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FracCAT Treatment Report

Well : MIP UNIT5H
Field : UNDESIGNAT
Formation : Marcellus

Well Location : Westover
County : Monongalia
State : West Virginia
Country : United States

Prepared for
Client : NORTHEAST NATURAL ENERGY LLC
Client Rep : Mike Inman
Proposal No : 1
Date Prepared : 10-31-15

Prepared by
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Division : Schlumberger
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Service Point : Weston
Fax Number :

Comments : Stage 8

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Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 8

Section 1: Stage 8, Propped Frac: Designed Pump Sched. - Ramp

Designed Pump Schedule Ramp									
Step #	Step Name	Slurry Volume (bbl)	Pump Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Prop Name	Prop Conc (PPA)	Prop Mass (lb)
1	Rate	20.0	30.0	0.7	Slickwater	840		0.0	0
2	Acid 715% HC	35.7	15.0	2.4	HCl 15	1500		0.0	0
3	spacer	60.0	80.0	0.8	Slickwater	2520		0.0	0
4	Acid 15% HC	35.7	80.0	0.4	HCl 15	1500		0.0	0
5	PAD	595.0	80.0	7.4	Slickwater	24990		0.0	0
6	0.25 PPA	288.2	80.0	3.6	Slickwater	11970	100 Mesh Sand	0.2	2992
7	0.5 PPA	306.8	80.0	3.8	Slickwater	12600	100 Mesh Sand	0.5	6300
8	0.75 PPA	413.6	80.0	5.2	Slickwater	16800	100 Mesh Sand	0.7	12600
9	1.00 PPA	522.7	80.0	6.5	Slickwater	21000	100 Mesh Sand	1.0	21000
10	1.50 PPA	814.9	80.0	10.2	Slickwater	32046	100 Mesh Sand	1.5	48069
11	2.0 PPA	635.9	80.0	7.9	Slickwater	24486	100 Mesh Sand	2.0	48972
12	.50 PPA	511.4	80.0	6.4	Slickwater	21000	40/70 White	0.5	10500
13	.75 PPA	413.7	80.0	5.2	Slickwater	16800	40/70 White	0.8	12600
14	1.0 PPA	418.2	80.0	5.2	Slickwater	16800	40/70 White	1.0	16800
15	1.5 PPA	747.8	80.0	9.3	Slickwater	29400	40/70 White	1.5	44100
16	2.0 PPA	1091.1	80.0	13.6	Slickwater	42000	40/70 White	2.0	84000
17	2.5 PPA	557.0	80.0	7.0	Slickwater	21000	40/70 White	2.5	52500
18	3.0 PPA	341.0	80.0	4.3	Slickwater	12600	40/70 White	3.0	37800
19	Flush	287.0	80.0	3.6	Slickwater	12054		0.0	0

Designed Ramp Totals			
Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
8095.9	103.5	321906	398233

Section 2: Stage 8, Propped Frac: As Measured Pump Schedule

As Measured Pump Schedule										
Step #	Step Name	Slurry Volume (bbl)	Slurry Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Proppant Name	Max Prop Conc (PPA)	Prop Conc (PPA)	Prop Mass (lb)
1	Rate	20.0	13.8	1.7	Slickwater	829		0.0	0.0	0
2	Acid 715% HC	35.7	15.4	2.3	HCl 15	1500		0.0	0.0	0
3	spacer	60.0	15.2	4.0	Slickwater	2520		0.0	0.0	0
4	Acid 15% HC	35.7	15.2	2.4	HCl 15	1500		0.0	0.0	0
5	PAD	595.0	52.4	15.0	Slickwater	24954		0.0	0.0	0
6	0.25 PPA	288.2	74.3	3.9	Slickwater	11962	100 Mesh Sand	0.3	0.2	2913
7	0.5 PPA	306.8	85.2	3.6	Slickwater	12602	100 Mesh Sand	0.5	0.4	6213

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As Measured Pump Schedule

Step #	Step Name	Slurry Volume (bbl)	Slurry Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Proppant Name	Max Prop Conc (PPA)	Prop Conc (PPA)	Prop Mass (lb)
8	0.75 PPA	413.6	85.3	4.8	Slickwater	16804	100 Mesh Sand	0.8	0.7	12494
9	1.00 PPA	522.7	85.3	6.1	Slickwater	21003	100 Mesh Sand	1.0	0.4	20913
10	1.50 PPA	814.9	85.3	9.5	Slickwater	32051	100 Mesh Sand	1.5	0.7	47938
11	2.0 PPA	534.0	85.3	6.3	Slickwater	20566	100 Mesh Sand	2.0	0.0	41000
12	.50 PPA	506.3	85.3	5.9	Slickwater	20772	40/70 White	2.0	0.0	10906
13	.75 PPA	413.7	85.3	4.8	Slickwater	16808	40/70 White	0.7	0.1	12419
14	1.0 PPA	418.2	85.3	4.9	Slickwater	16804	40/70 White	1.0	0.0	16694
15	1.5 PPA	1076.7	85.3	12.6	Slickwater	42334	40/70 White	1.5	0.0	63344
16	2.0 PPA	817.8	85.3	9.6	Slickwater	31486	40/70 White	2.0	0.0	62785
17	2.5 PPA	722.5	85.3	8.5	Slickwater	27247	40/70 White	2.5	0.0	67977
18	3.0 PPA	254.6	85.3	3.0	Slickwater	9537	40/70 White	3.0	0.0	25525
19	Flush	289.2	84.8	3.5	Slickwater	12205		0.0	0.0	0

Stage Pressures & Rates

Step #	Step Name	Average Slurry Rate (bbl/min)	Maximum Slurry Rate (bbl/min)	Average Treating Pressure (psi)	Maximum Treating Pressure (psi)	Minimum Treating Pressure (psi)
1	Rate	13.8	15.6	5131	5826	3270
2	Acid 715% HC	15.4	15.7	5934	5957	5837
3	spacer	15.2	15.2	5882	5926	5829
4	Acid 15% HC	15.2	15.2	5868	5886	5845
5	PAD	52.4	75.1	8252	9282	5812
6	0.25 PPA	74.3	82.7	8709	9190	8308
7	0.5 PPA	85.2	85.4	8555	8590	8429
8	0.75 PPA	85.3	85.4	8522	8565	8496
9	1.00 PPA	85.3	85.4	8482	8516	8461
10	1.50 PPA	85.3	85.5	8485	8520	8432
11	2.0 PPA	85.3	85.4	8521	8557	8490
12	.50 PPA	85.3	85.4	8553	8642	8478
13	.75 PPA	85.3	85.4	8468	8488	8451
14	1.0 PPA	85.3	85.4	8450	8474	8432
15	1.5 PPA	85.3	85.5	8462	8528	8420
16	2.0 PPA	85.3	85.5	8634	8733	8529
17	2.5 PPA	85.3	85.4	8461	8574	8404
18	3.0 PPA	85.3	85.5	8480	8535	8447
19	Flush	84.8	85.4	8790	8989	6130

As Measured Totals

Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
8125.8	112.4	323484	400180

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Average Treating Pressure:	8455 psi
Maximum Treating Pressure:	9282 psi
Minimum Treating Pressure:	3270 psi
Average Injection Rate:	81.2 bbl/min
Maximum Injection Rate:	85.5 bbl/min
Average Horsepower:	16963.6 hhp
Maximum Horsepower:	18813.3 hhp
Maximum Prop Concentration:	3.0 PPA
Open psi	3205
Ball vol	285 bbl
Break	5970
Break rate	15 bpm
ISIP	6156
FG	1.26
5 min	5217
10 min	5014
15 min	4881

Section 3: Stage 8, Propped Frac: Job Messages

Message Log

#	Time	Message	Treating Pressure (psi)	Annulus Pressure (psi)	Total Slurry (bbl)	Slurry Rate (bbl/min)	Prop. Conc. (PPA)
1		Reset Executed Steps	0	0	0.0	0.0	0.0
2		Reset Executed Steps	0	0	0.0	0.0	0.0
3	22:41:38	Remark	2201	4	0.0	0.0	0.0
4	22:42:48	Remark	9505	4	0.0	0.1	0.0
5	22:46:00	Remark	9361	4	0.0	0.0	0.0
6	2:32:12	Start Rate Automatically	3205	4	0.0	0.0	0.0
7	2:32:12	Start Propped Frac Automatically	3205	4	0.0	0.0	0.0
8	2:32:12	Start Stage 8 Automatically	3205	4	0.0	0.0	0.0
9	2:32:12	Started Pumping	3205	4	0.0	0.0	0.0
10	2:33:54	Start Acid 715% HC Automatically	5863	4	20.3	15.5	0.0
11	2:36:13	Start spacer Automatically	5926	3	55.9	15.2	0.0
12	2:40:10	Start Acid 15% HC Automatically	5852	4	115.9	15.2	0.0
13	2:42:31	Start PAD Automatically	5878	4	151.5	15.2	0.0
14	2:50:39	Stage at Perfs: Rate	8046	3	315.0	43.0	0.0
15	2:51:05	Stage at Perfs: Acid 715% HC	8269	3	335.1	44.7	0.0
16	2:51:49	Stage at Perfs: spacer	8816	4	371.5	53.3	0.0
17	2:52:53	Stage at Perfs: Acid 15% HC	9003	4	431.4	58.6	0.0
18	2:53:28	Stage at Perfs: PAD	9101	4	466.6	61.0	0.0
19	2:57:31	Start 0.25 PPA Automatically	8924	3	747.3	67.3	0.0
20	2:57:31	Started Pumping Prop	8924	3	747.3	67.3	0.0
21	3:01:24	Start 0.5 PPA Automatically	8465	3	1035.7	83.3	0.3
22	3:01:43	Stage at Perfs: 0.25 PPA	8553	4	1062.5	85.5	0.5
23	3:05:00	Start 0.75 PPA Automatically	8554	4	1342.6	85.3	0.5
24	3:05:06	Stage at Perfs: 0.5 PPA	8554	3	1351.1	85.4	0.7
25	3:08:42	Stage at Perfs: 0.75 PPA	8503	3	1658.4	85.3	0.7
26	3:09:51	Start 1.00 PPA Automatically	8500	4	1756.5	85.4	0.8
27	3:13:33	Stage at Perfs: 1.00 PPA	8471	4	2072.2	85.3	1.0
28	3:15:58	Start 1.50 PPA Automatically	8473	4	2278.4	85.5	1.0
29	3:19:40	Stage at Perfs: 1.50 PPA	8464	3	2594.1	85.2	1.5
30	3:25:31	Start 2.0 PPA Automatically	8530	4	3093.4	85.3	1.5

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Message Log

#	Time	Message	Treating Pressure (psi)	Annulus Pressure (psi)	Total Slurry (bbl)	Slurry Rate (bbl/min)	Prop. Conc. (PPA)
31	3:25:36	Activated Extend Stage	8528	4	3100.5	85.3	2.0
32	3:29:13	Stage at Perfs: 2.0 PPA	8530	5	3409.1	85.3	2.0
33	3:31:46	Deactivated Extend Stage	8550	4	3626.7	85.3	2.0
34	3:31:46	Start .50 PPA Manually	8550	4	3626.7	85.3	2.0
35	3:35:28	Stage at Perfs: .50 PPA	8559	5	3942.5	85.3	0.5
36	3:37:42	Start .75 PPA Manually	8479	4	4133.1	85.4	0.5
37	3:41:24	Stage at Perfs: .75 PPA	8472	4	4448.7	85.3	0.7
38	3:42:33	Start 1.0 PPA Automatically	8461	4	4546.8	85.4	0.7
39	3:46:15	Stage at Perfs: 1.0 PPA	8433	4	4862.6	85.4	1.0
40	3:47:27	Start 1.5 PPA Automatically	8445	4	4965.0	85.1	1.0
41	3:51:09	Stage at Perfs: 1.5 PPA	8426	3	5280.8	85.4	1.5
42	3:56:11	Activated Extend Stage	8486	4	5710.3	85.4	1.5
43	4:00:04	Deactivated Extend Stage	8531	4	6041.6	85.3	1.5
44	4:00:04	Start 2.0 PPA Manually	8531	4	6041.6	85.3	1.5
45	4:00:08	Activated Extend Stage	8540	4	6047.3	85.5	1.5
46	4:03:40	.85 fr	8656	5	6348.8	85.3	2.0
47	4:03:46	Stage at Perfs: 2.0 PPA	8673	4	6357.4	85.3	2.0
48	4:08:26	1.0 fr	8590	3	6755.6	85.4	2.0
49	4:09:39	Deactivated Extend Stage	8570	3	6859.5	85.3	2.0
50	4:09:39	Start 2.5 PPA Manually	8570	3	6859.5	85.3	2.0
51	4:09:43	Activated Extend Stage	8579	4	6865.1	85.4	2.0
52	4:13:21	Stage at Perfs: 2.5 PPA	8413	4	7175.2	85.4	2.5
53	4:18:07	Deactivated Extend Stage	8453	4	7582.0	85.5	2.5
54	4:18:07	Start 3.0 PPA Manually	8453	4	7582.0	85.5	2.5
55	4:18:17	Activated Extend Stage	8452	4	7596.2	85.5	3.0
56	4:20:45	Cut Prop	8470	4	7806.7	85.4	3.0
57	4:21:06	Deactivated Extend Stage	8562	3	7836.6	85.2	0.0
58	4:21:06	Start Flush Manually	8562	3	7836.6	85.2	0.0
59	4:21:14	Stopped Pumping Prop	8587	4	7848.0	85.3	0.0
60	4:21:49	Stage at Perfs: 3.0 PPA	8741	4	7897.7	85.3	0.0

Section 4: Stage 8, Propped Frac: Material Balance

Material Balance

Material Name	Quantity Pumped
Slickwater	320484 gal
HCl 15	2940 gal
100 Mesh Sand	141540 lb
40/70 White	258640 lb
B385	90 gal
B317, Scale	25 gal
A264	6 lb
J609, Water Friction-Reducing Agent	185 gal
L058	30 lb

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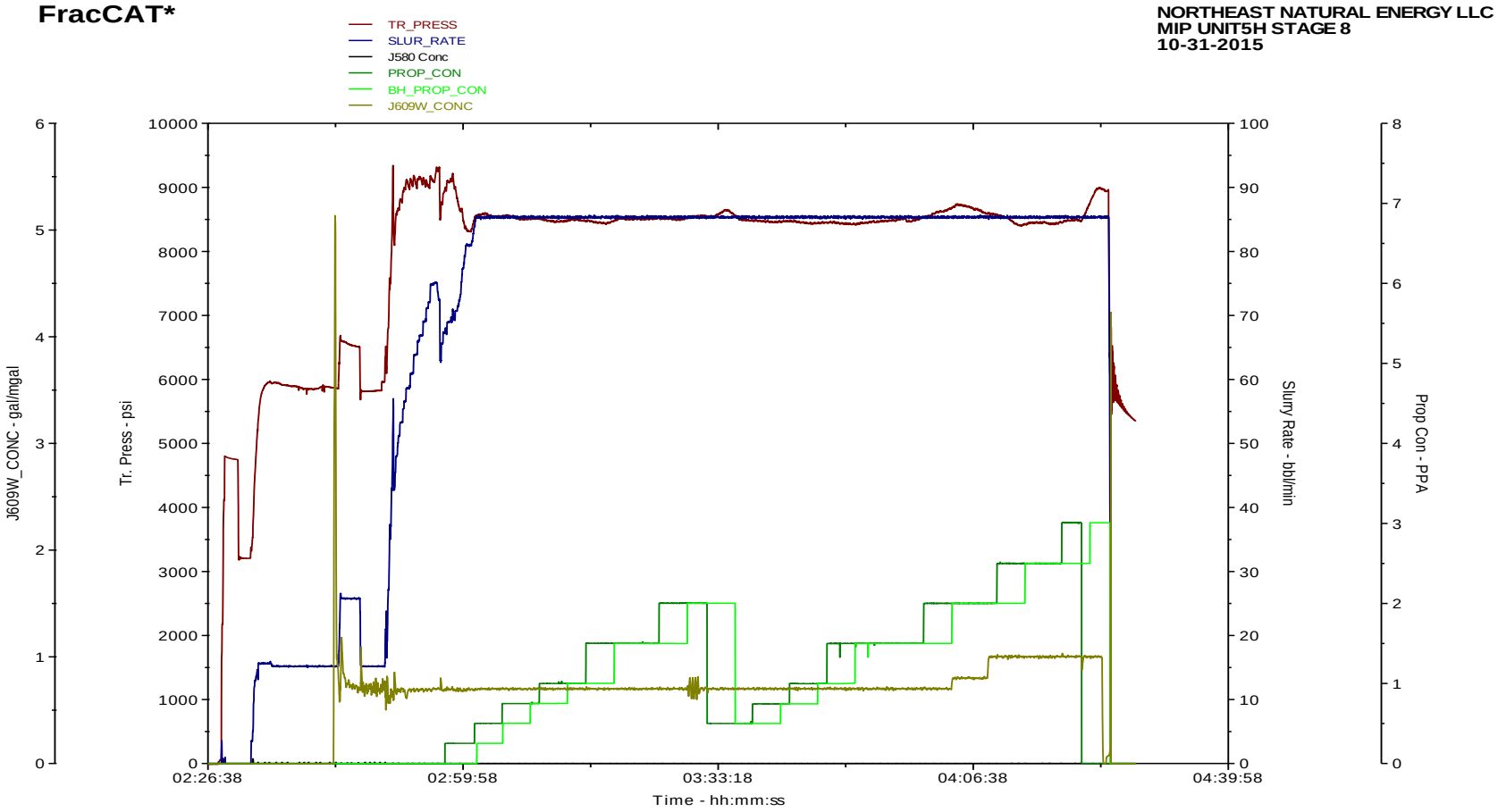
Section 5: Stage 8, Propped Frac: Post Job PRC Monitoring Panel



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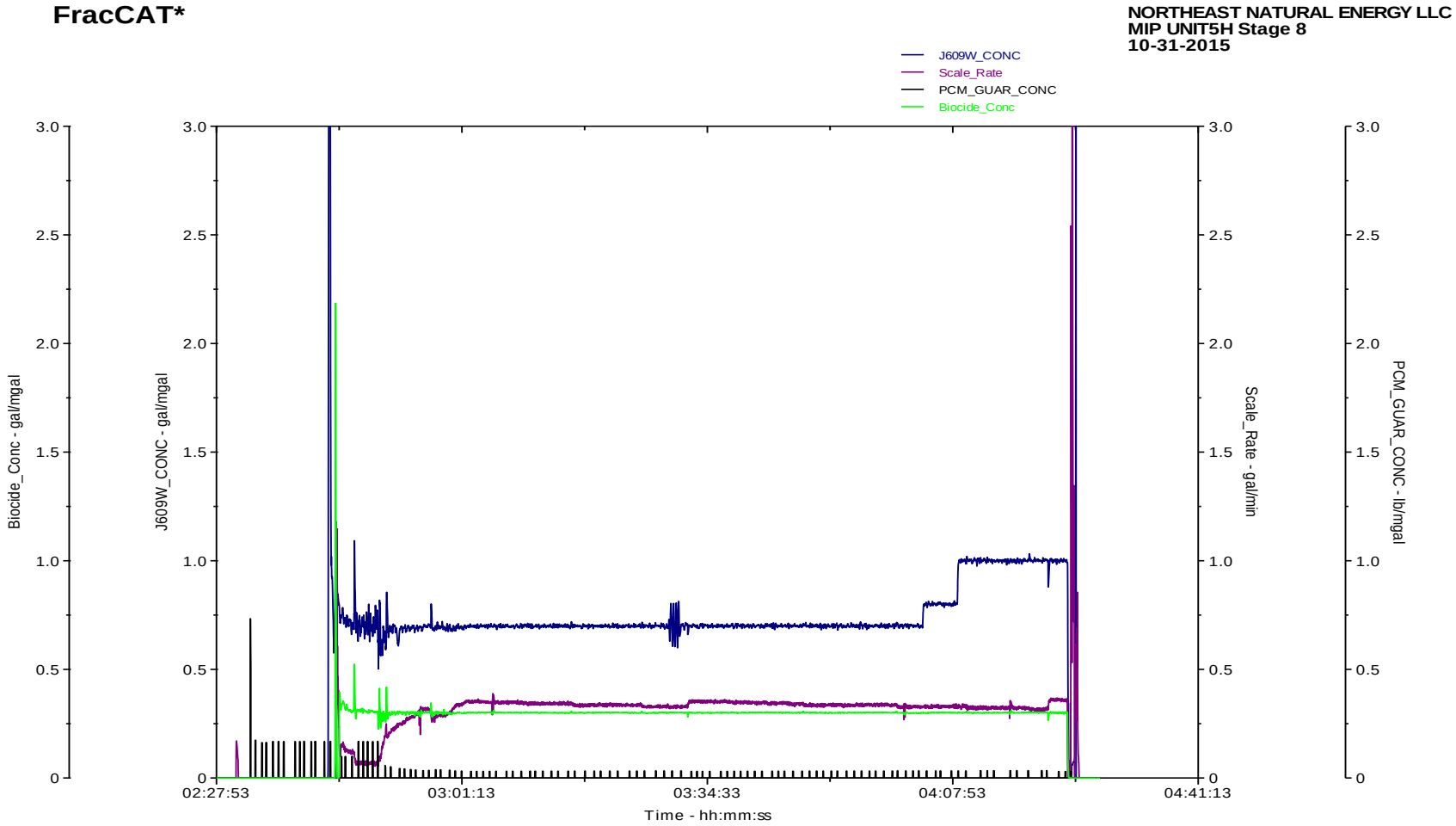
Section 6: Stage 8, Propped Frac: Post Job Chemical Plot



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