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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 : 11-1-15

Prepared by
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Comments : Stage 16

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Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 16

Section 1: Stage 16, 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 7.5% HC	36.0	15.0	2.4	HCl 07.5	1512		0.0	0
3	Spacer	60.0	15.0	4.0	Slickwater	2520		0.0	0
4	Acid 7.5% HC	36.0	15.0	2.4	HCl 07.5	1512		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	2.00 PPA	637.0	80.0	8.0	Slickwater	24528	100 Mesh Sand	2.0	49056
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	1.00 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	252.0	80.0	3.2	Slickwater	10584		0.0	0

Designed Ramp Totals			
Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
8062.5	108.3	320502	398317

Section 2: Stage 16, Propped Frac: As Measured Pump Schede

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	14.4	1.6	Slickwater	829		0.0	0.0	0
2	Acid 7.5% HC	36.0	15.3	2.4	HCl 07.5	1500		0.0	0.0	0
3	Spacer	60.0	15.3	3.9	Slickwater	2520		0.0	0.0	0
4	Acid 7.5% HC	36.0	15.2	2.4	HCl 07.5	1500		0.0	0.0	0
5	PAD	595.0	60.0	12.9	Slickwater	24944		0.0	0.0	0

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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)
6	0.25 PPA	288.2	84.8	3.4	Slickwater	11967	100 Mesh Sand	0.3	0.1	2920
7	0.5 PPA	306.8	89.7	3.4	Slickwater	12602	100 Mesh Sand	0.5	0.1	6225
8	0.75 PPA	413.6	93.0	4.4	Slickwater	16802	100 Mesh Sand	0.7	0.4	12468
9	1.00 PPA	522.7	95.1	5.5	Slickwater	21005	100 Mesh Sand	1.0	0.8	20873
10	1.50 PPA	814.9	95.1	8.6	Slickwater	32050	100 Mesh Sand	1.5	1.2	47948
11	2.00 PPA	698.8	95.1	7.3	Slickwater	26912	100 Mesh Sand	2.0	0.0	53628
12	.50 PPA	511.4	95.1	5.4	Slickwater	20982	40/70 White	2.0	0.2	10987
13	.75 PPA	413.7	95.1	4.3	Slickwater	16805	40/70 White	0.7	0.4	12471
14	1.00 PPA	418.2	95.1	4.4	Slickwater	16804	40/70 White	1.0	0.7	16695
15	1.5 PPA	747.8	95.1	7.9	Slickwater	29405	40/70 White	1.5	0.0	43961
16	2.0 PPA	1166.5	94.7	12.3	Slickwater	44910	40/70 White	2.0	0.0	89616
17	2.5 PPA	362.1	93.3	3.9	Slickwater	13875	40/70 White	2.5	0.0	29413
18	Flush	254.4	83.3	3.1	Slickwater	10718		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	14.4	15.3	5838	6311	3447
2	Acid 7.5% HC	15.3	15.3	6362	6380	6312
3	Spacer	15.3	15.3	6264	6375	6193
4	Acid 7.5% HC	15.2	15.3	6267	6310	6230
5	PAD	60.0	83.6	8480	9198	6099
6	0.25 PPA	84.8	88.6	8770	9147	8501
7	0.5 PPA	89.7	90.1	8882	8915	8847
8	0.75 PPA	93.0	95.2	9008	9130	8856
9	1.00 PPA	95.1	95.3	9093	9107	9076
10	1.50 PPA	95.1	95.3	9092	9125	9043
11	2.00 PPA	95.1	95.2	9116	9168	8970
12	.50 PPA	95.1	95.3	8997	9076	8926
13	.75 PPA	95.1	95.2	8911	8949	8879
14	1.00 PPA	95.1	95.2	8878	8901	8861
15	1.5 PPA	95.1	95.2	8860	8889	8812
16	2.0 PPA	94.7	95.3	8785	8915	8663
17	2.5 PPA	93.3	93.4	8953	9174	8830
18	Flush	83.3	92.0	9044	9187	7679

As Measured Totals

Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
7666.1	97.1	306155	347100

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Average Treating Pressure:	8861 psi
Maximum Treating Pressure:	9198 psi
Minimum Treating Pressure:	3447 psi
Average Injection Rate:	89.6 bbl/min
Maximum Injection Rate:	95.3 bbl/min
Average Horsepower:	19604.5 hhp
Maximum Horsepower:	21375.5 hhp
Maximum Prop Concentration:	2.5 PPA
Open psi	3450
Ball vol	248 bbl
Break	7417
Ball rate	15bpm
ISIP	5983
FG	1.24
5min	4986
10 min	4767
15 min	4637

Section 3: Stage 16, 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	19:12:37	Remark	9550	6	0.0	0.0	0.0
4	19:15:47	Remark	9474	6	0.0	0.0	0.0
5	22:00:10	Start Rate Automatically	3443	5	0.0	0.0	0.0
6	22:00:10	Start Propped Frac Automatically	3443	5	0.0	0.0	0.0
7	22:00:10	Start Stage 16 Automatically	3443	5	0.0	0.0	0.0
8	22:00:10	Started Pumping	3443	5	0.0	0.0	0.0
9	22:01:46	Start Acid 7.5% HC Automatically	6312	5	20.1	15.3	0.0
10	22:04:08	Start Spacer Automatically	6377	6	56.2	15.3	0.0
11	22:08:04	Start Acid 7.5% HC Automatically	6242	6	116.2	15.3	0.0
12	22:10:25	Start PAD Automatically	6306	6	152.1	15.2	0.0
13	22:16:22	Stage at Perfs: Rate	8393	5	279.6	34.5	0.0
14	22:16:54	Stage at Perfs: Acid 7.5% HC	8704	6	300.1	42.8	0.0
15	22:17:41	Stage at Perfs: Spacer	8287	5	335.6	52.1	0.0
16	22:18:43	Stage at Perfs: Acid 7.5% HC	8917	5	395.7	62.8	0.0
17	22:19:17	Stage at Perfs: PAD	8995	5	432.4	67.8	0.0
18	22:23:19	Start 0.25 PPA Automatically	9137	5	747.4	80.9	0.0
19	22:23:19	Started Pumping Prop	9137	5	747.4	80.9	0.0
20	22:26:37	Stage at Perfs: 0.25 PPA	8849	5	1027.2	88.6	0.3
21	22:26:43	Start 0.5 PPA Automatically	8842	5	1036.0	88.5	0.3
22	22:29:50	Stage at Perfs: 0.5 PPA	8867	4	1315.5	89.9	0.5
23	22:30:08	Start 0.75 PPA Automatically	8869	5	1342.5	90.0	0.5
24	22:33:10	Stage at Perfs: 0.75 PPA	9080	5	1621.9	94.3	0.7
25	22:34:35	Start 1.00 PPA Automatically	9106	5	1756.5	95.1	0.7
26	22:37:32	Stage at Perfs: 1.00 PPA	9078	5	2037.1	95.2	1.0
27	22:40:05	Start 1.50 PPA Automatically	9078	6	2279.7	95.0	1.0
28	22:43:02	Stage at Perfs: 1.50 PPA	9070	5	2560.4	95.3	1.5
29	22:48:39	Start 2.00 PPA Automatically	9118	5	3094.5	94.9	1.5
30	22:48:41	Activated Extend Stage	9102	5	3097.7	95.0	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	22:51:36	Stage at Perfs: 2.00 PPA	9131	5	3375.1	94.9	2.0
32	22:55:59	Deactivated Extend Stage	8984	5	3792.1	95.1	2.0
33	22:55:59	Start .50 PPA Manually	8984	5	3792.1	95.1	2.0
34	22:58:56	Stage at Perfs: .50 PPA	9030	5	4072.6	95.1	0.5
35	23:01:22	Start .75 PPA Automatically	8948	5	4304.1	94.9	0.5
36	23:04:19	Stage at Perfs: .75 PPA	8897	5	4584.7	95.1	0.7
37	23:05:43	Start 1.00 PPA Automatically	8884	6	4717.9	95.0	0.7
38	23:08:40	Stage at Perfs: 1.00 PPA	8866	5	4998.6	95.1	1.0
39	23:10:07	Start 1.5 PPA Automatically	8881	6	5136.5	94.9	1.0
40	23:13:04	Stage at Perfs: 1.5 PPA	8830	6	5417.1	95.2	1.5
41	23:17:58	Start 2.0 PPA Automatically	8842	5	5883.2	95.1	1.5
42	23:20:55	Stage at Perfs: 2.0 PPA	8667	4	6163.9	95.3	2.0
43	23:27:23	Activated Extend Stage	8789	5	6778.9	94.2	2.0
44	23:30:17	Deactivated Extend Stage	8835	5	7049.7	93.6	2.0
45	23:30:17	Start 2.5 PPA Manually	8835	5	7049.7	93.6	2.0
46	23:30:20	Activated Extend Stage	8828	6	7054.4	93.3	2.0
47	23:33:17	Stage at Perfs: 2.5 PPA	9037	5	7329.7	93.4	2.5
48	23:33:47	Cut Prop	9162	6	7376.3	93.4	0.1
49	23:34:10	Deactivated Extend Stage	9187	6	7411.8	91.5	0.0
50	23:34:10	Start Flush Manually	9187	6	7411.8	91.5	0.0
51	23:34:13	Stopped Pumping Prop	9187	5	7416.4	91.5	0.0

Section 4: Stage 16, Propped Frac: Material Balance

Material Balance	
Material Name	Quantity Pumped
Slickwater	303131 gal
HCl 07.5	3000 gal
100 Mesh Sand	140660 lb
40/70 White	206440 lb
B385	70 gal
B317, Scale	30 gal
J609, Water Friction-Reducing Agent	242 gal
A264, Corros	3 gal
L058, Iron C	15 lb

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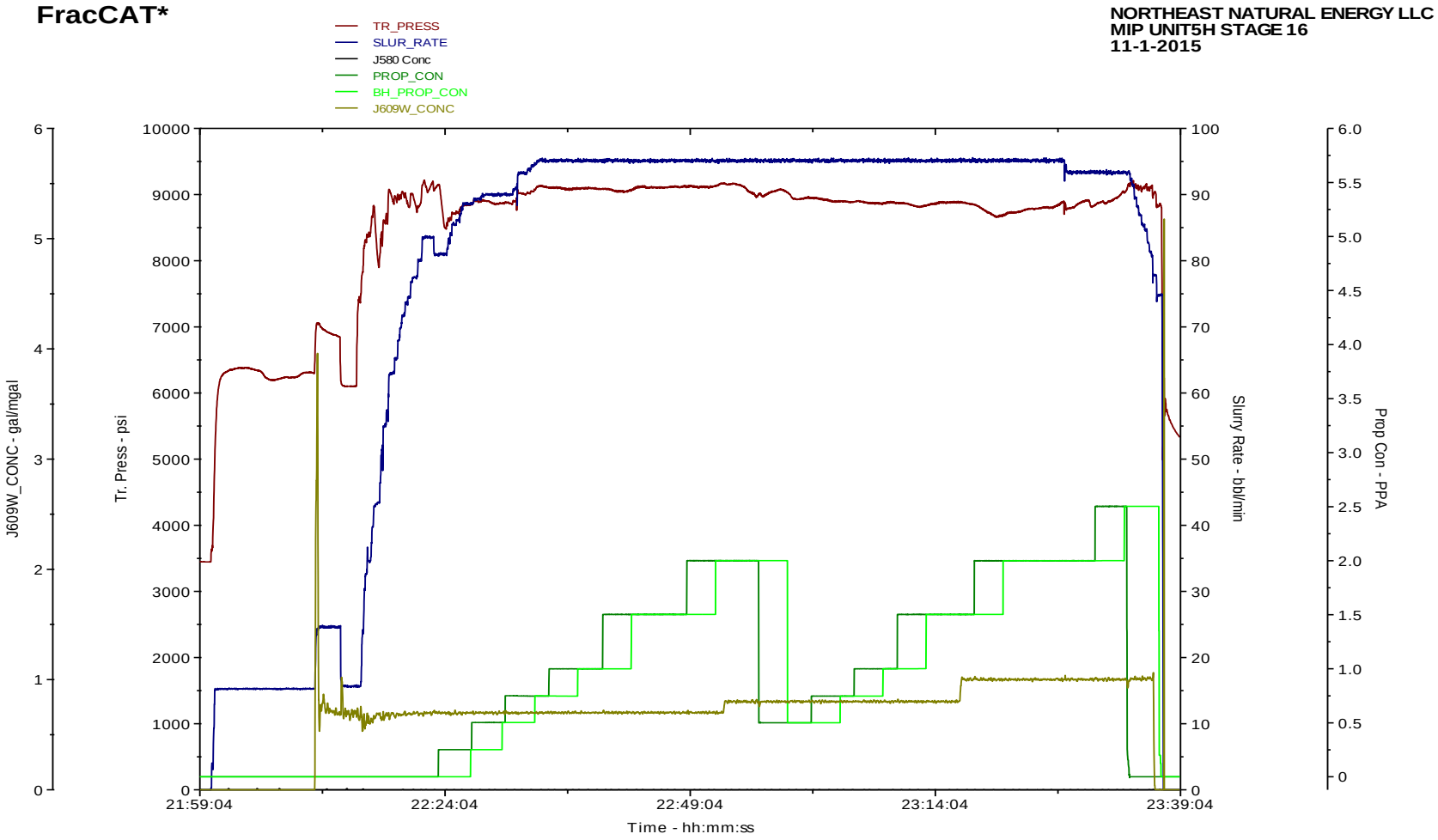
Section 5: Stage 16, Propped Frac: Post Job PRC Monitoring Panel



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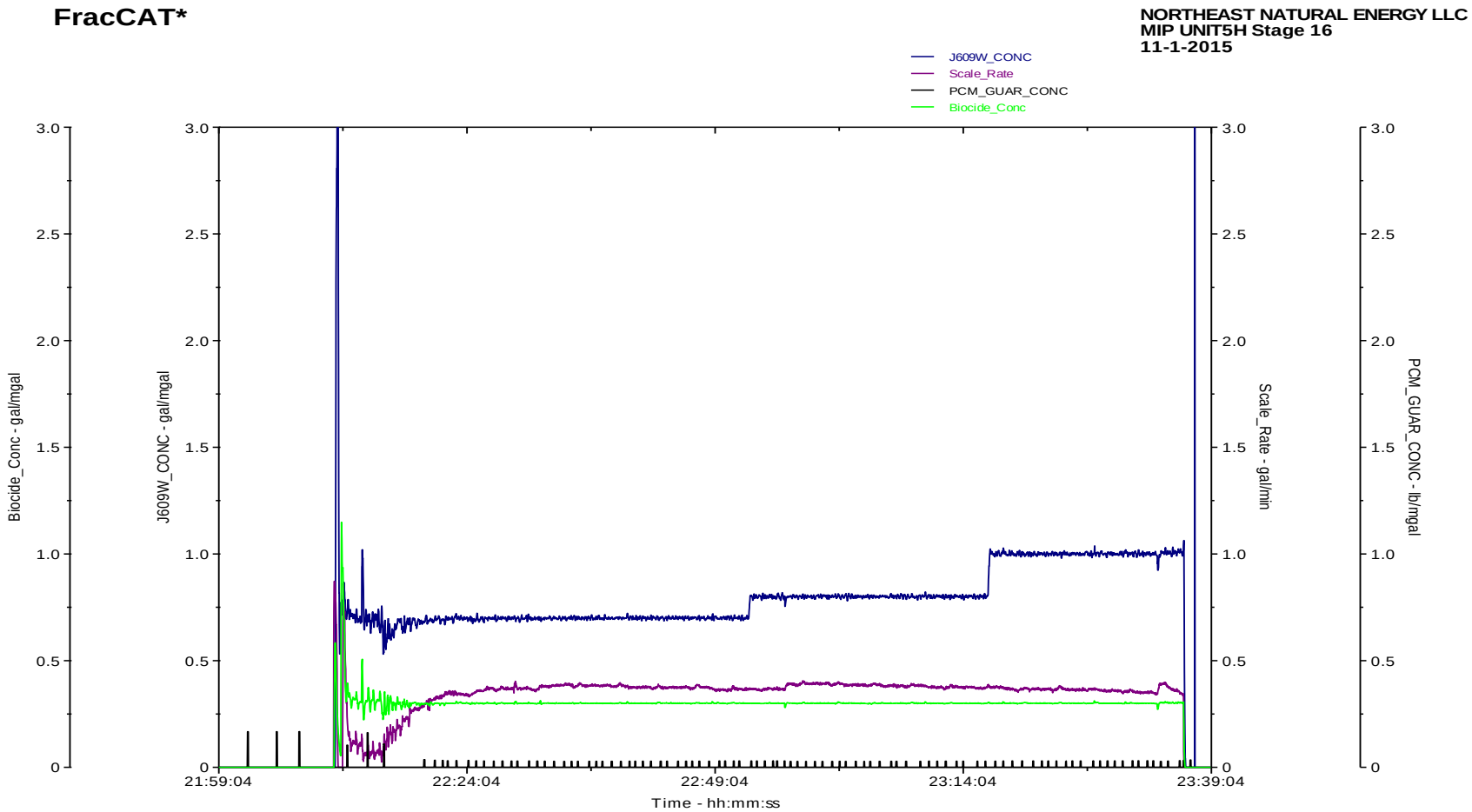
Section 6: Stage 16, Propped Frac: Post Job Chemical Plot



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