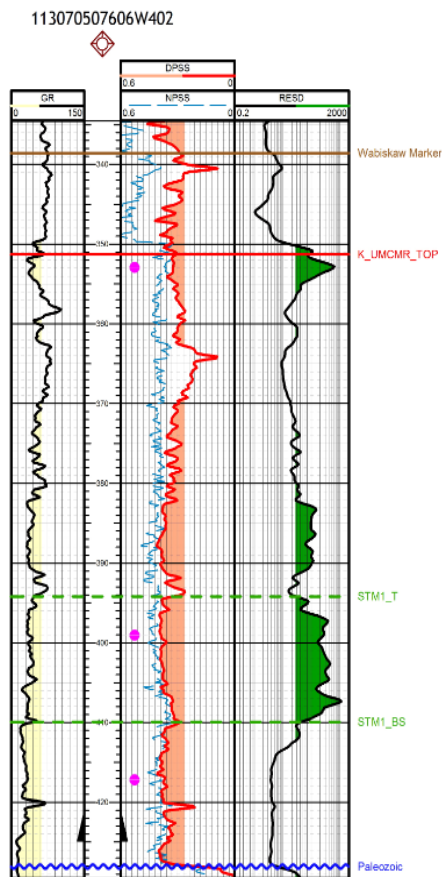
Pad J Mid Heel Observation Well Pressure (5.6m from J5 well pair)

3.1.1-5d



Pad J Mid Toe Observation Well Temp (6.7m from J3 well pair)

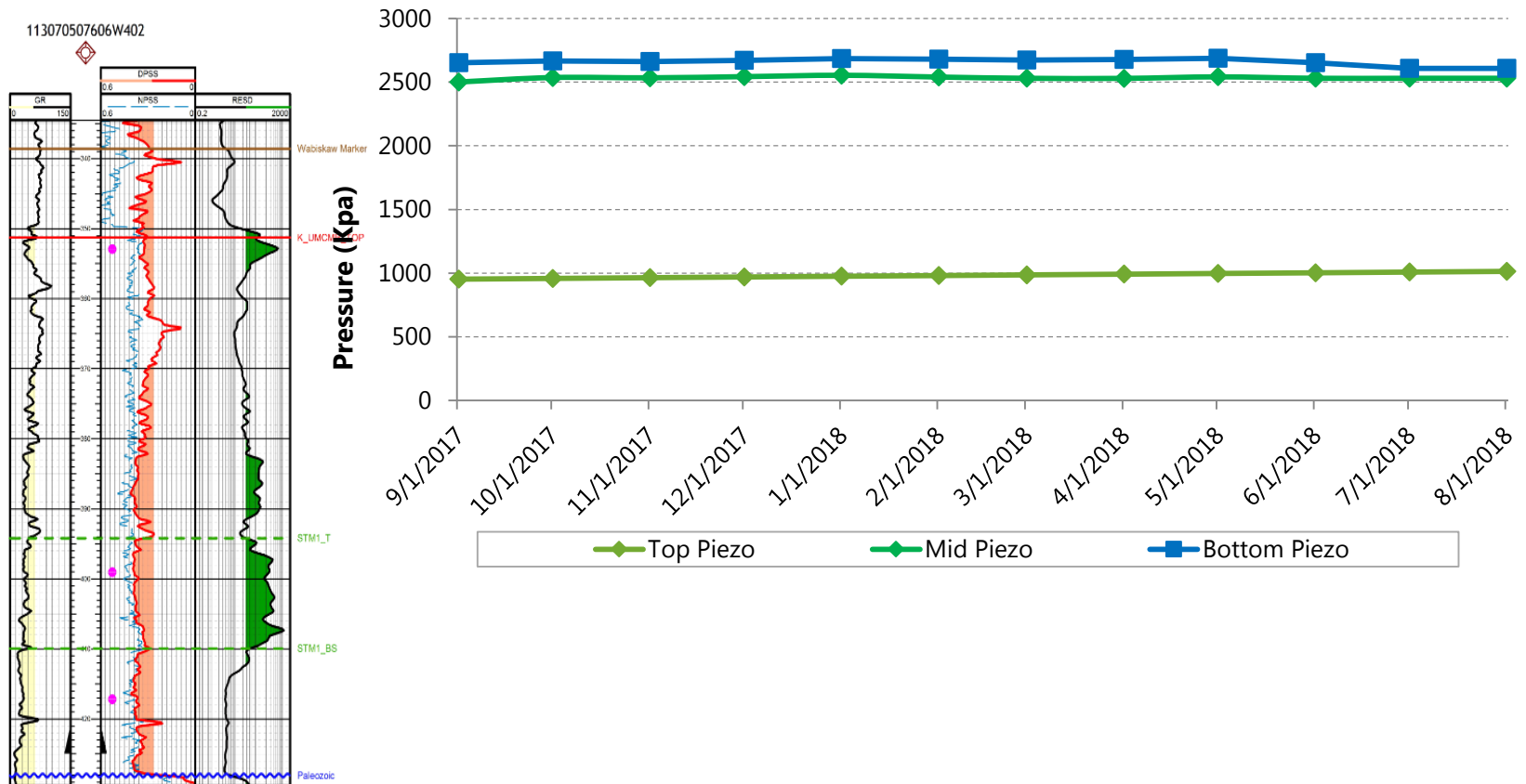
3.1.1-5d



2017/09/01 2017/10/01 9/1/2017 10/1/2017 11/1/2017 12/1/2017 1/1/2018 2/1/2018 3/1/2018 4/1/2018 5/1/2018 6/1/2018 7/1/2018 8/1/2018

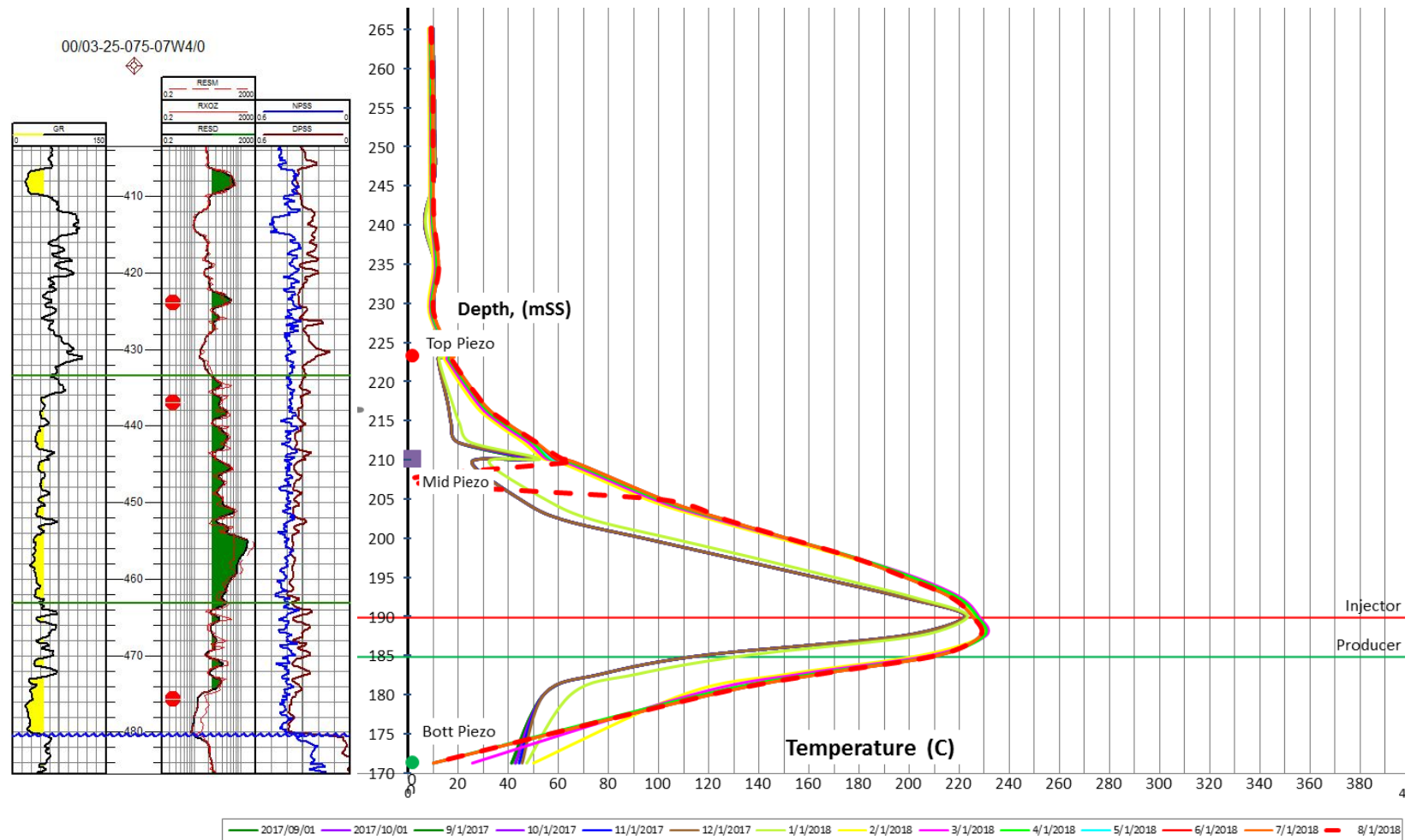
Pad J Mid Toe Observation Well Pressure (6.7m from J3 well pair)

3.1.1-5d



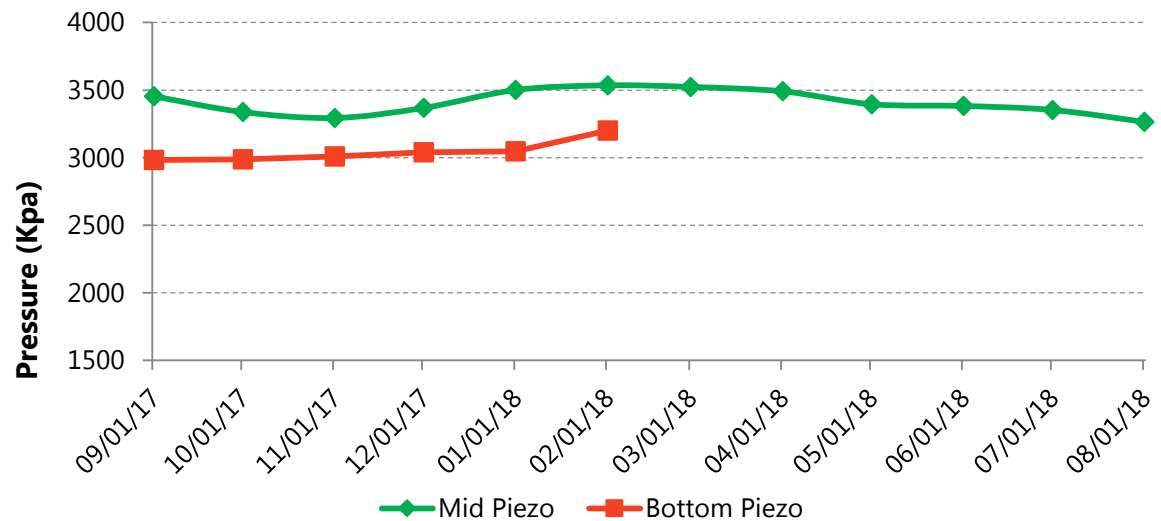
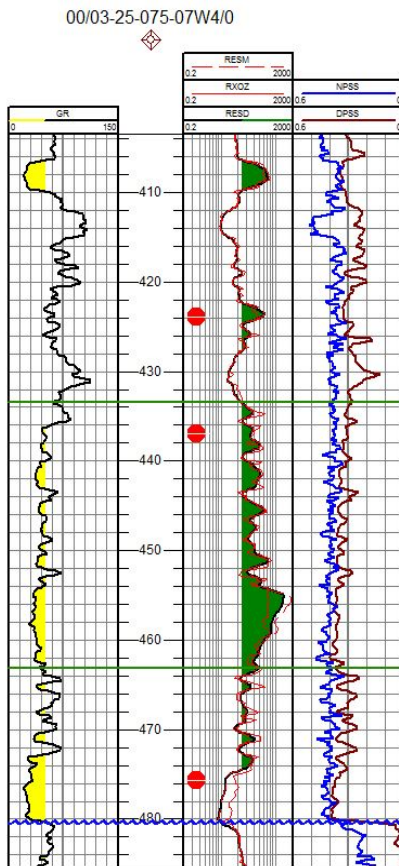
Pad VV South Heel Observation Well Temp (9.1m from VV6 well pair)

3.1.1-5d



Pad VV South Heel Observation Well Pressure (9.1m from VV6 well pair)

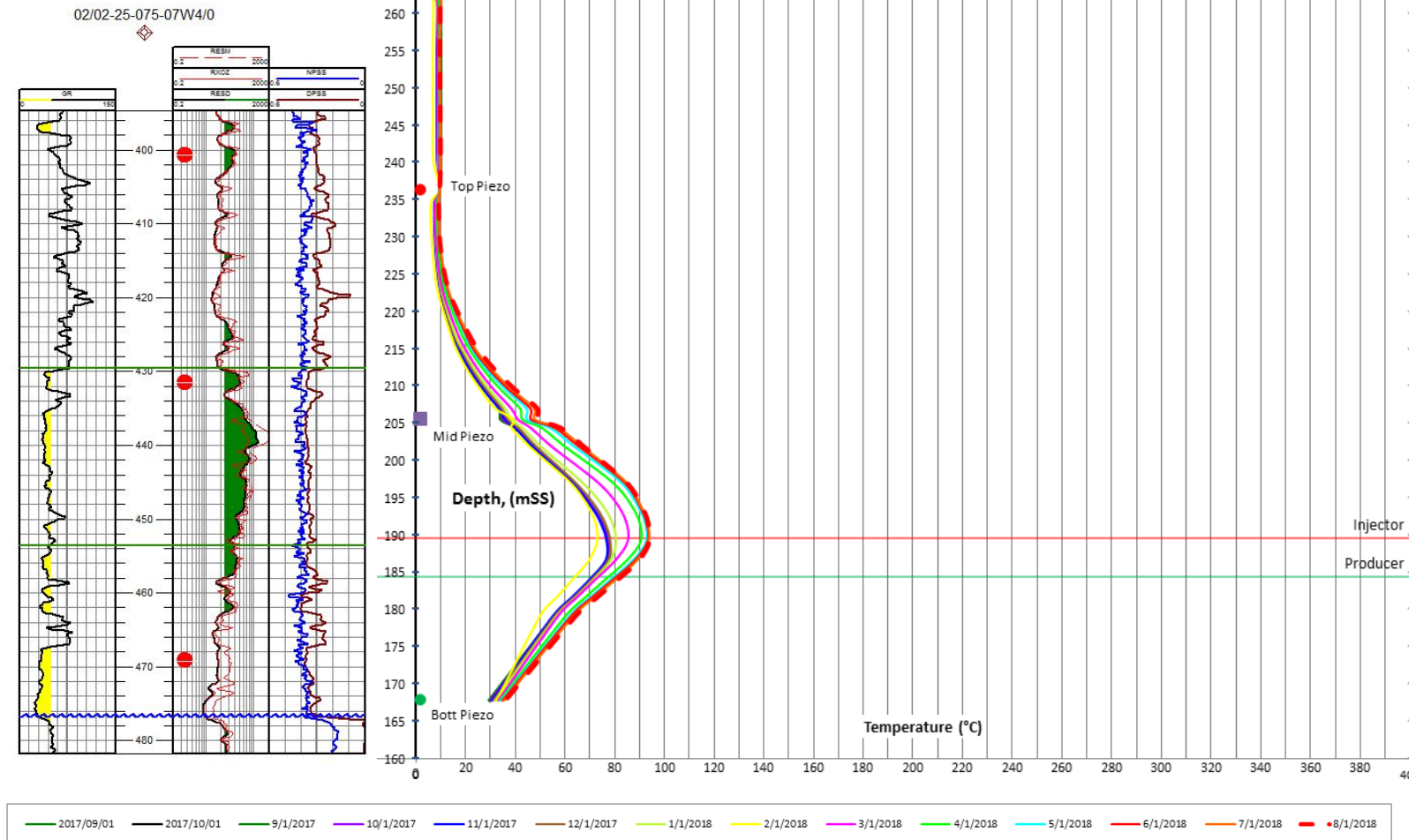
3.1.1-5d



* The middle piezometer has failed

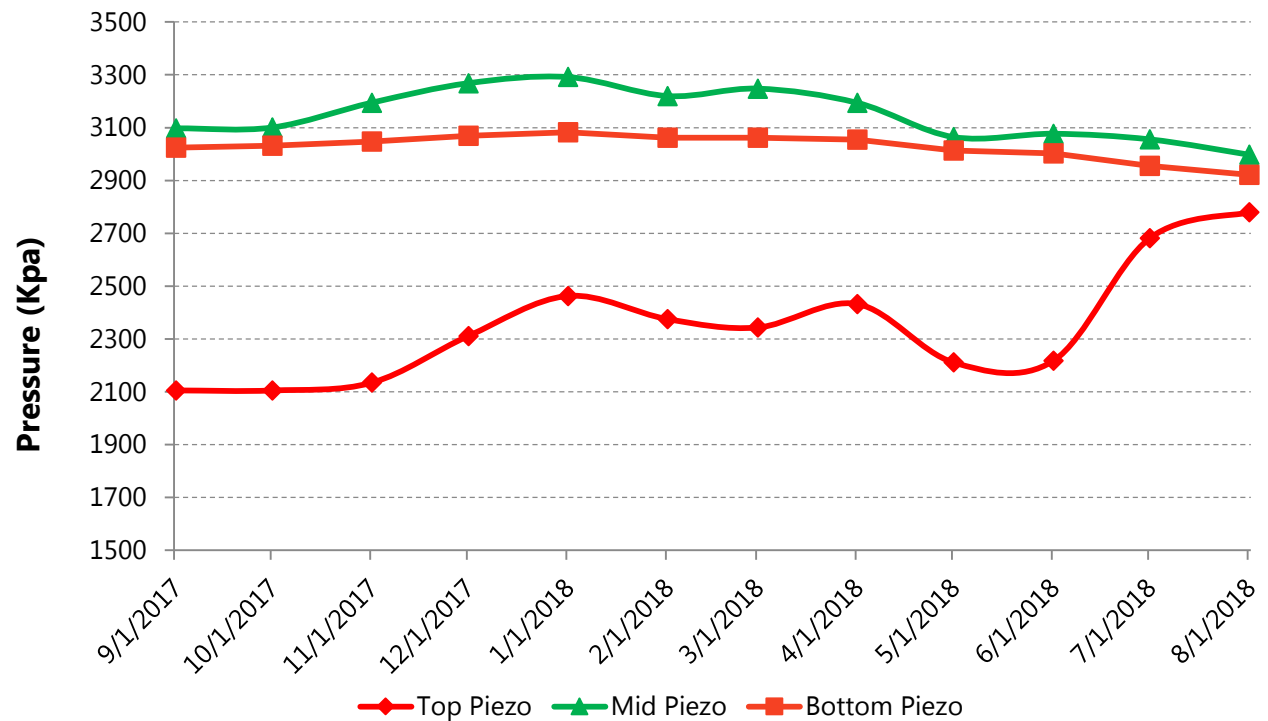
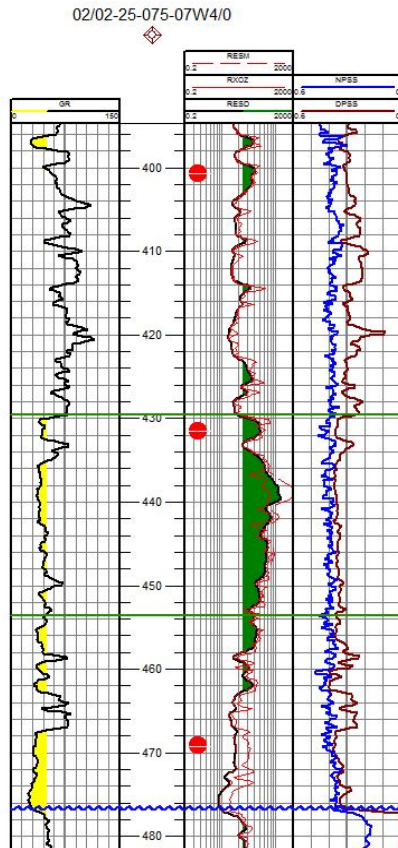
Pad VV Mid Toe Observation Well Temp (9.9m from VV7 well pair)

3.1.1-5d



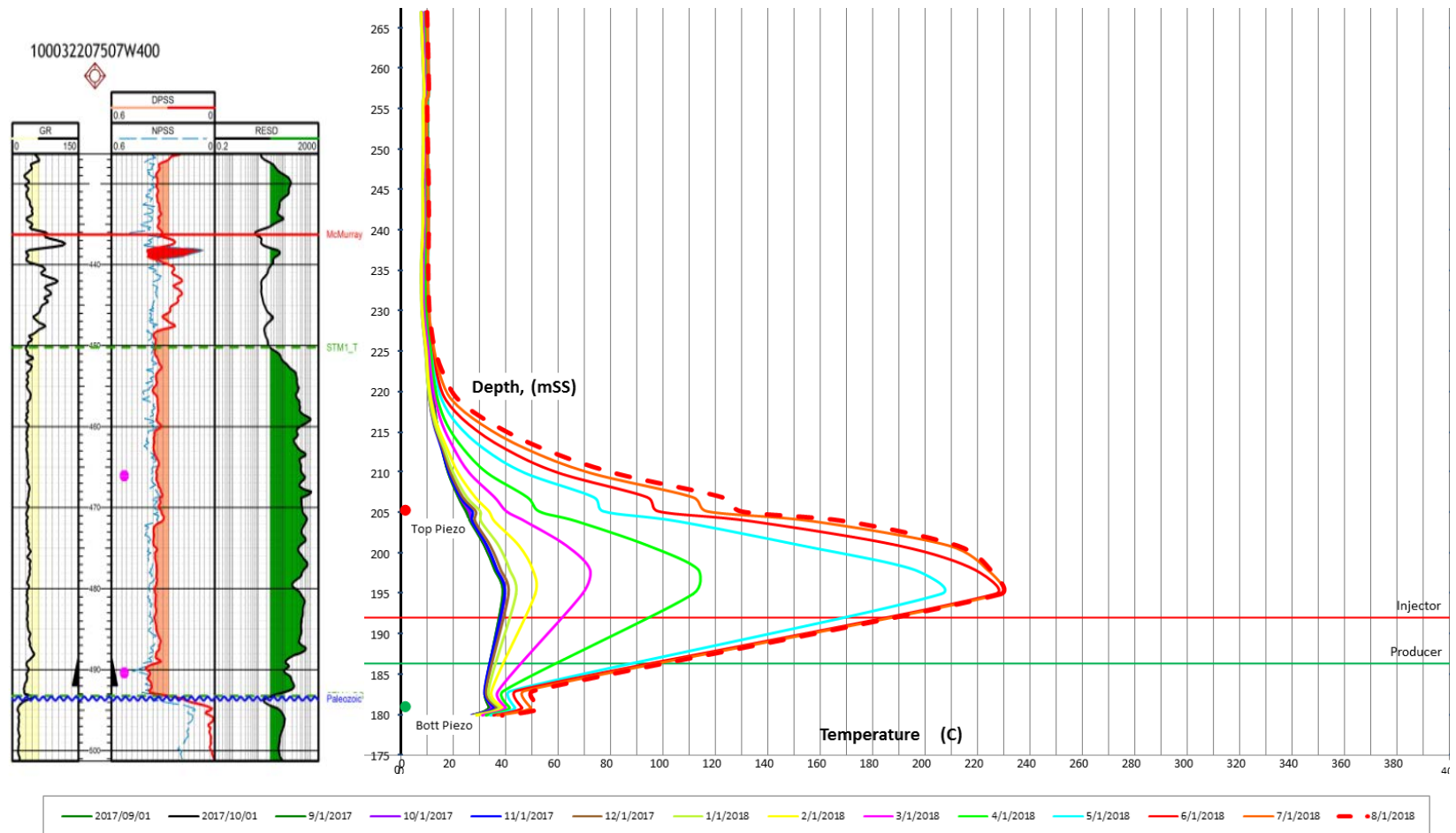
Pad VV Mid Toe Observation Well Pressure (9.9m from VV7 well pair)

3.1.1-5d



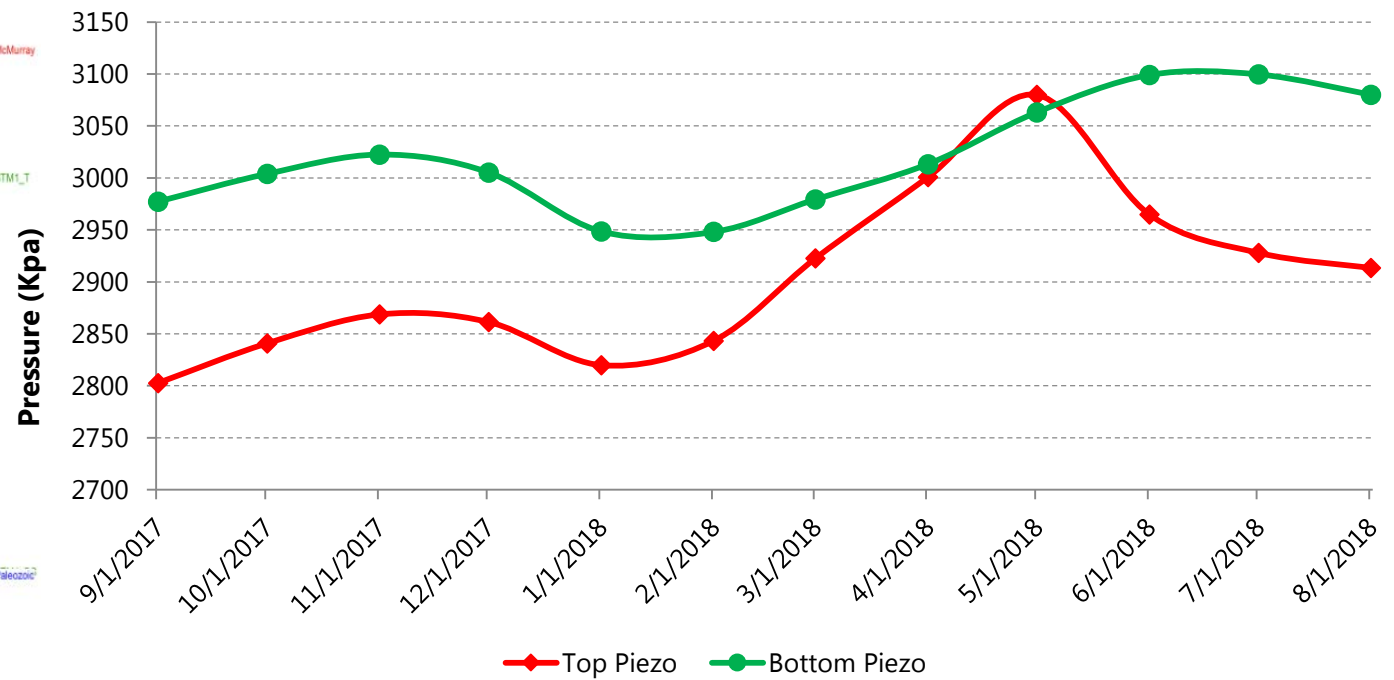
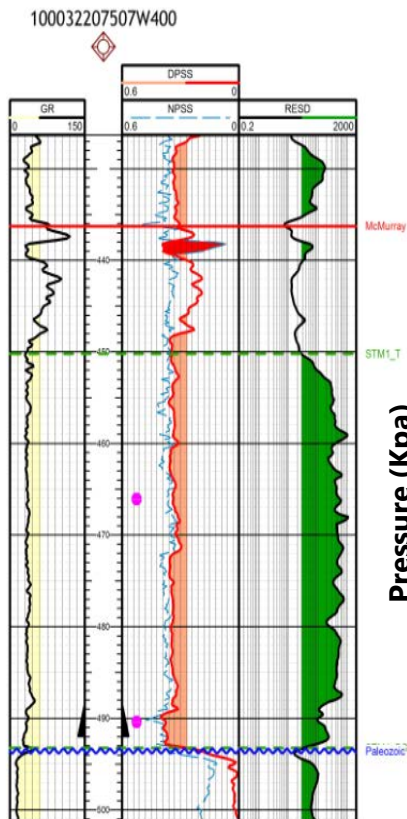
Pad K Heel Observation Well Temp (10.7m from K6 well pair)

3.1.1-5d



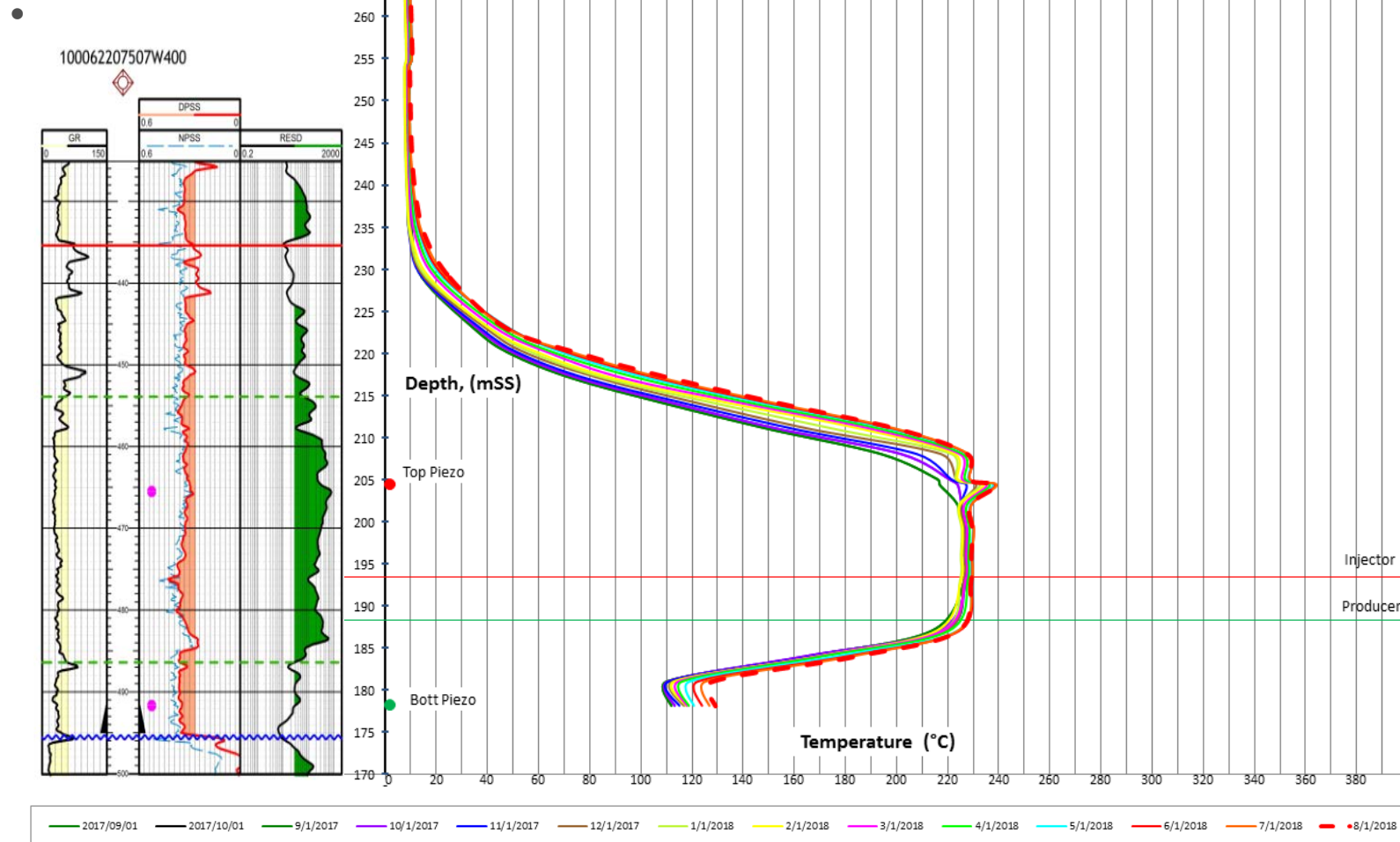
Pad K Heel Observation Well Pressure (10.7m from K6 well pair)

3.1.1-5d



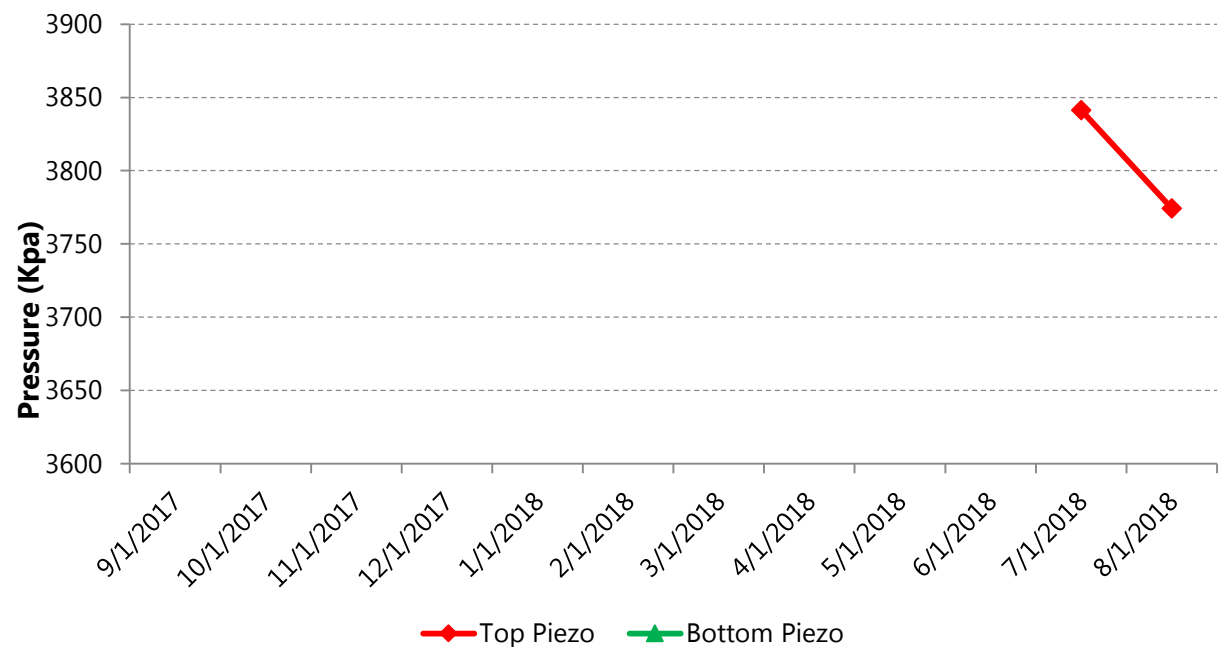
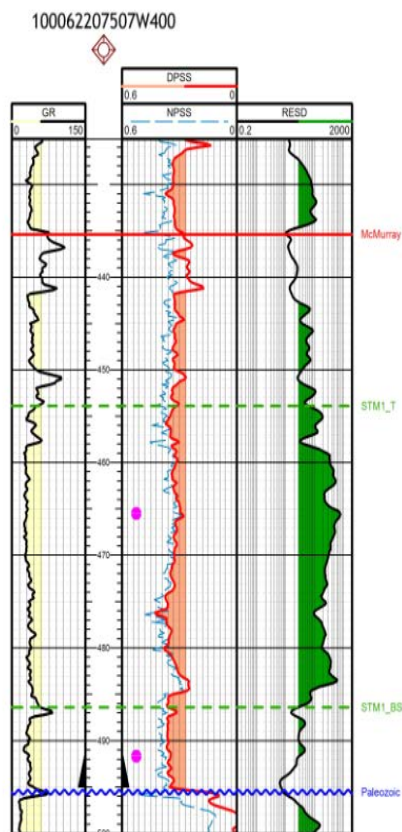
Pad K Toe Observation Well Temp (9.5m from K5 well pair)

3.1.1-5d



Pad K Toe Observation Well Pressure (9.5m from K5 well pair)

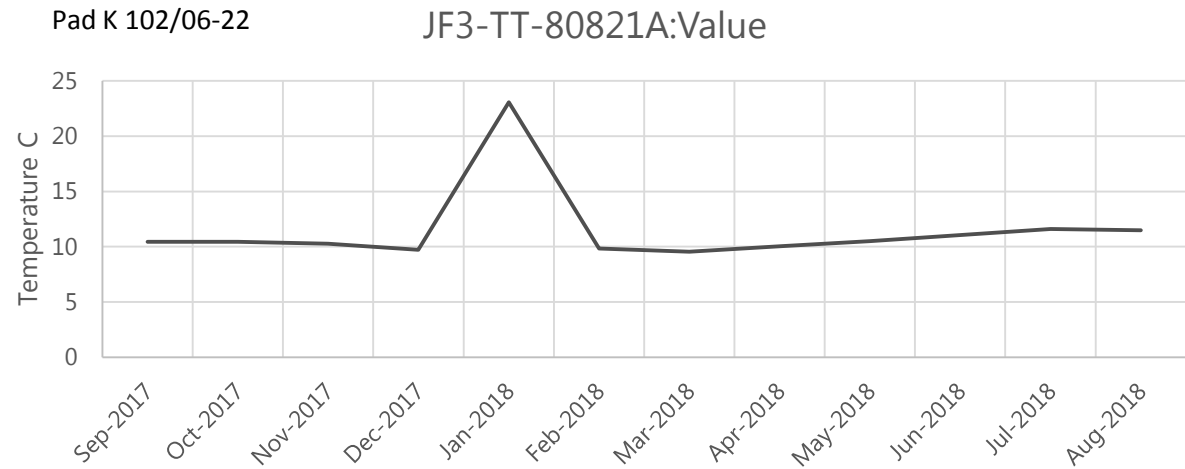
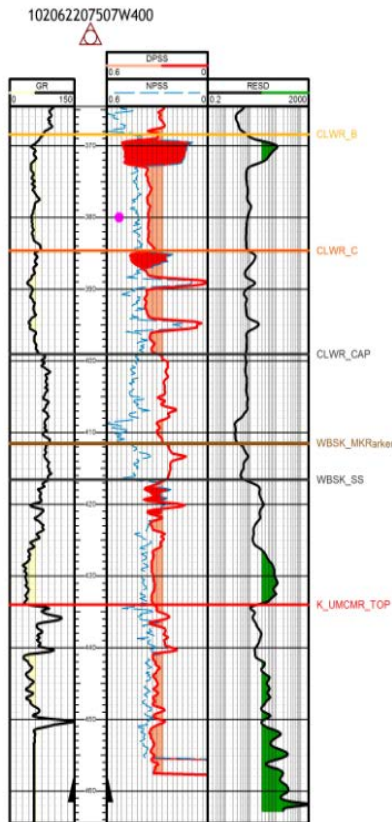
3.1.1-5d



* The bottom piezometer has failed

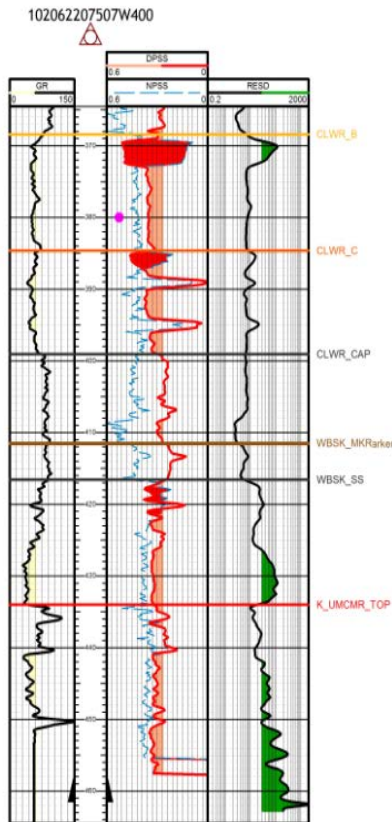
Pad K Caprock 6-22 Observation Well Temp (9.8m from K5 well pair)

3.1.1-5d



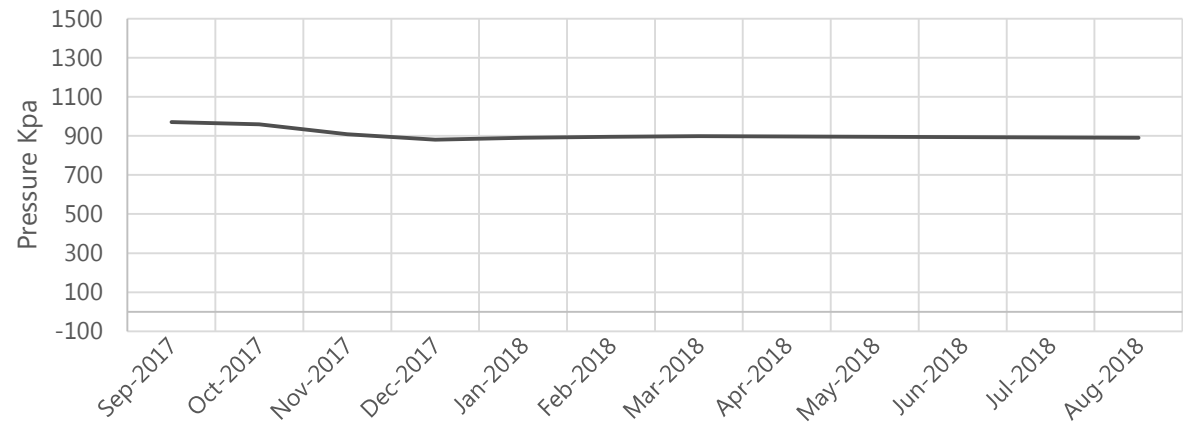
Pad K Caprock 6-22 Observation Well Pressure (9.8m from K5 well pair)

3.1.1-5d



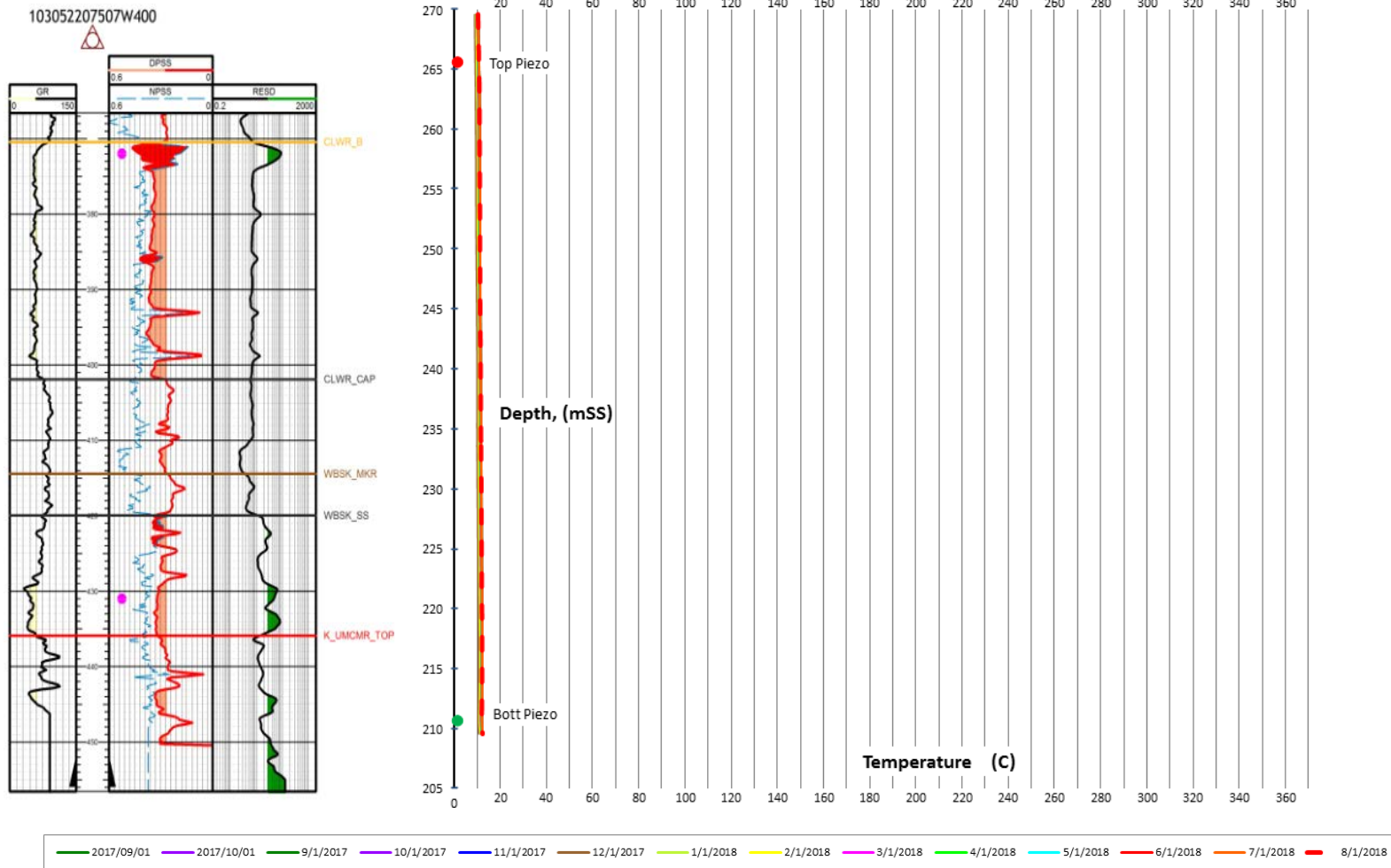
Pad K 102/06-22

380mKB



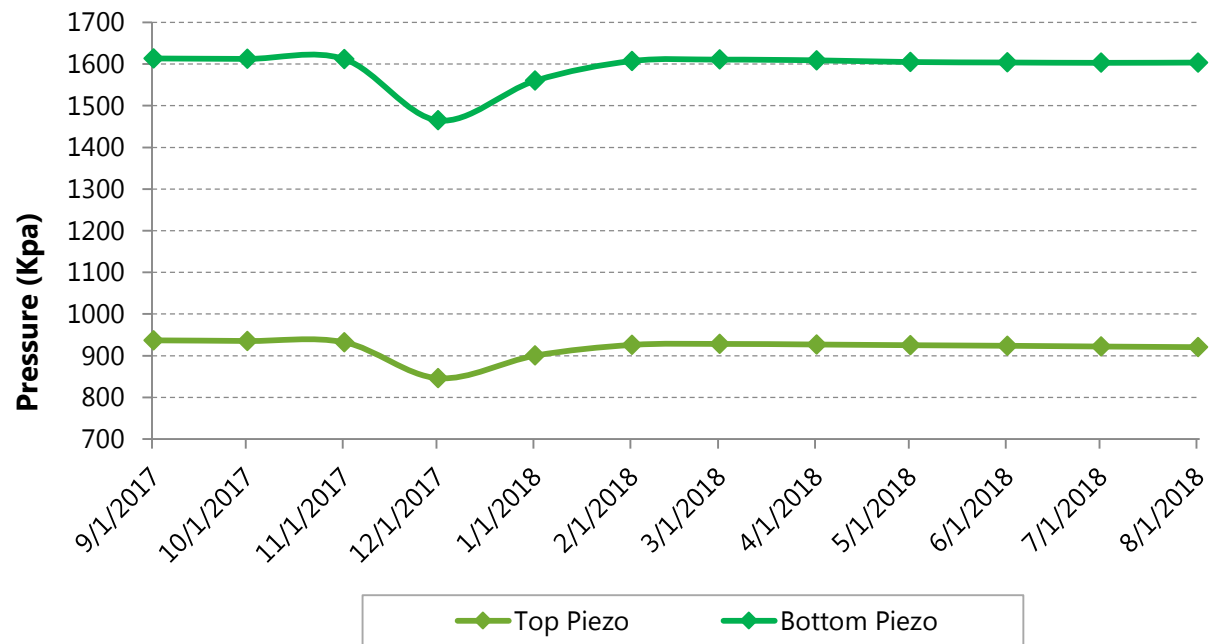
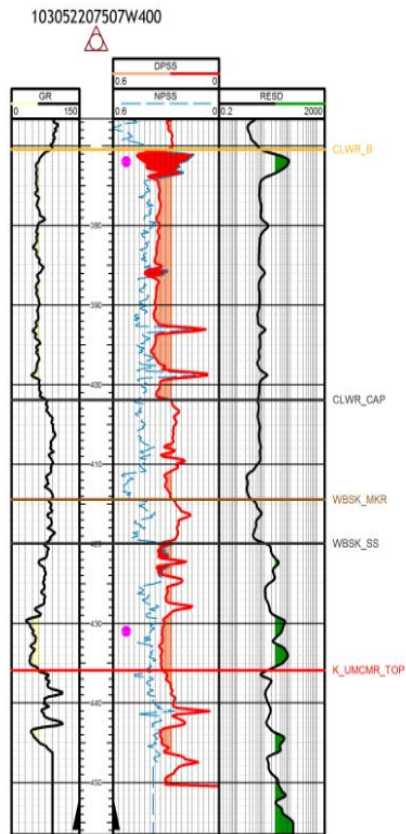
Pad K Caprock 5-22 Observation Well Temp (11.9m from K10 well pair)

3.1.1-5d



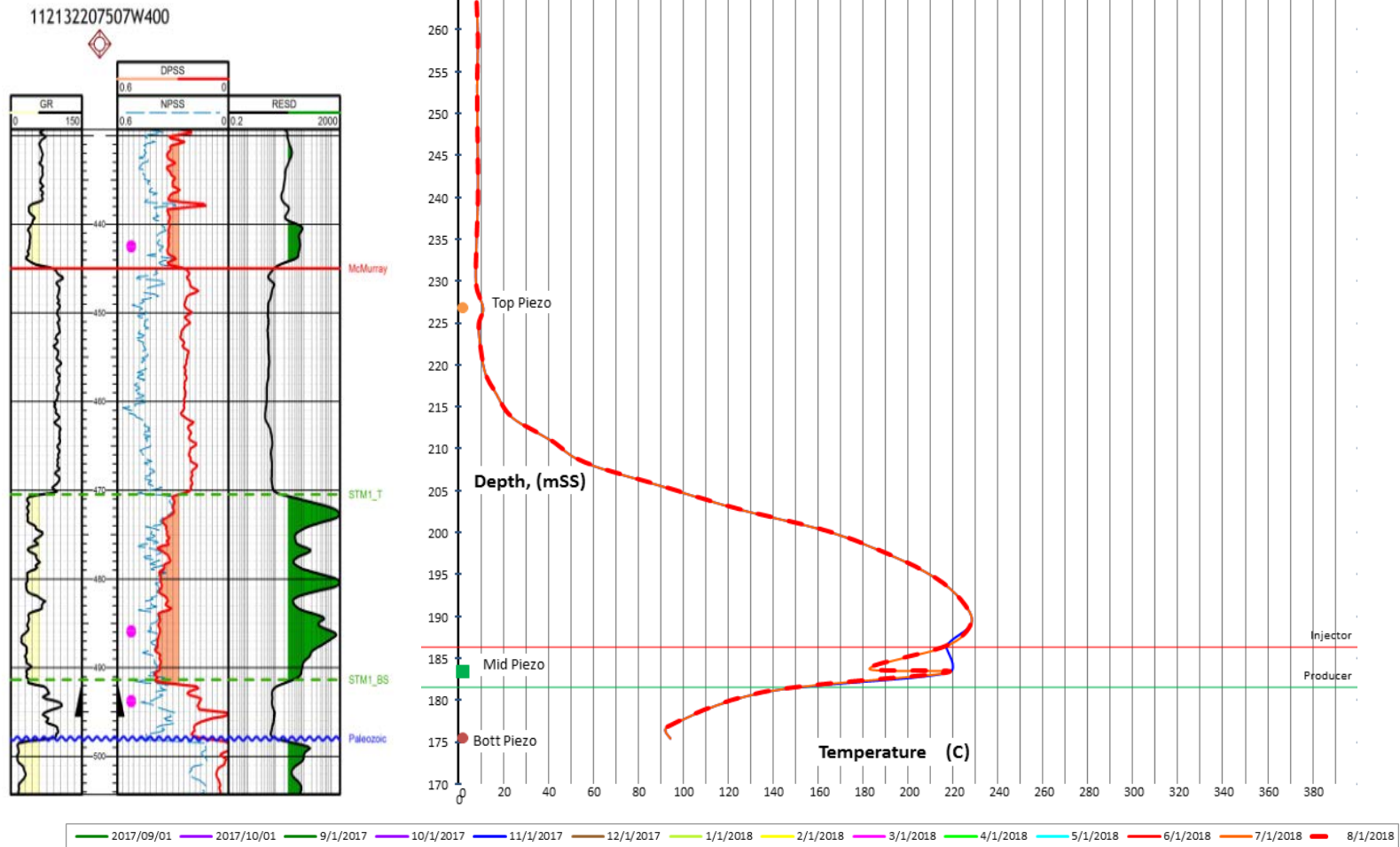
Pad K Caprock 5-22 Observation Well Pressure (11.9m from K10 well pair)

3.1.1-5d



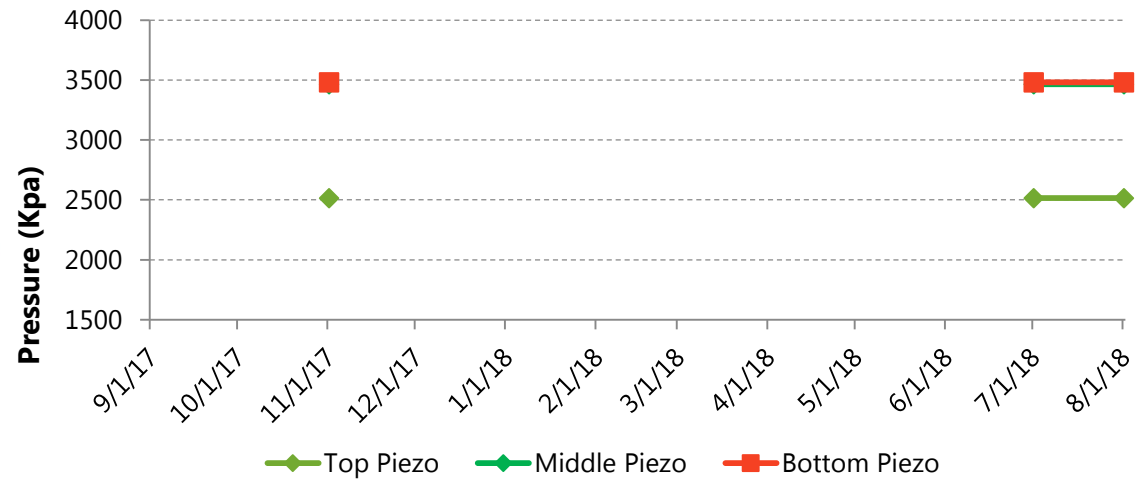
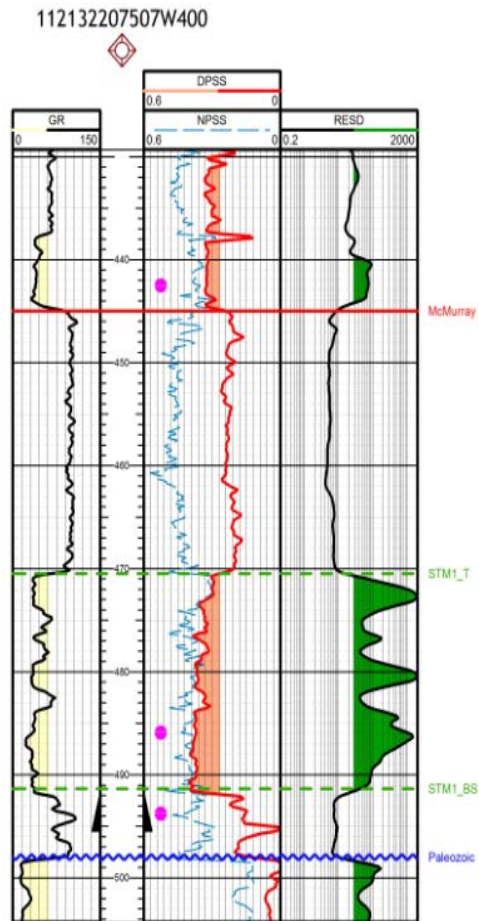
Pad RR North Heel Observation Well Temp (7.4m from RR8 well pair)

3.1.1-5d



Pad RR North Heel Observation Well Pressure (7.4m from RR8 well pair)

3.1.1-5d

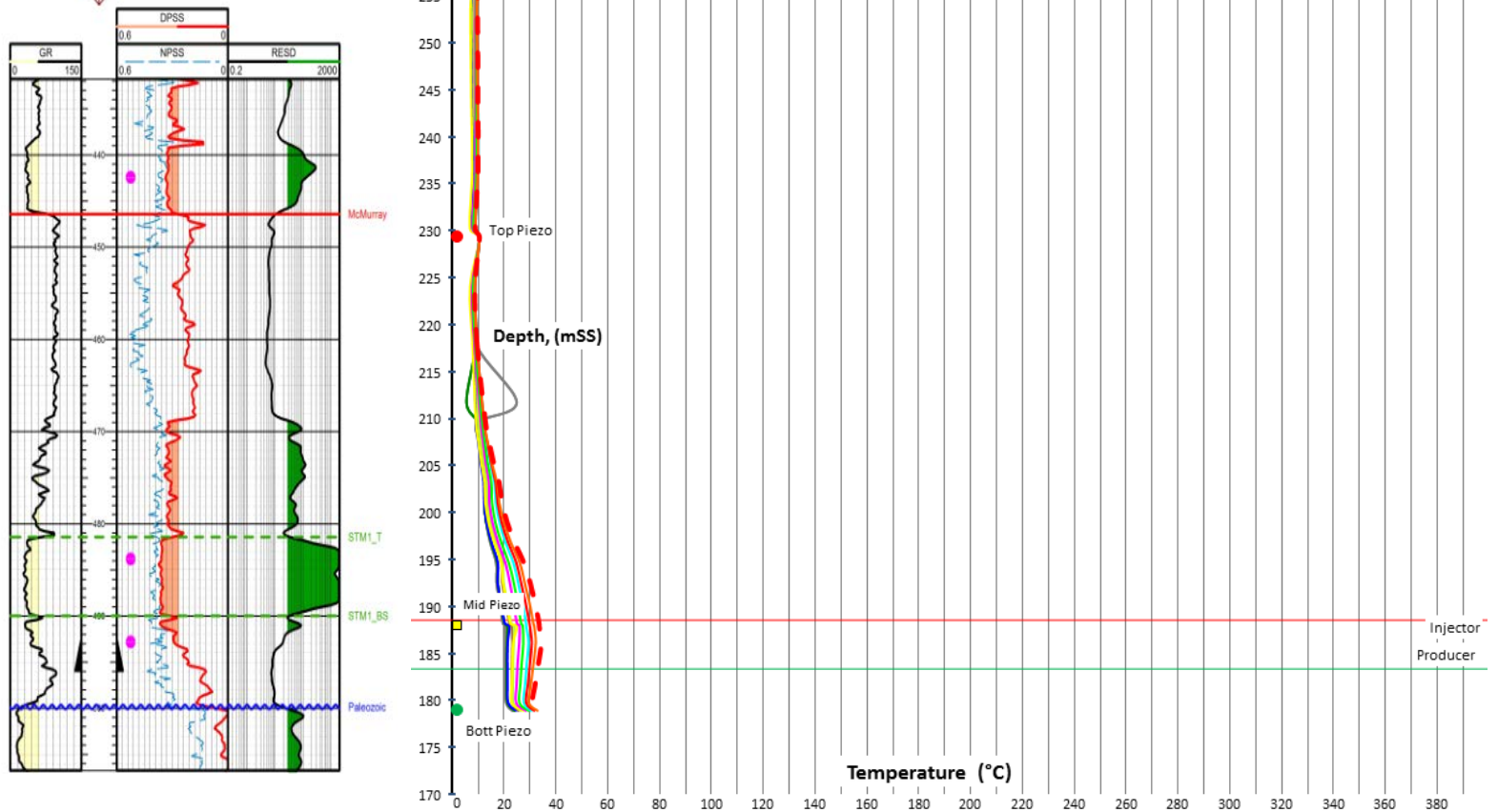


* The middle piezometer has failed

Pad RR Mid Toe Observation Well Temp (9.9m from RR5 well pair)

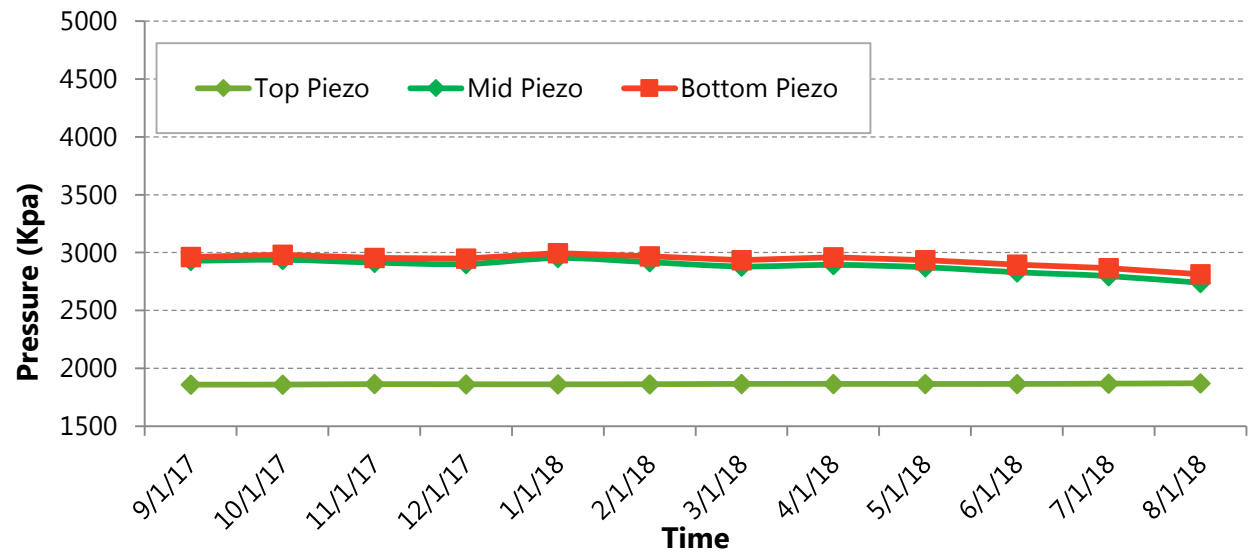
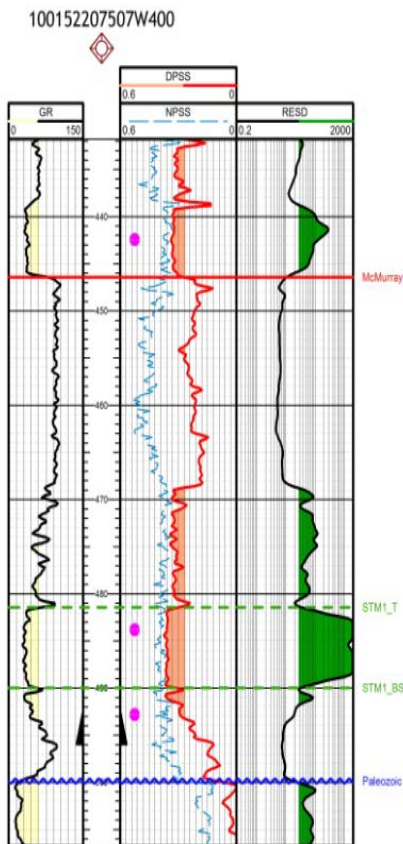
3.1.1-5d

100152207507W400



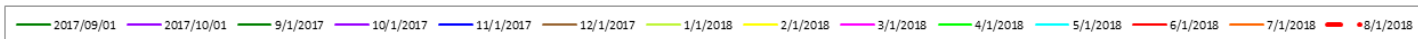
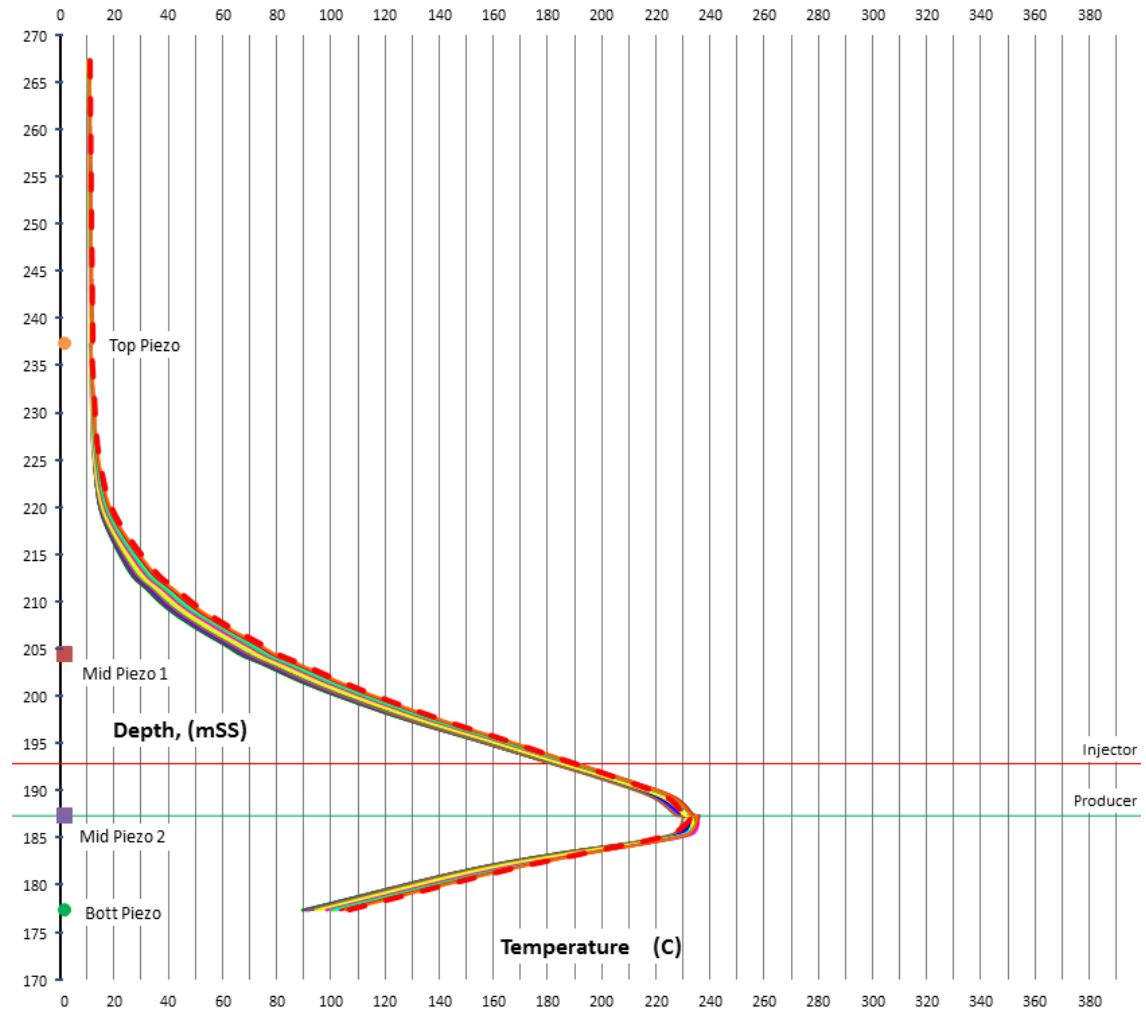
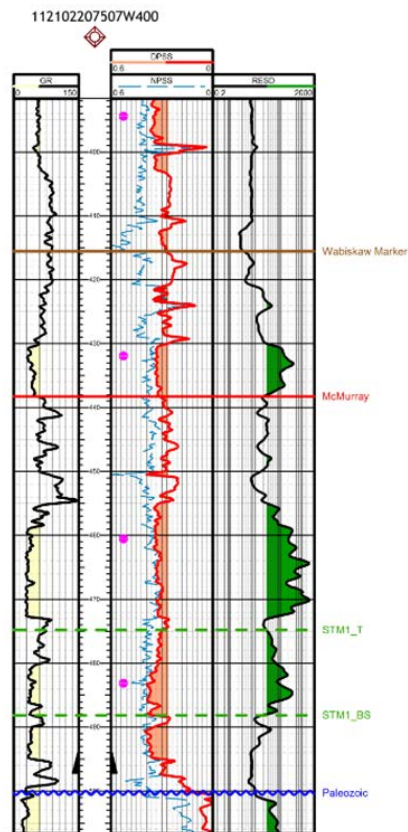
Pad RR Mid Toe Observation Well Pressure (9.9m from RR5 well pair)

3.1.1-5d



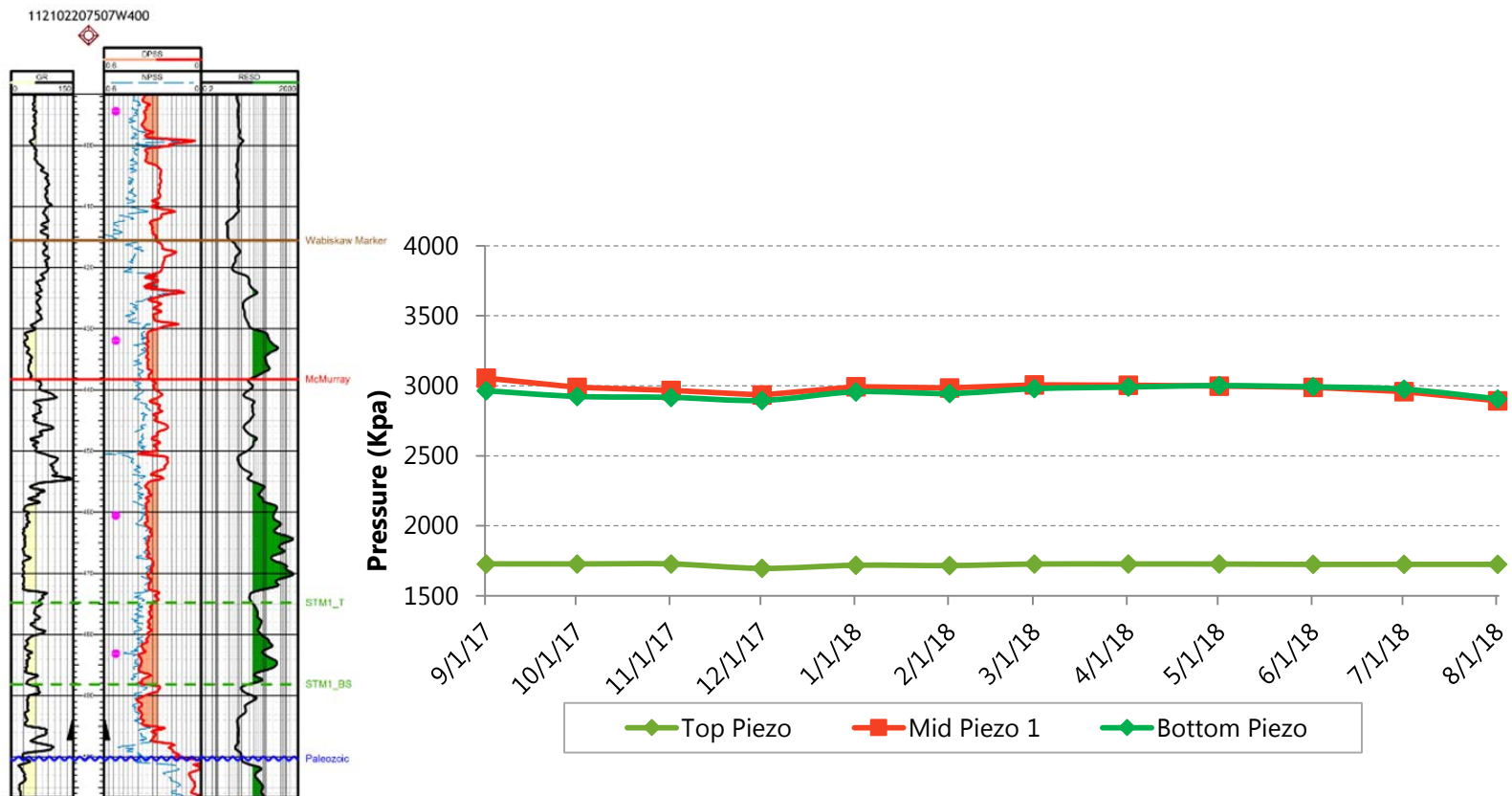
Pad RR South Toe Observation Well Temp (16.5m from RR3 well pair)

3.1.1-5d



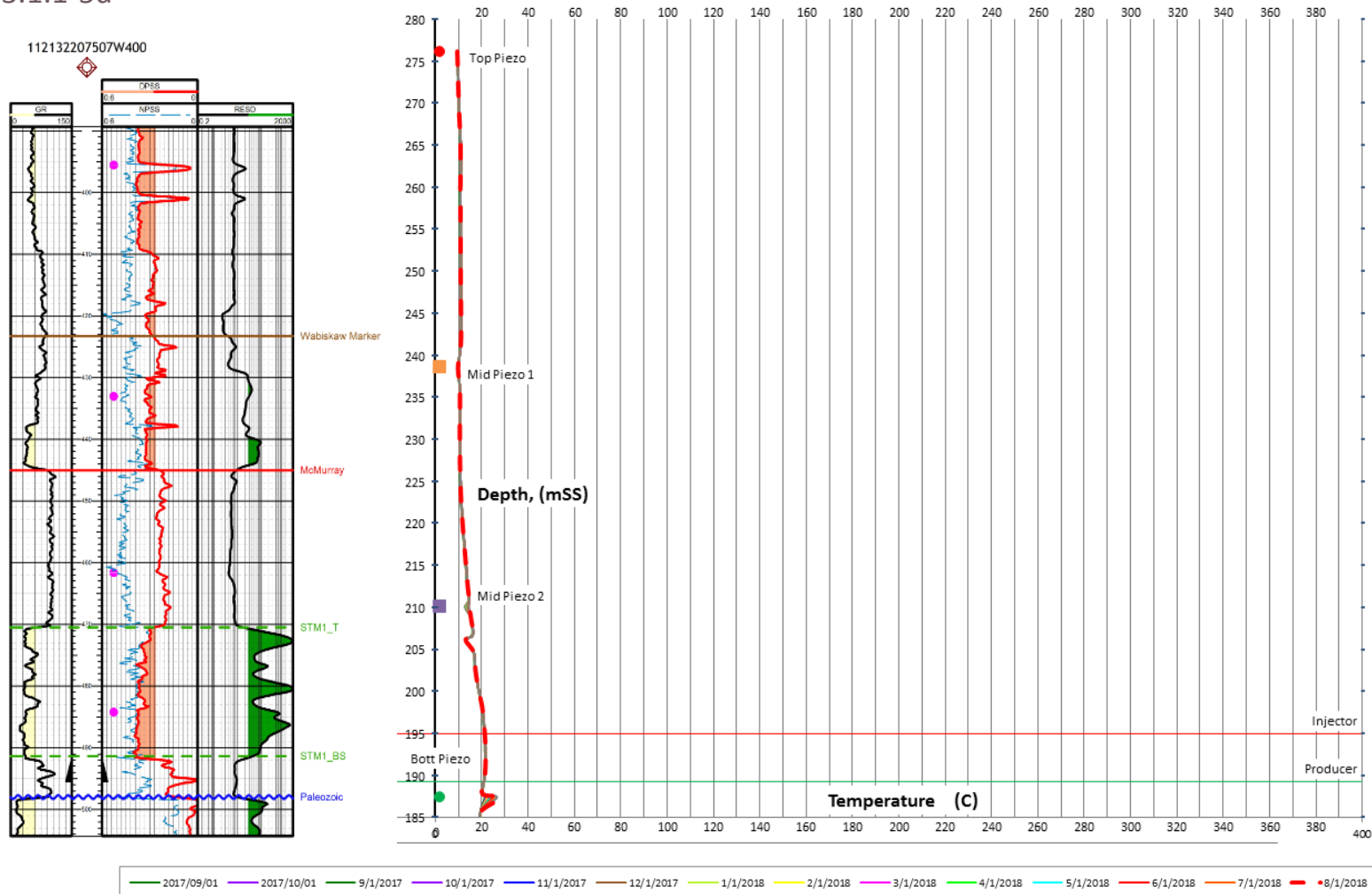
Pad RR South Toe Observation Well Pressure (16.5m from RR3 well pair)

3.1.1-5d



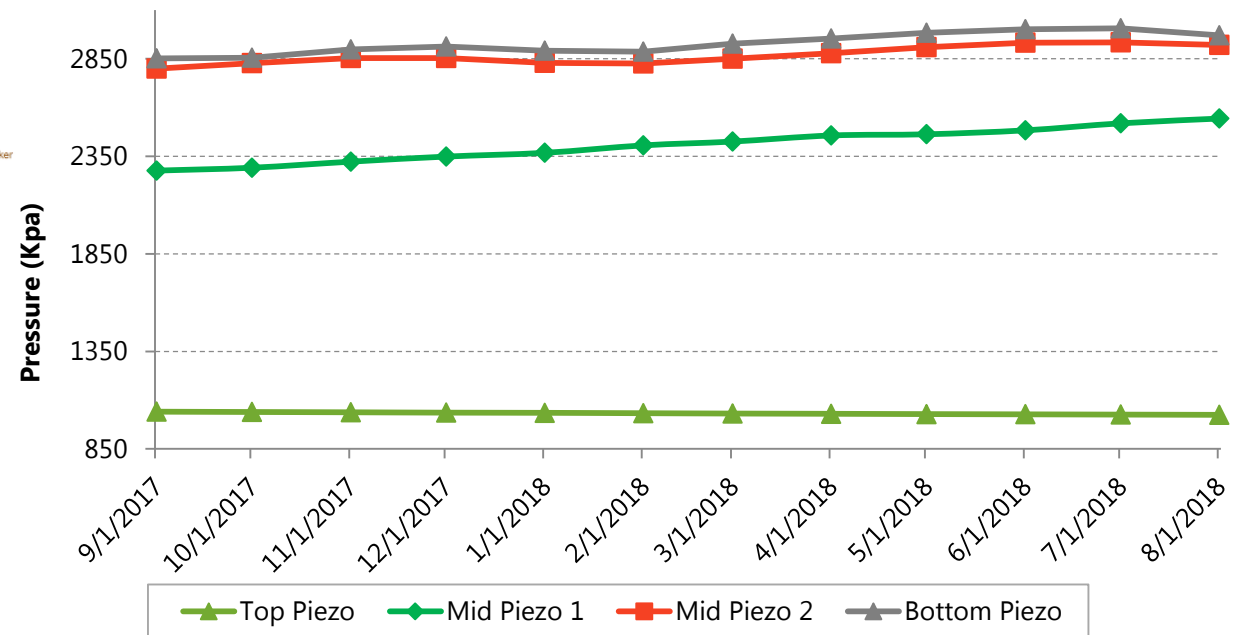
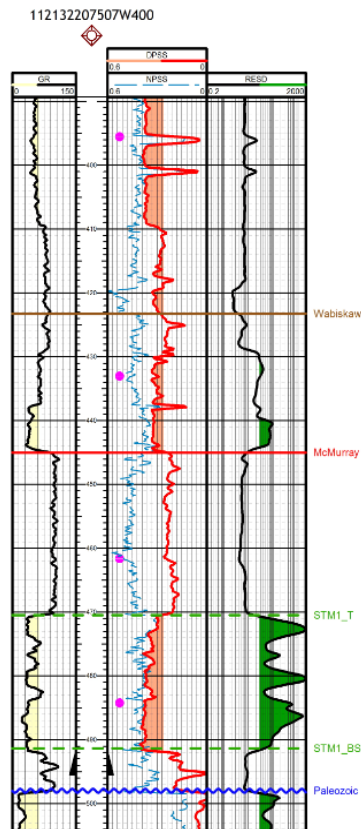
Pad RR Caprock Observation Well Temp (10.0m from RR1 well pair)

3.1.1-5d



Pad RR Caprock Observation Well Pressure (10.0m from RR1 well pair)

3.1.1-5d



Appendix B

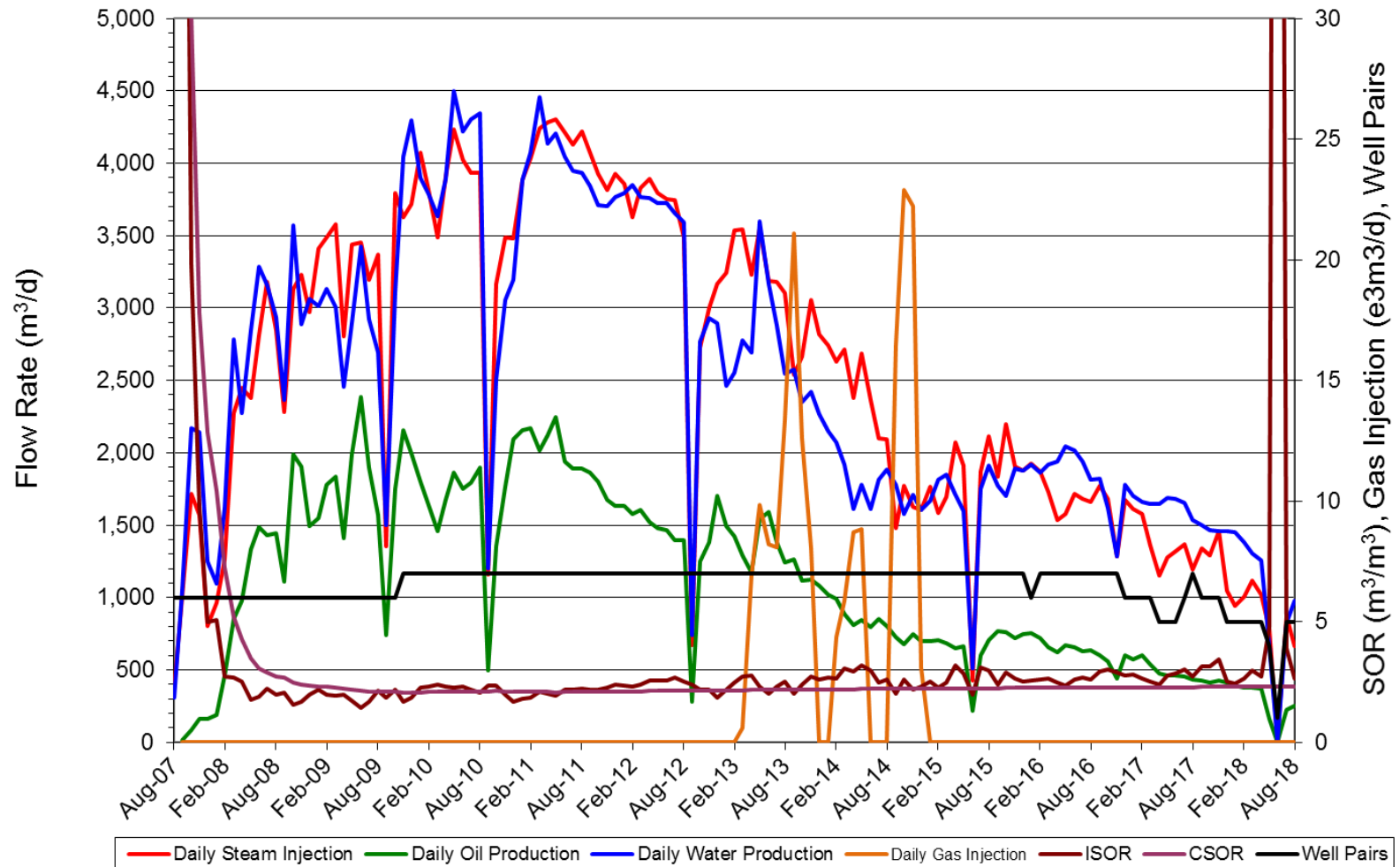
Production 3.1.1-7h

October 2018

Pad A Performance

Jackfish 1 Pad A Life Plot

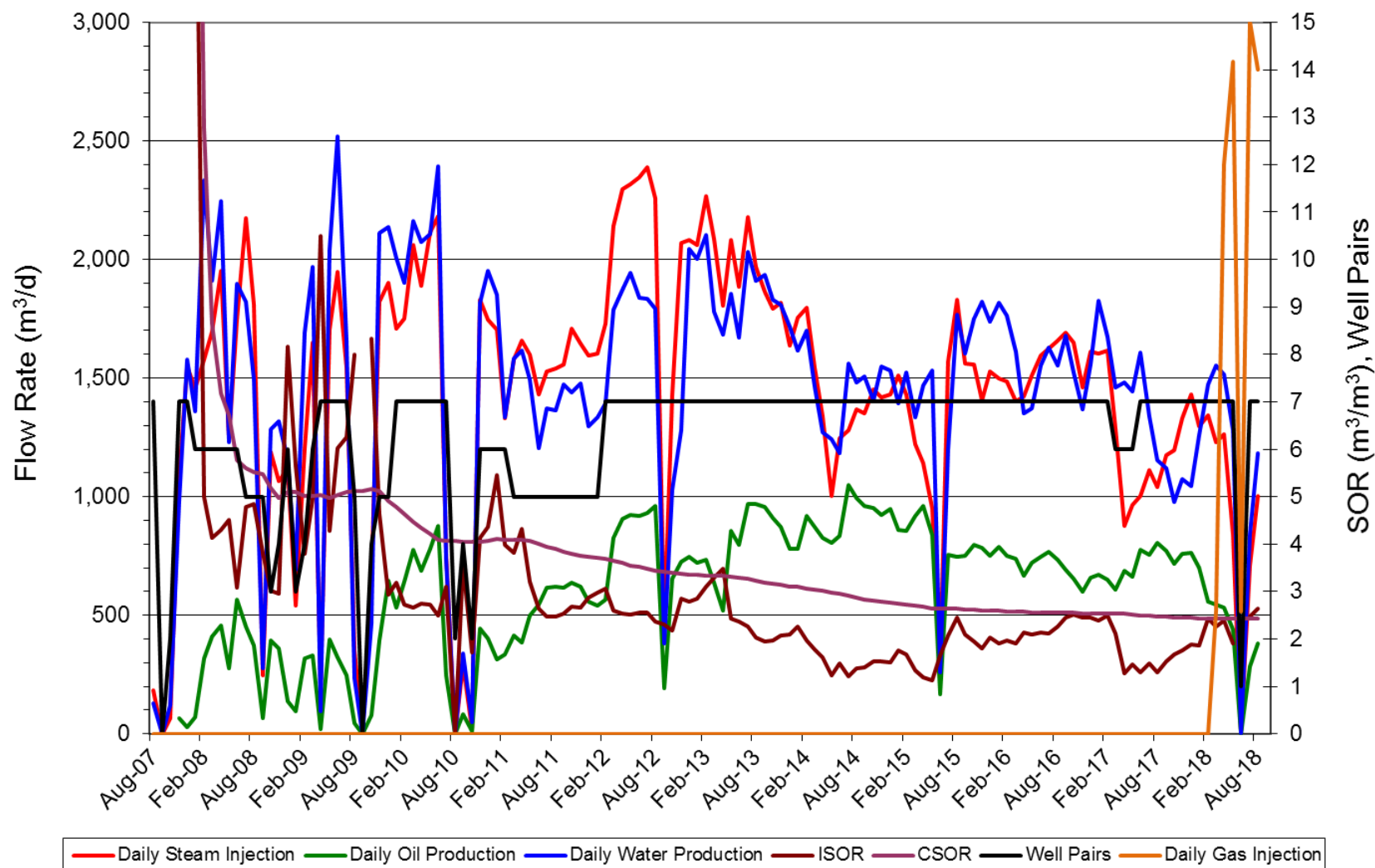
3.1.1-7h



Pad B Performance

Jackfish 1 Pad B Life Plot

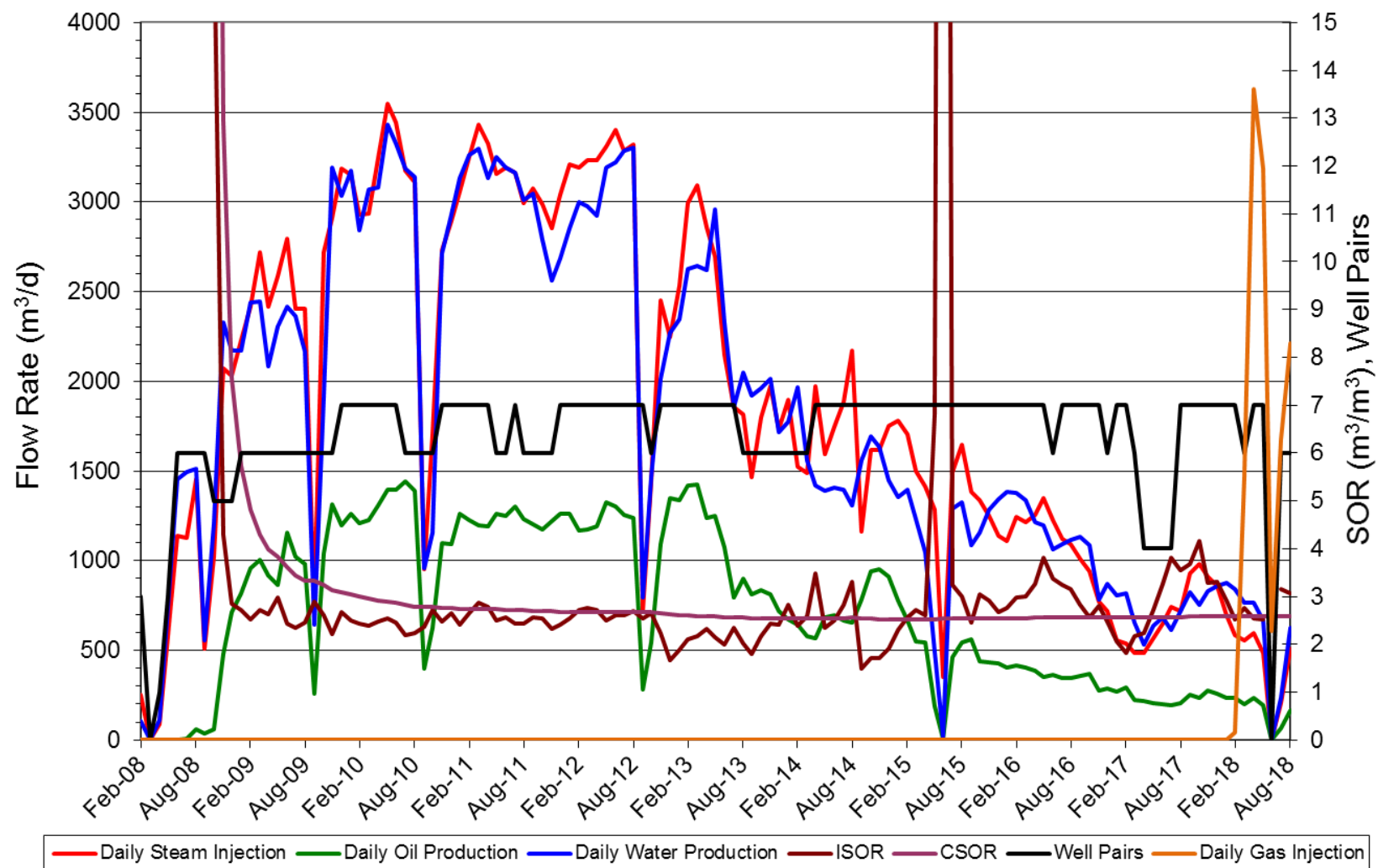
3.1.1-7h



Pad C Performance

Jackfish 1 Pad C Life Plot

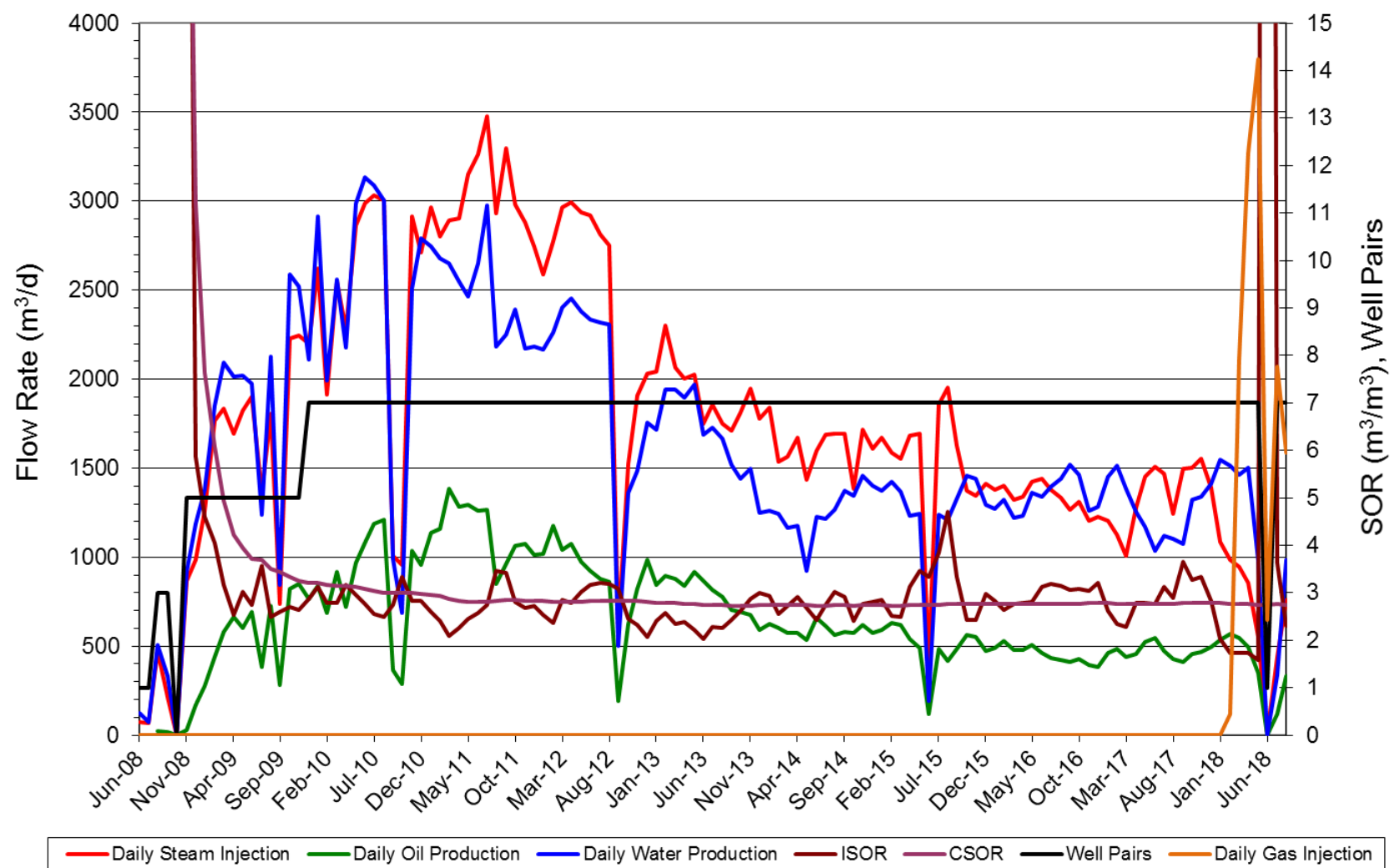
3.1.1-7h



Pad D Performance

Jackfish 1 Pad D Life Plot

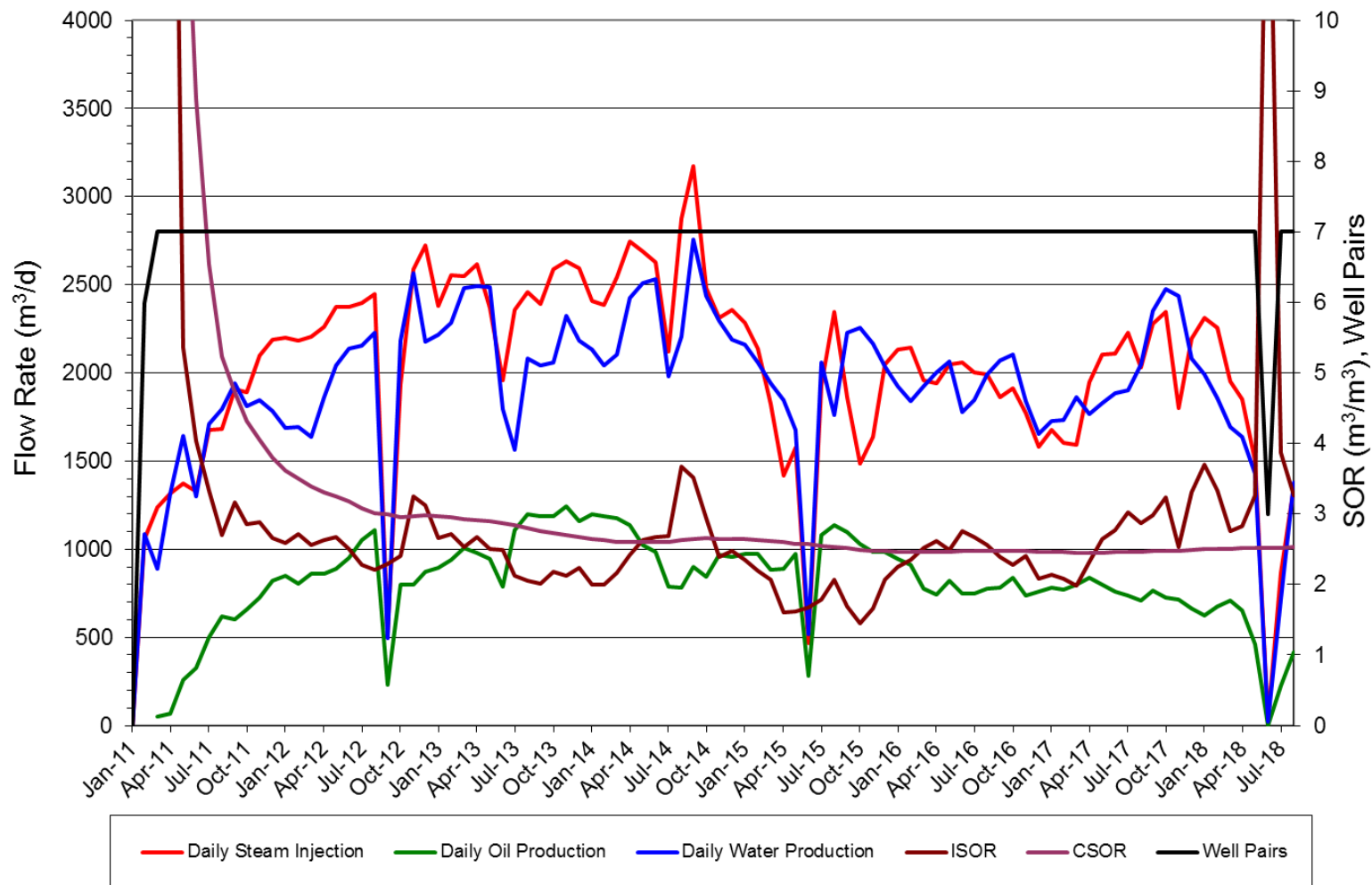
3.1.1-7h



Pad E Performance

Jackfish 1 Pad E Life Plot

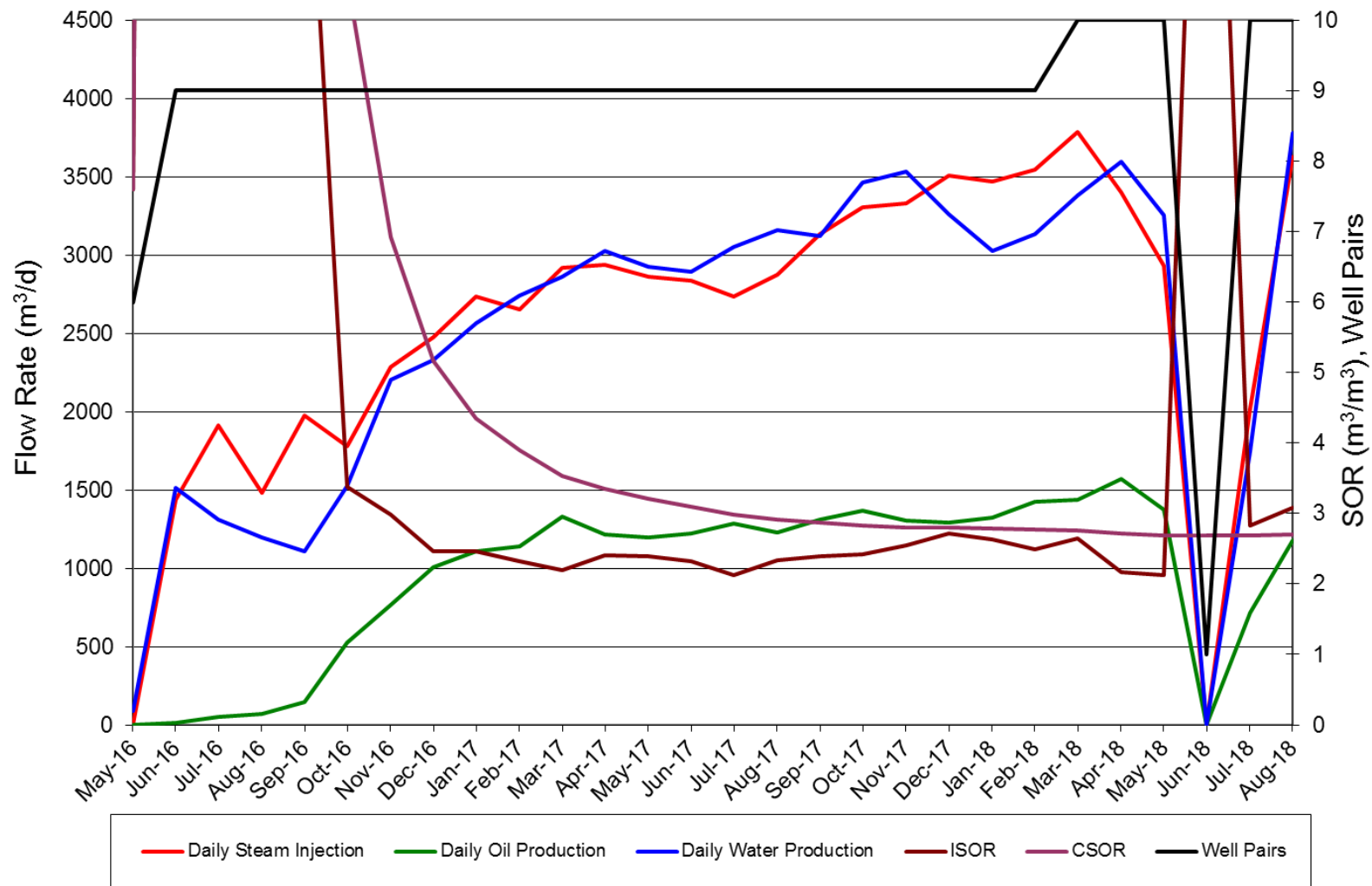
3.1.1-7h



Pad F Performance

Jackfish 1 Pad F Life Plot

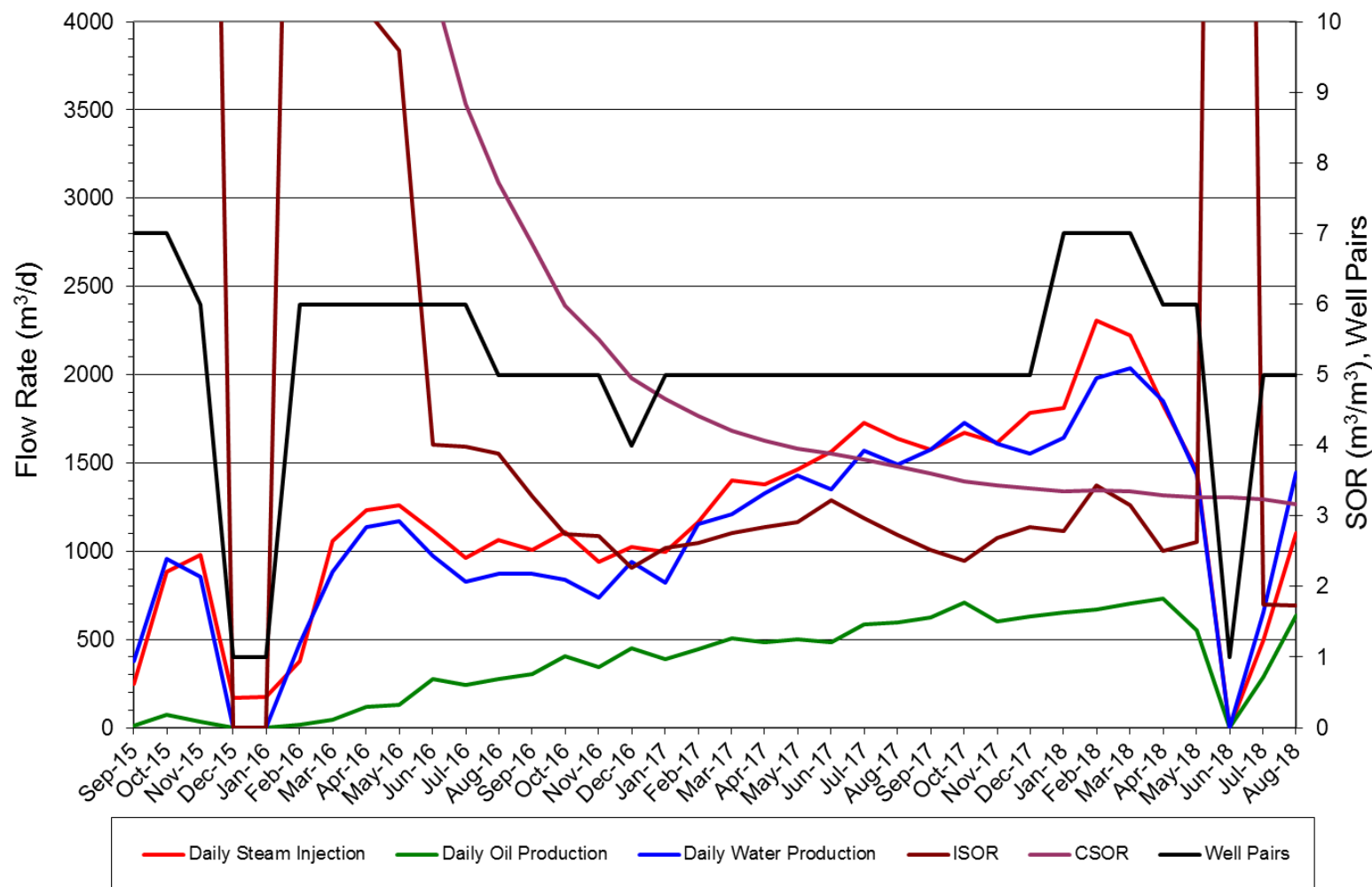
3.1.1-7h



Pad G Performance

Jackfish 1 Pad G Life Plot

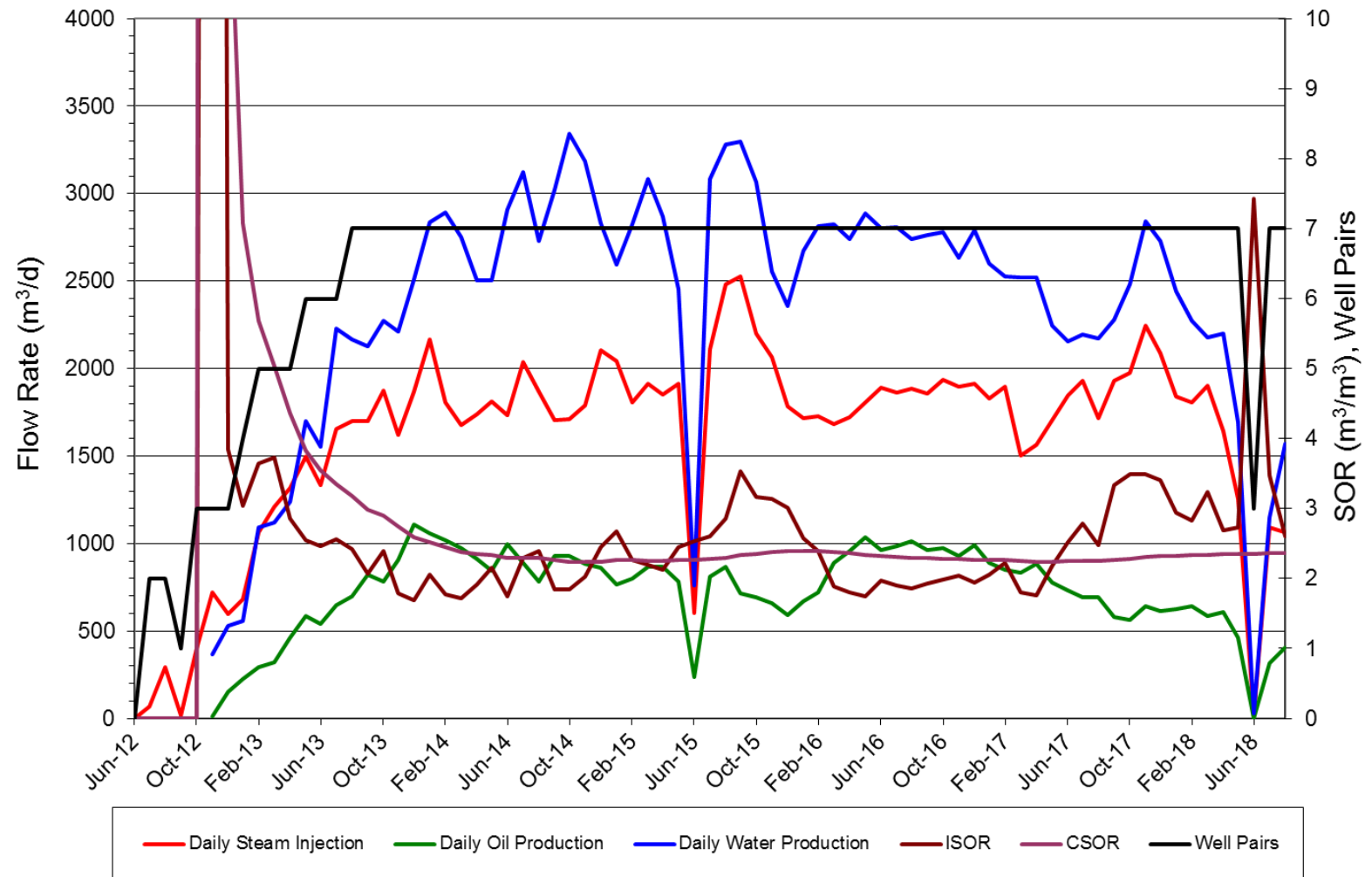
3.1.1-7h



Pad H Performance

Jackfish 1 Pad H Life Plot

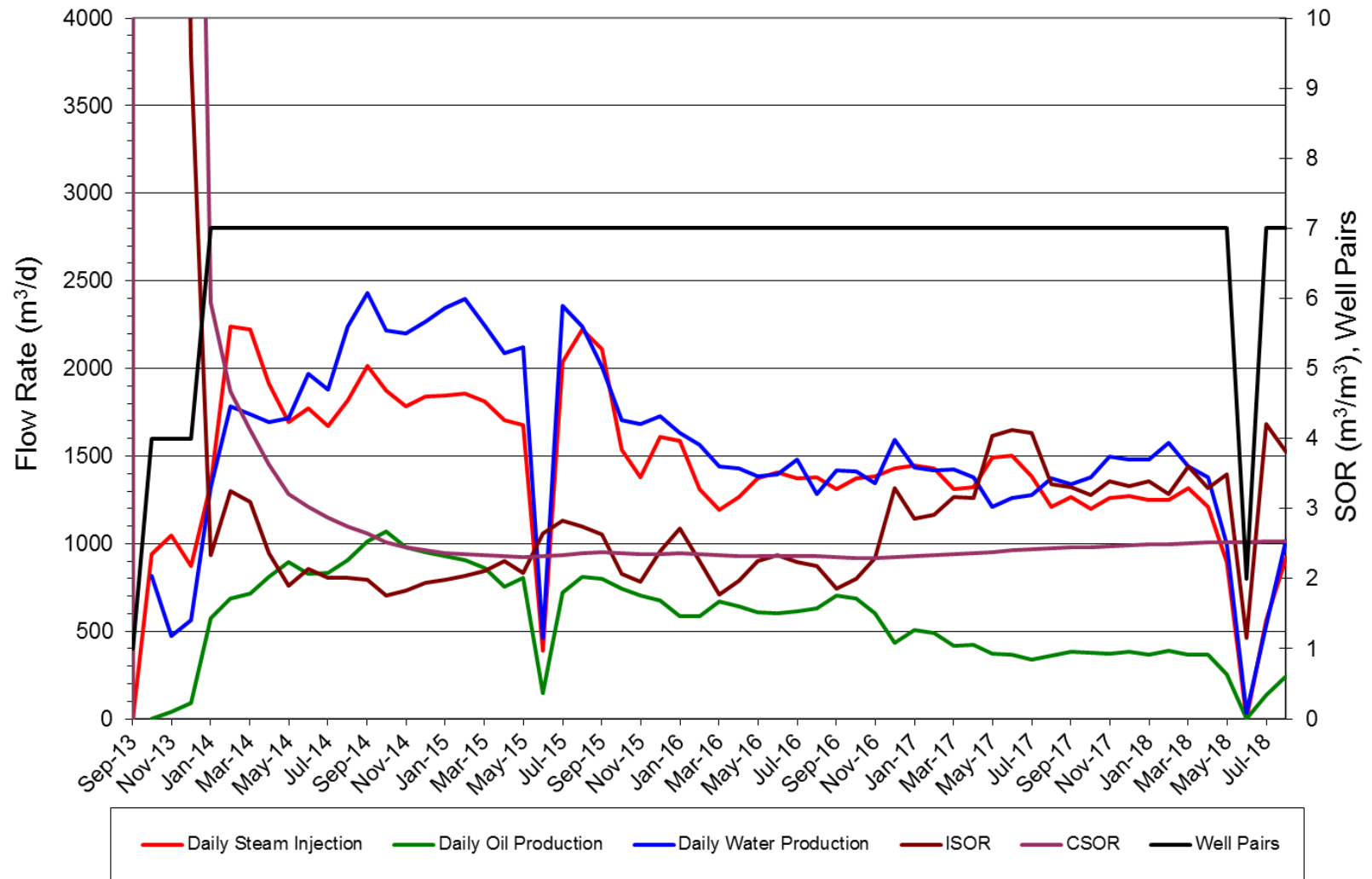
3.1.1-7h



Pad I Performance

Jackfish 1 Pad I Life Plot

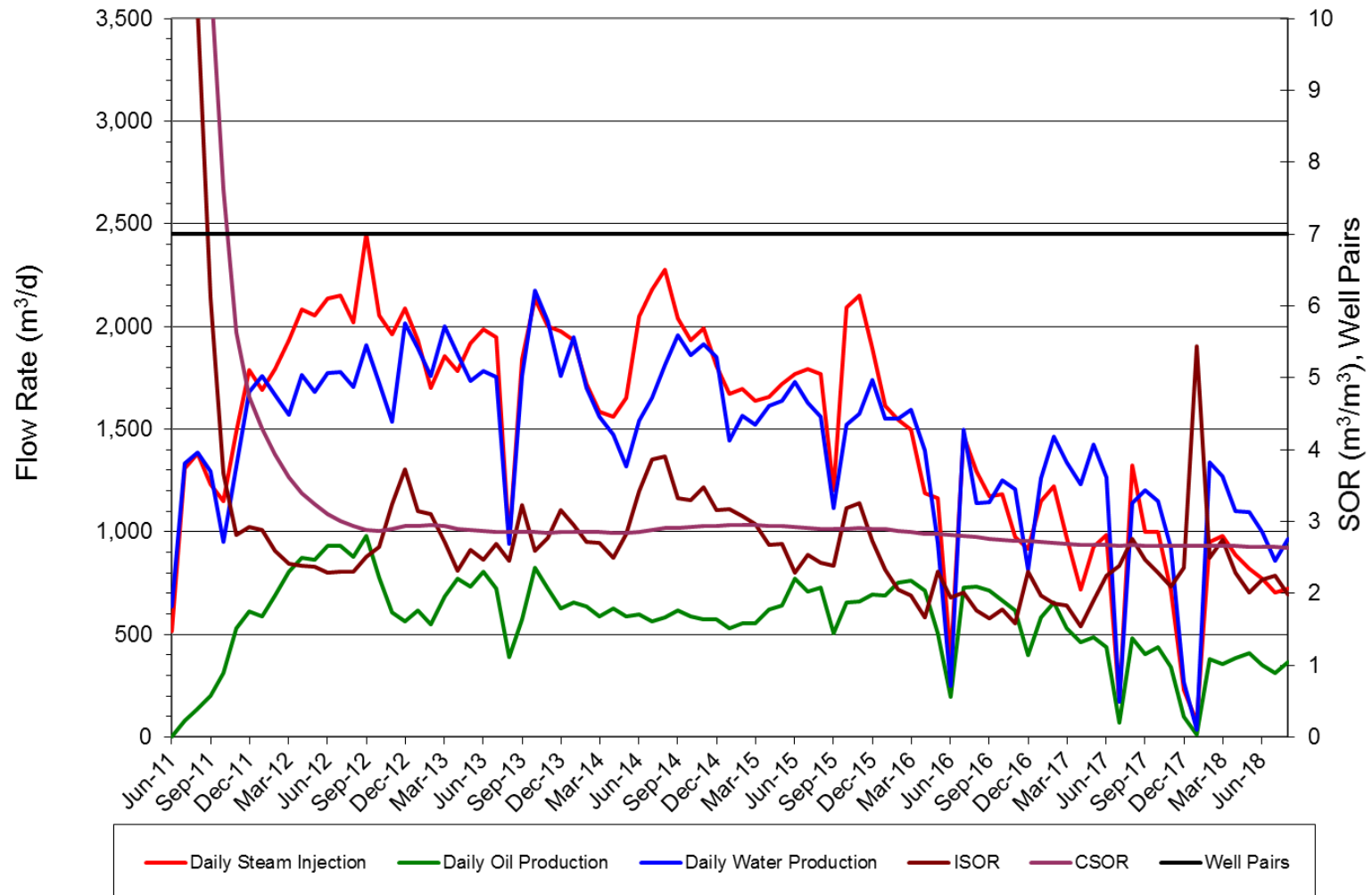
3.1.1-7h



Pad AA Performance

Jackfish 2 Pad AA Life Plot

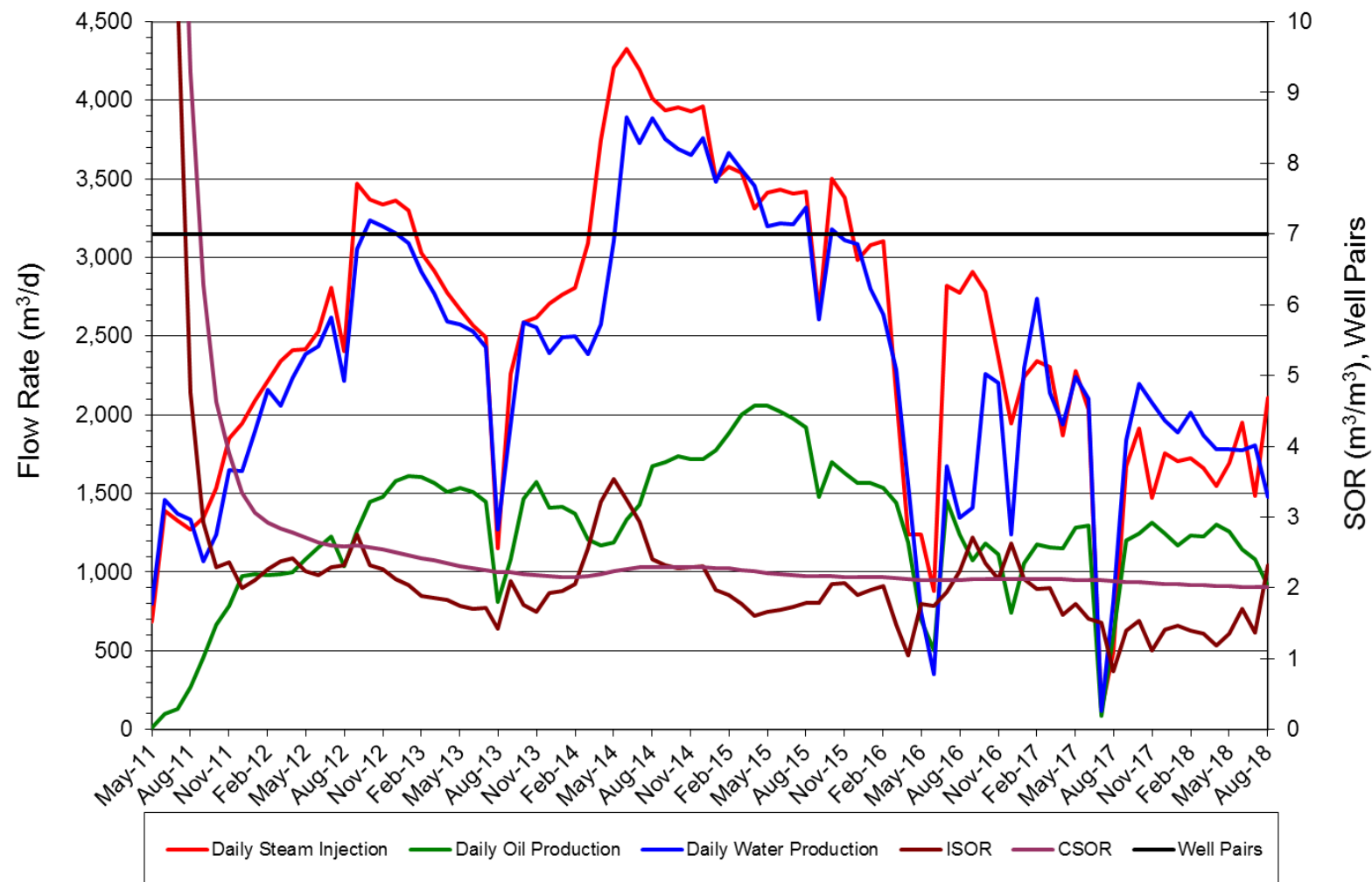
3.1.1-7h



Pad BB Performance

Jackfish 2 Pad BB Life Plot

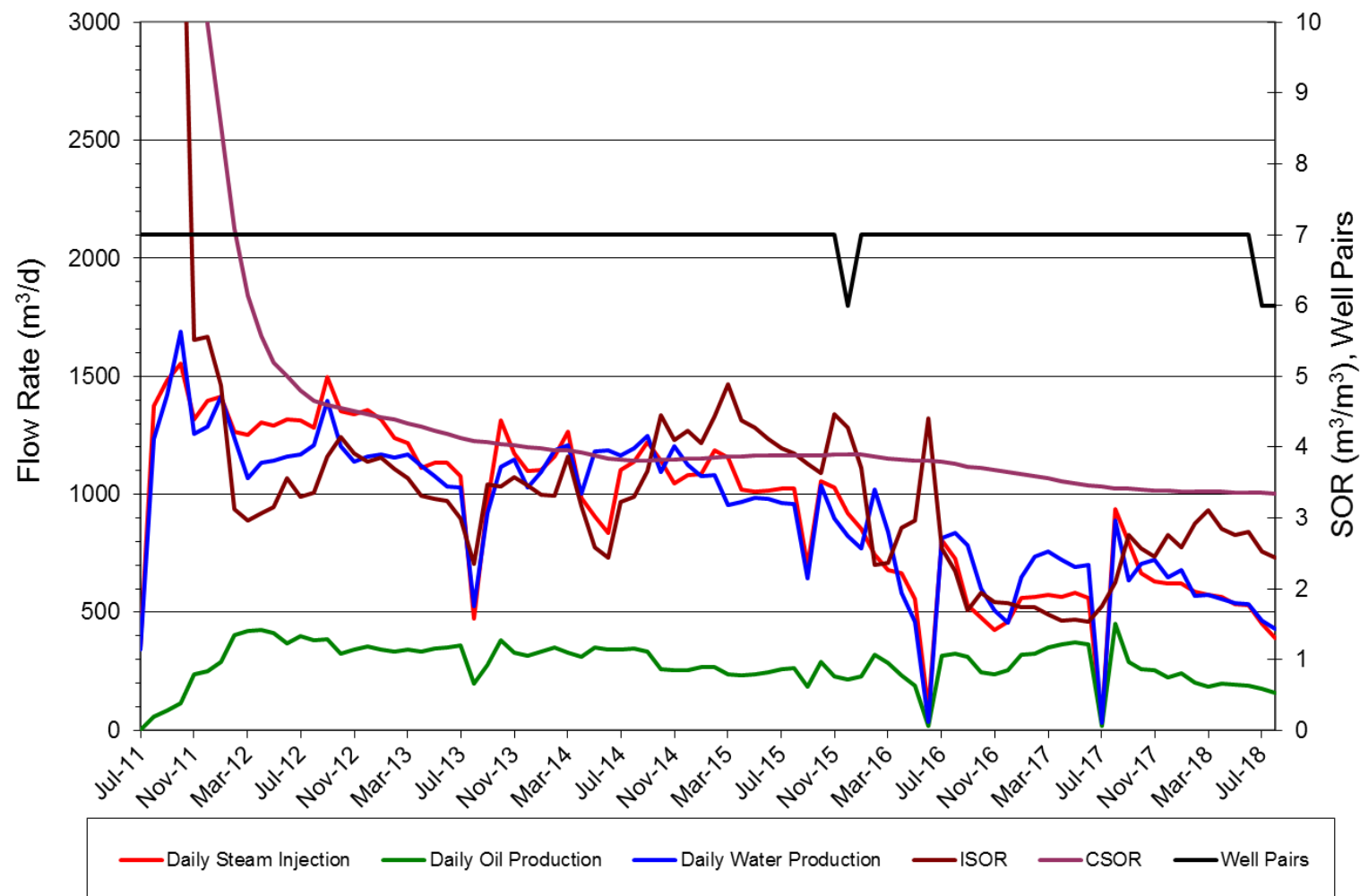
3.1.1-7h



Pad CC Performance

Jackfish 2 Pad CC Life Plot

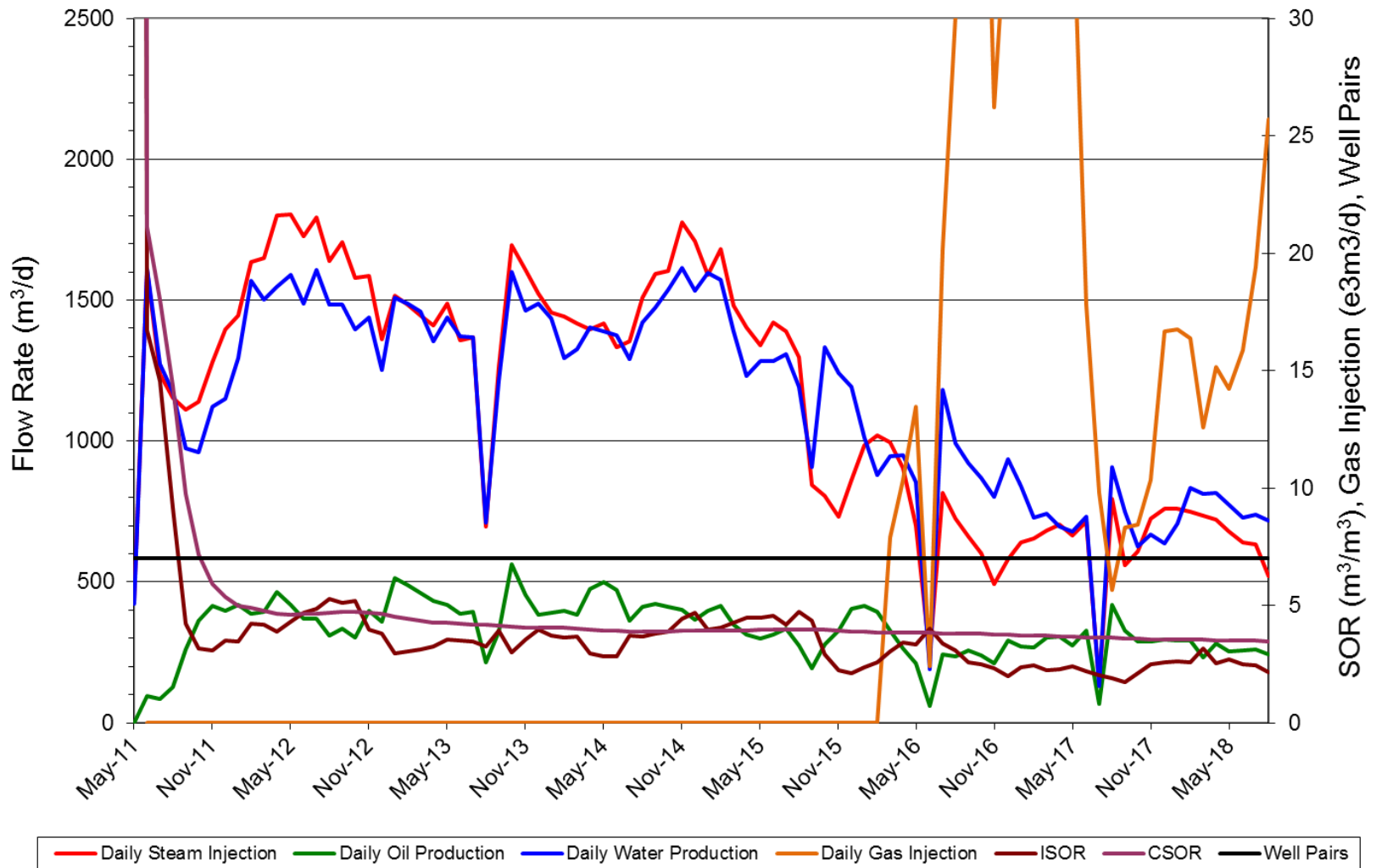
3.1.1-7h



Pad DD Performance

Jackfish 2 Pad DD Life Plot

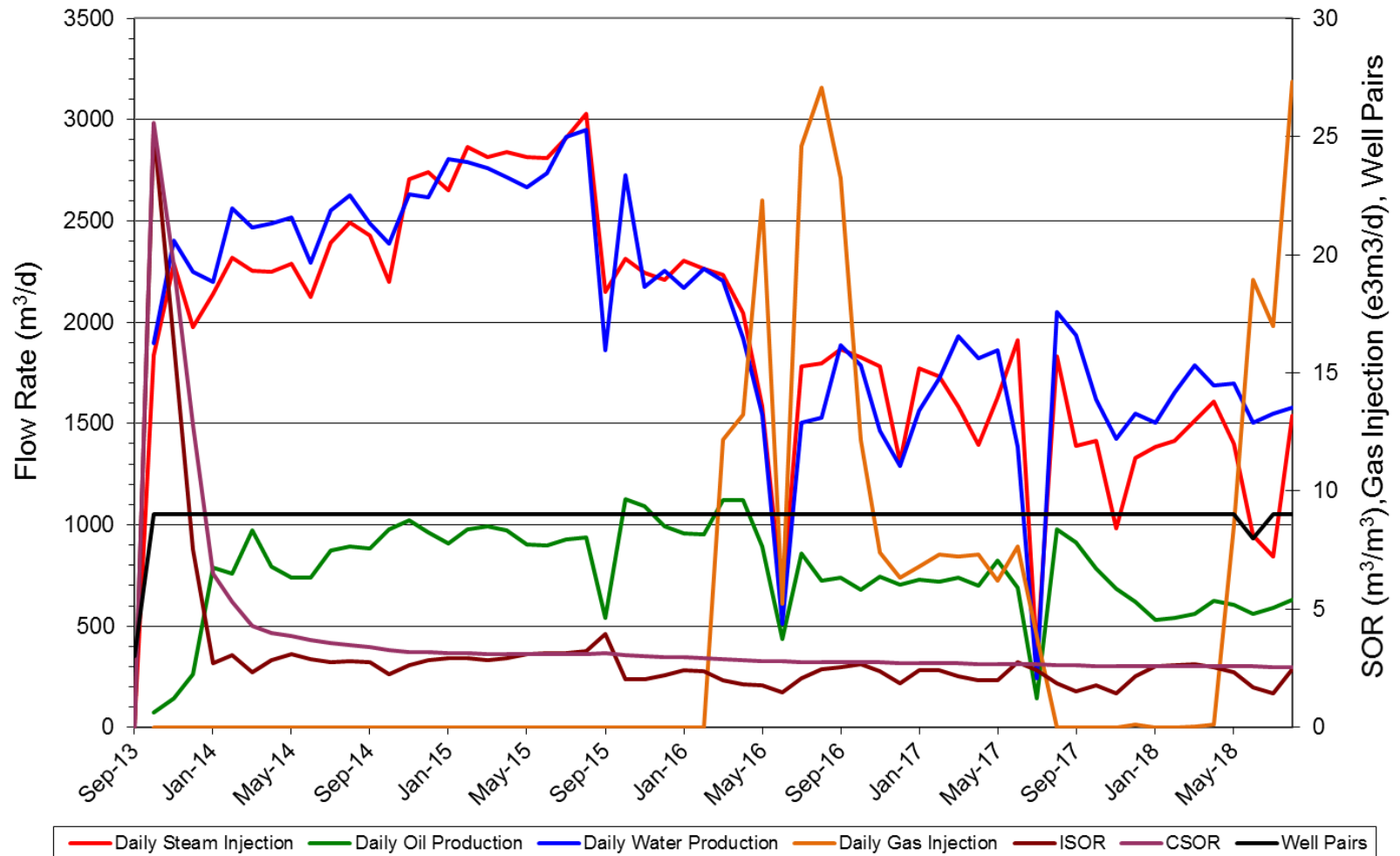
3.1.1-7h



Pad FF Performance

Jackfish 2 Pad FF Life Plot

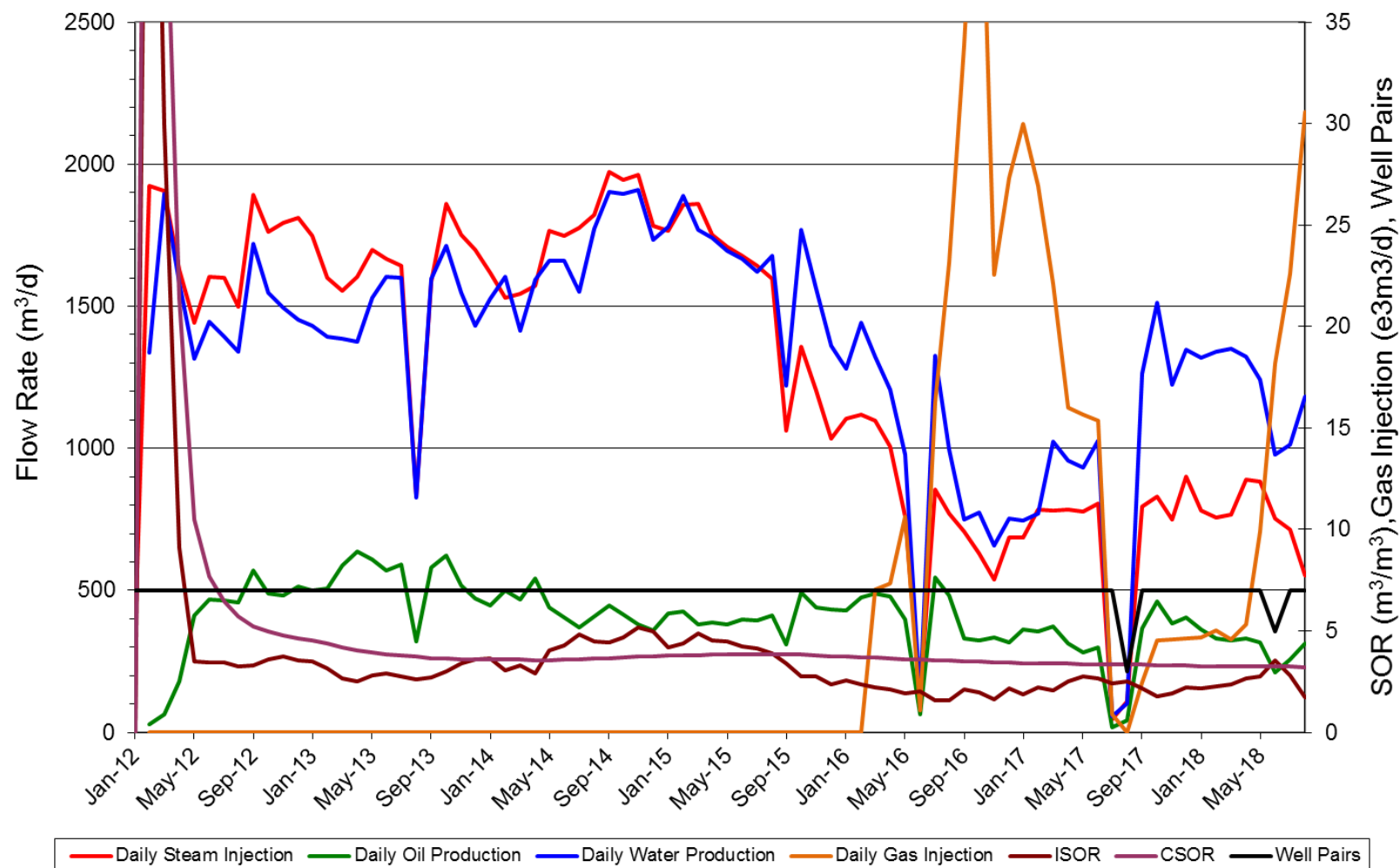
3.1.1-7h



Pad KK Performance

Jackfish 2 Pad KK Life Plot

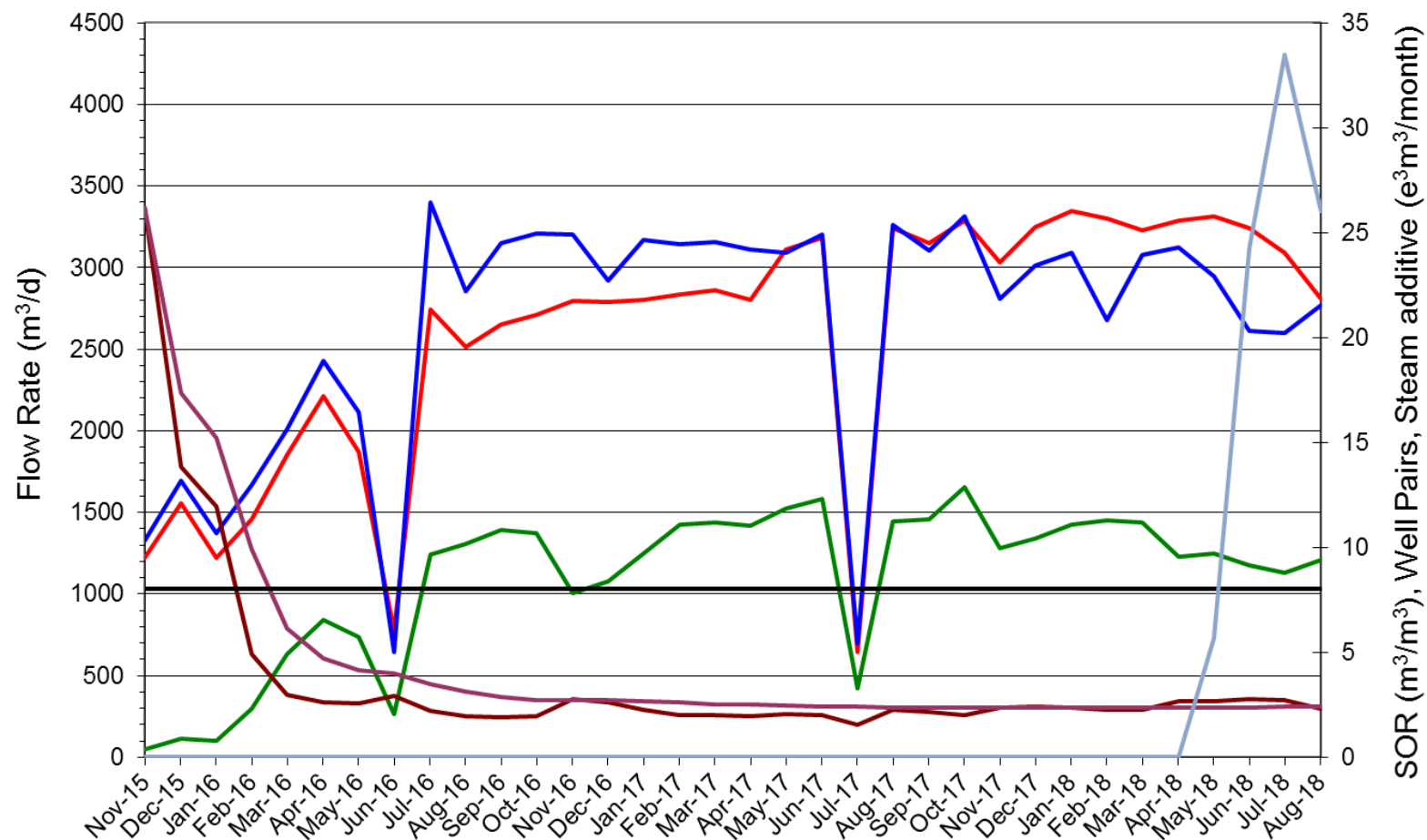
3.1.1-7h



Pad OO Performance

Jackfish 2 Pad OO Life Plot

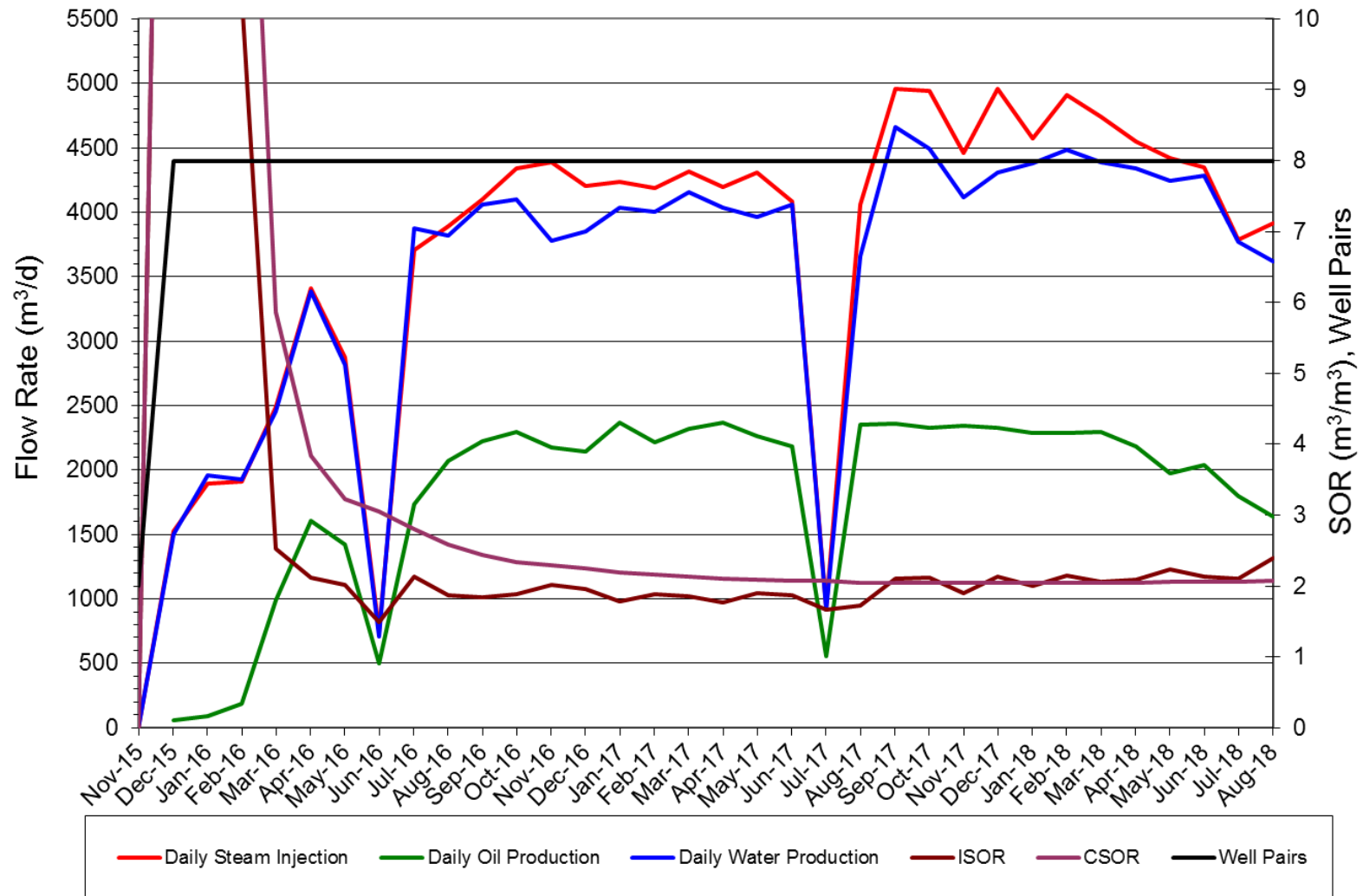
3.1.1-7h



Pad PP Performance

Jackfish 2 Pad PP Life Plot

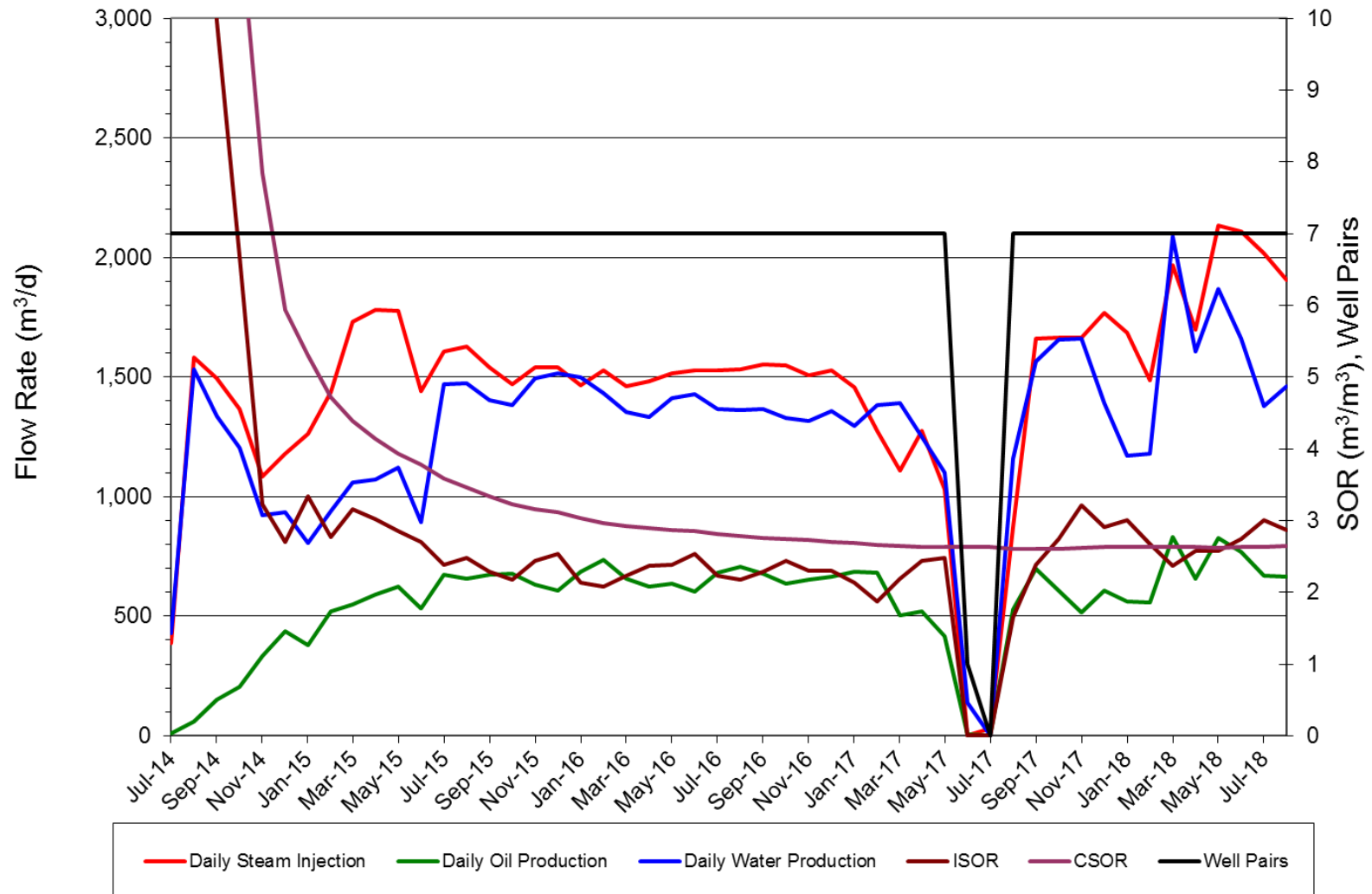
3.1.1-7h



Pad J Performance

Jackfish 3 Pad J Life Plot

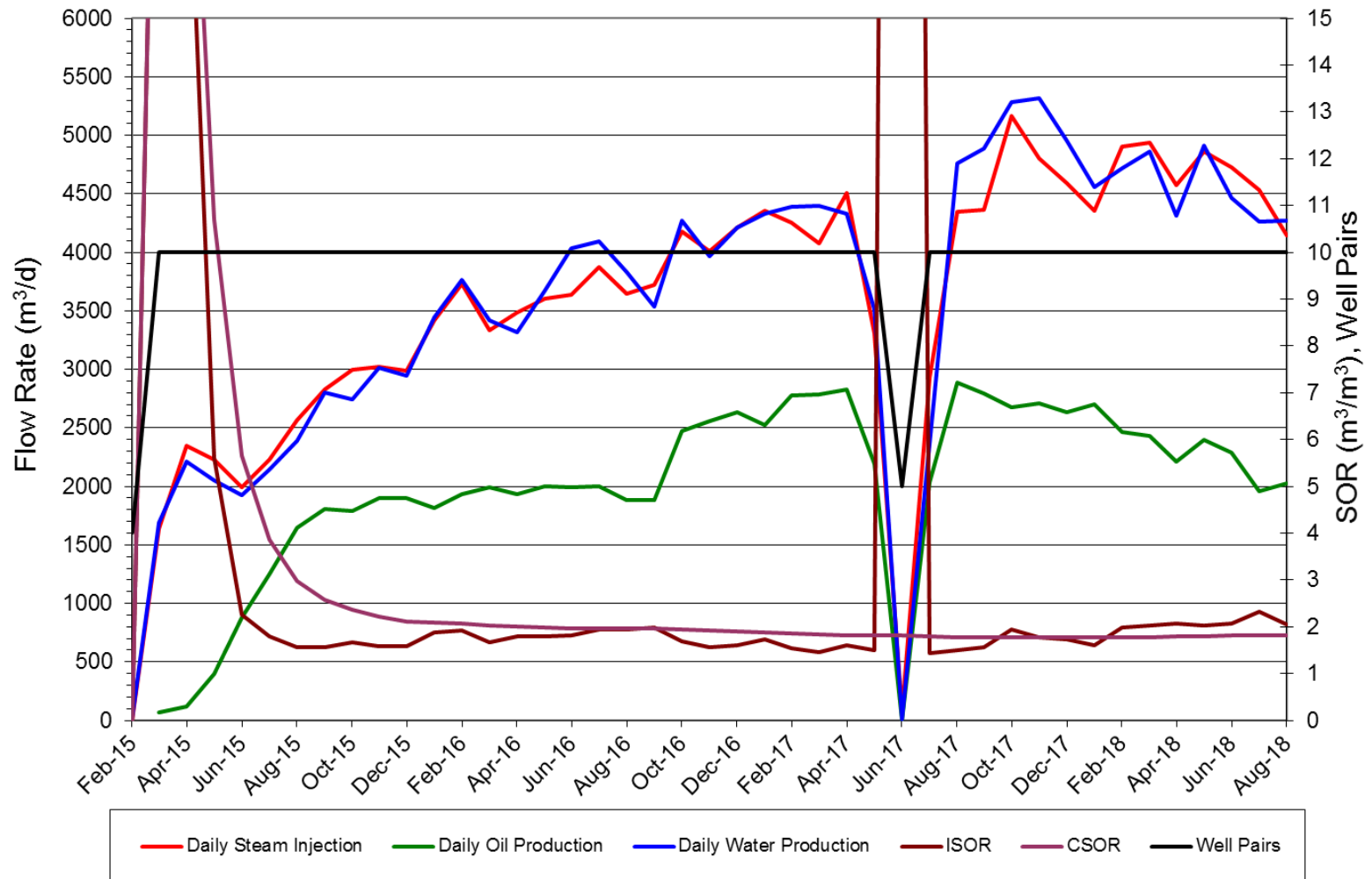
3.1.1-7h



Pad K Performance

Jackfish 3 Pad K Life Plot

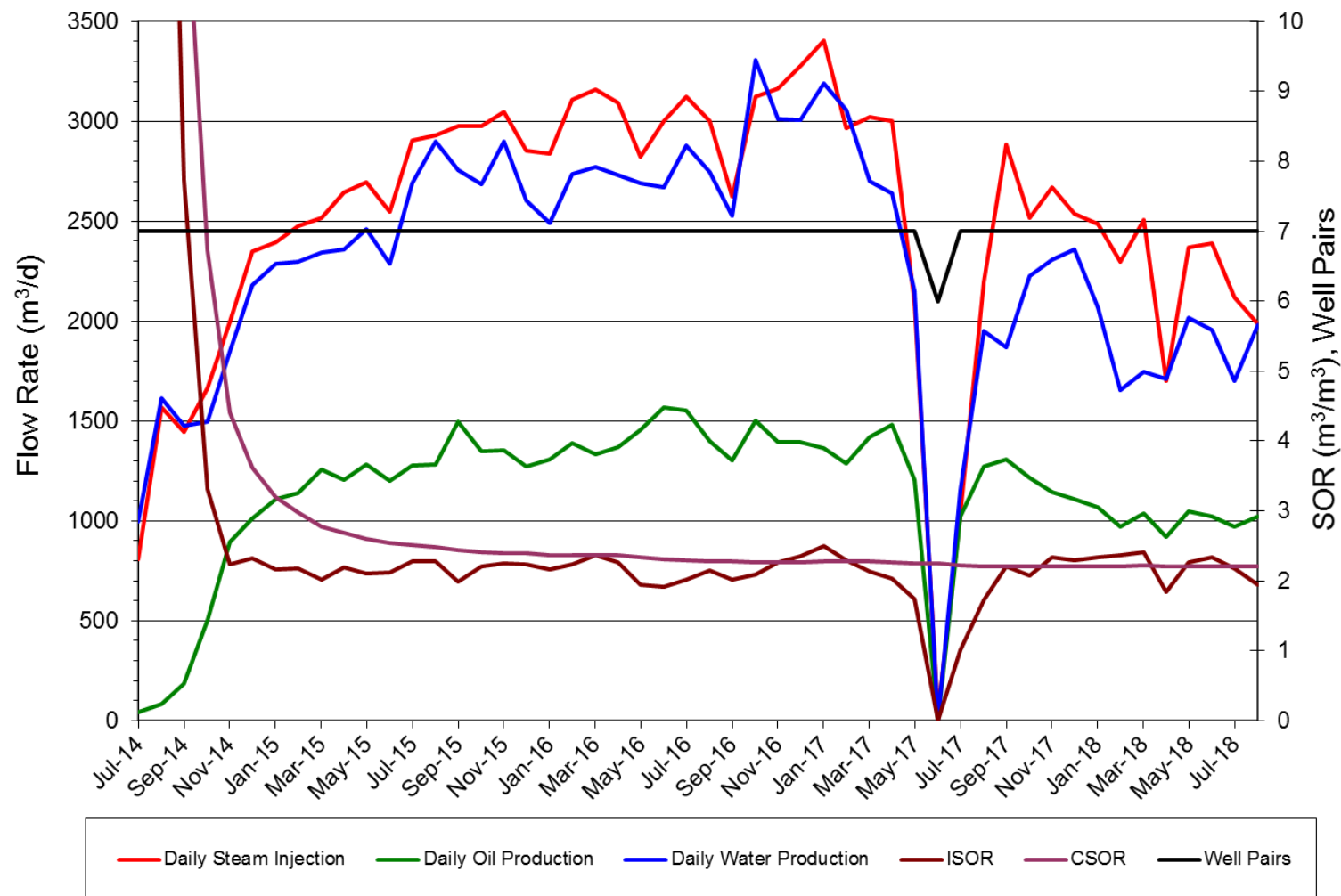
3.1.1-7h



Pad EE Performance

Jackfish 3 Pad EE Life Plot

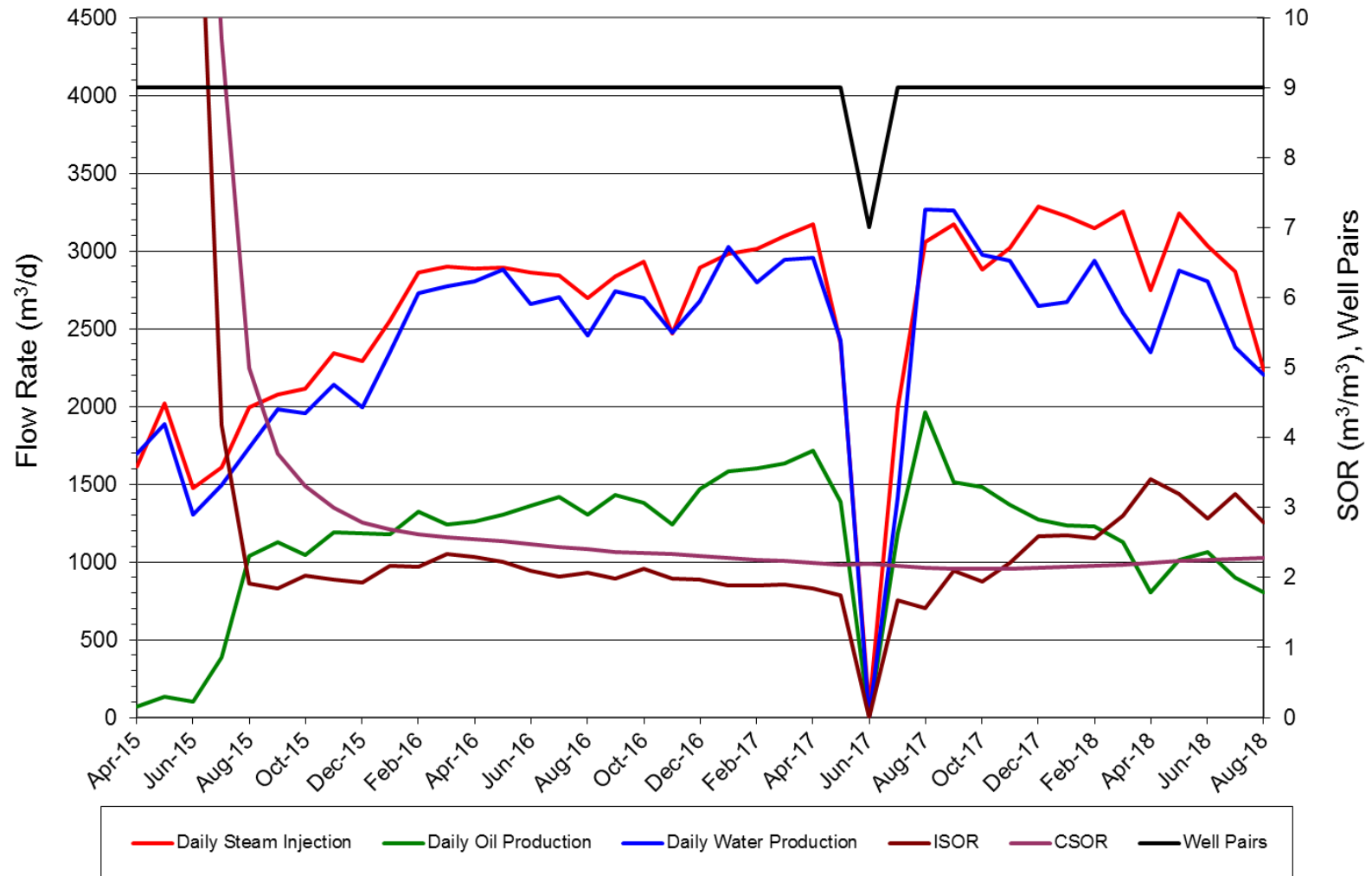
3.1.1-7h



Pad RR Performance

Jackfish 3 Pad RR Life Plot

3.1.1-7h



Pad VV Performance

Jackfish 3 Pad VV Life Plot

3.1.1-7h

