

6/6/02



Dugan Production Company

Sanchez O'Brian 1 SWD

San Juan, New Mexico
Sec.06,T24N,R09W
Mesaverde

Step Rate Test

May 30, 2002

Prepared for: Mr. John Alexander
VP
Dugan Production Company
(505) 325-1821

Prepared by: Mike McNeese
AMERICAN ENERGY SERVICES

Service Point: Farmington
Sales Contact: Mike McNeese

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AMERICAN ENERGY SERVICES

GENERAL INFORMATION

Customer : **Dugan Production Company**
Well Name : **Sanchez O'Brian 1 SWD**
County, State : **San Juan, New Mexico**
Note : **Step Rate Test**
Prepared for : **Mr. John Alexander**
Customer Title: **VP**
Phone No. : **(505) 325-1821**
Prepared by : **Mike McNeese**
Title: **Technical Sales**
Phone No. : **(505) 325-4192**
Service point : ▼
State : **New Mexico**
Sales Contact: **Mike McNeese**
Sales Title: **Account Manager**
Phone No. : **(505) 325-4192**
Sec.,T,R **Sec.06,T24N,R09W**
Field **Undesignated MV**
Formation: **Mesaverde**
Date: **May 30, 2002**
Miles To Location: **35**
No. Units **7**

Dugan Production Company
 Sanchez O'Brian 1 SWD
 Sec.06,T24N,R09W
 Mesaverde
 San Juan, New Mexico
 Step Rate Test

JOB DATA

Job Type:	Step Rate Test	
Treating Conductor:	Tubing	
Est. Pump Rate (bpm):	12.125	
Est. Pressure (psi):	3,047	3,000 (max psi)

Fluid Requirements:	Produced Water	98,438 gallons
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Total Water Required:	98,438 gallons
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Proppant/Diverter Requirements:

Total Sand Volume:	0
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(lbs sand/foot pay)	0
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WELL DATA

Formation:	Mesaverde	
Top Perforation (ft.):	3,286	
Bottom Perforation (ft):	4,390	
Mid Perforation (ft):	3,838	
No. of Perforations:	270	
Perforation Diameter (inches):	0.38	
Frac Height (ft.):	n/a	
Net Pay (ft.):	60	
Fracture Gradient (psi/ft):	0.6675	
Bottomhole Pressure (psi):	n/a	
Surface Ground Temp (deg. F):	65	
Bottom Hole Temp (deg. F):	101	(based on 1.1 deg. F per 100')
Porosity (%):	n/a	
Permeability (md):	n/a	
Tubing Size:	2 7/8", Lined Tubing, 0'-3219' (Packer)	
Casing Size:	5 1/2", 15.5#, 0'-4756' (PBTD)	
Liner Size:	n/a	
Well/Production type:	Salt Water Disposal	

Additional Information: Produced water will be supplied by the customer.

Fluid 1: Produced Water

Fluid 7: Total Water Required:

UOM

Chem.
Code[illegible]

--- Additional Information ---

Produced water will be furnished by the customer.

Recorder set ~ 41000'

Frac Calculations

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INPUT

Top Perforation (ft.):	3,286	
Bottom Perforation (ft):	4,390	
Mid Perforation (ft):	3,838	
Fracture Gradient (psi/ft):	0.67	
Pipe Friction (psi/ft):	560	
No. of Perforations:	270	
Perforation Diameter (inches):	0.38	
Fluid S.G.	1.000	
Tubing Size:	2 7/8", Lined Tubing, 0'-3219' (Packer)	
Casing Size:	5 1/2", 15.5#, 0'-4756' (PBDT)	
Liner Size:	n/a	
Est. Pump Rate (bpm):	12.125	
Csg./Tbg Capacity (bbl/ft):	0.00579	0.0159
Flush Volume (gal):	828	

Definitions:

BHFP = Bottomhole Frac Pressure (psi)

HH = Hydrostatic Head (psi)

PF = Friction Pressure Loss (psi)

PPF = Perforation Friction Pressure (psi)
 $= \{2.93 * (\text{rate} / \# \text{perfs})^2 / (\text{perf diameter})^4\}$
 * specific gravity

ISDP = Instantaneous Shut Down Pressure
 $= \text{BHFP} - \text{HH}$

STP = Surface Treating Pressure (psi)
 $= \text{BHFP} - \text{HH} + \text{PF} + \text{PPF}$

HHP = Hydraulic horsepower (hhp)
 $= \text{STP} * \text{Rate} / 40.8$

Calculations:

BHFP = 2,562 psi

HH = 1,664 psi

PF = 2,149 psi

PPF = 0 psi

ISDP = 897 psi

STP = 3,047 psi

HHP = 905



Procedure For Step Rate Test:

1. Pump produced water at 0.25 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. T 250 - 148
490
2. Pump produced water at 0.75 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 740 - 106
240
3. Pump produced water at 1.25 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 980 - 60
200
4. Pump produced water at 1.75 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1080 - 30
110
5. Pump produced water at 2.25 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1190 - 23
90
6. Pump produced water at 2.75 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1220
~~1310~~ - 19
30
7. Pump produced water at 3.25 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1310 - 10
20
8. Pump produced water at 3.75 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1330 - 20
100
9. Pump produced water at 4.25 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1430 - 35
170
10. Pump produced water at 4.75 bpm for exactly 15 minutes and record all of the rates and pressure. Use a choke assembly to pinch back the rate and adjust to the desired rate. 1540 - 50
130
11. Pump produced water at 5.25 bpm for exactly 15 minutes and record all of the rates and pressure. 1670 - 60
120
12. Pump produced water at 5.75 bpm for exactly 15 minutes and record all of the rates and pressure. 1790 - 55
140

13. Pump produced water at 6.25 bpm for exactly 15 minutes and record all of the rates and pressure. 1930 - 55
160
14. Pump produced water at 6.75 bpm for exactly 15 minutes and record all of the rates and pressure. 2090 - 60
120
15. Pump produced water at 7.25 bpm for exactly 15 minutes and record all of the rates and pressure. 2210 - 55
110
16. Pump produced water at 7.75 bpm for exactly 15 minutes and record all of the rates and pressure. 2320 - 50
150
17. Pump produced water at 8.25 bpm for exactly 15 minutes and record all of the rates and pressure. 2470 - 50
110
18. Pump produced water at 8.75 bpm for exactly 15 minutes and record all of the rates and pressure. 2580 - 50
150
19. Pump produced water at 9.25 bpm for exactly 15 minutes and record all of the rates and pressure. 2730 - 55
150
20. Pump produced water at 9.75 bpm for exactly 15 minutes and record all of the rates and pressure. 2880 - 60
150
21. Pump produced water at 10.25 bpm for exactly 15 minutes and record all of the rates and pressure. 3030 - 70
~~240~~
150
22. Pump produced water at 10.75 bpm for exactly 15 minutes and record all of the rates and pressure. 3180 - 110
lost flow meter ~ 4 min into this stop.
Switched flow meter to backup. 60
23. Pump produced water at 11.25 bpm for exactly 15 minutes and record all of the rates and pressure. 3240 - 110
170
24. Pump produced water at 11.75 bpm for exactly 15 minutes and record all of the rates and pressure. 3410 - 135
190 ~~200~~
25. Pump produced water at 12.25 bpm for exactly 15 minutes and record all of the rates and pressure. 3600 - 160
Ran out of water ~ 13 min into
Step- Shut down.

STP required to fracture the formation = 2,562 psi
(based on ISIP from pump-in) ISDP = 900
Frac Gradient From ISDP = 0.6675 psi/ft

ISIP- ~~1070~~ 1070
5 min - 930
10 " - 840
15 " - 830

Pump Schedule

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Number of tanks Using 450 Usable BBL/Tank:

5.21

Fluid & Proppant Pumping Schedule

Fluid Type	Fluid Volume (gals)	Conc. (lb/gal)	Totals (lbs)	Proppant Mesh Size	Clean Fluid (bbls)	Volume Cum Clean (bbls)	Slurry Fluid (bbls)	Cum Slurry (bbls)
Produced Water	158	0.00	0	Pad	4	4	4	4
Produced Water	473	0.00	0	0.00	11	15	11	15
Produced Water	788	0.00	0	0.00	19	34	19	34
Produced Water	1103	0.00	0	0.00	26	60	26	60
Produced Water	1418	0.00	0	0.00	34	94	34	94
Produced Water	1733	0.00	0	0.00	41	135	41	135
Produced Water	2048	0.00	0	0.00	49	184	49	184
Produced Water	2363	0.00	0	0.00	56	240	56	240
Produced Water	2678	0.00	0	0.00	64	304	64	304
Produced Water	2993	0.00	0	0.00	71	375	71	375
Produced Water	3308	0.00	0	0.00	79	454	79	454
Produced Water	3623	0.00	0	0.00	86	540	86	540
Produced Water	3938	0.00	0	0.00	94	634	94	634
Produced Water	4253	0.00	0	0.00	101	735	101	735
Produced Water	4568	0.00	0	0.00	109	844	109	844
Produced Water	4883	0.00	0	0.00	116	960	116	960
Produced Water	5198	0.00	0	0.00	124	1084	124	1084
Produced Water	5513	0.00	0	0.00	131	1215	131	1215
Produced Water	5828	0.00	0	0.00	139	1354	139	1354
Produced Water	6143	0.00	0	0.00	146	1500	146	1500
Produced Water	6458	0.00	0	0.00	154	1654	154	1654
Produced Water	6773	0.00	0	0.00	161	1815	161	1815
Produced Water	7088	0.00	0	0.00	169	1984	169	1984
Produced Water	7403	0.00	0	0.00	176	2160	176	2160
Produced Water	7718	0.00	0	0.00	184	2344	184	2344
Totals	98438		0		2344		2344	

Rate Schedule

Fluid Type	Fluid Volume (gals)	Proppant Conc. (lb/gal)	Slurry Rate (bpm)	Clean Fluid Rate (bpm)	Proppant Rate (lbs/min)	Slurry Volume (bbls)	Cum Slurry (bbls)	Pump Time (min)
1 Produced Water	158	0.00	0.250	0.3	0	4	4	15.00
2 Produced Water	473	0.00	0.750	0.8	0	11	15	15.00
3 Produced Water	788	0.00	1.250	1.3	0	19	34	15.00
4 Produced Water	1103	0.00	1.750	1.8	0	26	60	15.00
5 Produced Water	1418	0.00	2.250	2.3	0	34	94	15.00
6 Produced Water	1733	0.00	2.750	2.8	0	41	135	15.00
7 Produced Water	2048	0.00	3.250	3.3	0	49	184	15.00
8 Produced Water	2363	0.00	3.750	3.8	0	56	240	15.00
9 Produced Water	2678	0.00	4.250	4.3	0	64	304	15.00
10 Produced Water	2993	0.00	4.750	4.8	0	71	375	15.00
11 Produced Water	3308	0.00	5.250	5.3	0	79	454	15.00
12 Produced Water	3623	0.00	5.750	5.8	0	86	540	15.00
13 Produced Water	3938	0.00	6.250	6.3	0	94	634	15.00
14 Produced Water	4253	0.00	6.750	6.8	0	101	735	15.00
15 Produced Water	4568	0.00	7.250	7.3	0	109	844	15.00
16 Produced Water	4883	0.00	7.750	7.8	0	116	960	15.00
17 Produced Water	5198	0.00	8.250	8.3	0	124	1084	15.00
18 Produced Water	5513	0.00	8.750	8.8	0	131	1215	15.00
19 Produced Water	5828	0.00	9.250	9.3	0	139	1354	15.00
20 Produced Water	6143	0.00	9.750	9.8	0	146	1500	15.00
21 Produced Water	6458	0.00	10.250	10.3	0	154	1654	15.00
22 Produced Water	6773	0.00	10.750	10.8	0	161	1815	15.00
23 Produced Water	7088	0.00	11.250	11.3	0	169	1984	15.00
24 Produced Water	7403	0.00	11.750	11.8	0	176	2160	15.00
25 Produced Water	7718	0.00	12.250	12.3	0	184	2344	15.00
Total Pump Time (min)								375
Total Pump Time (hrs.)								6.25

AMERICAN ENERGY SERVICES

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 Mesaverde
 San Juan, New Mexico
 Step Rate Test

CODE

PRICE ESTIMATE

Chemicals

Unit Cost

Book Total

Proppants/Diverters

Chemical Total:

\$0.00

Equipment

Proppant Total:

\$0.00

se0215	1 ea	Minimum Pump Charge for 1000 HHP Pump, first 4 hrs	\$3,500.00	\$3,500.00
se0302	1 ea	0 - 10 BPM Blender, first 4 hrs	\$1,550.00	\$1,550.00
ts0102	1 job	Computer Van Frac Unit, Real Time Monitoring Unit	\$3,300.00	\$3,300.00
se001	245 mi	Unit Mileage Charge-Trucks, Cars, and Vans (except bulk units)	\$4.40	\$1,078.00
se0100	1 ea	Acid Pump Service ! (0 - 300 HHP)	\$1,100.00	\$1,100.00
se0600	4 job	2" Valve Rental	\$290.00	\$1,160.00

Equipment Total:

\$11,688.00

JOB TOTAL:

\$11,688.00

DISCOUNTED TOTAL:

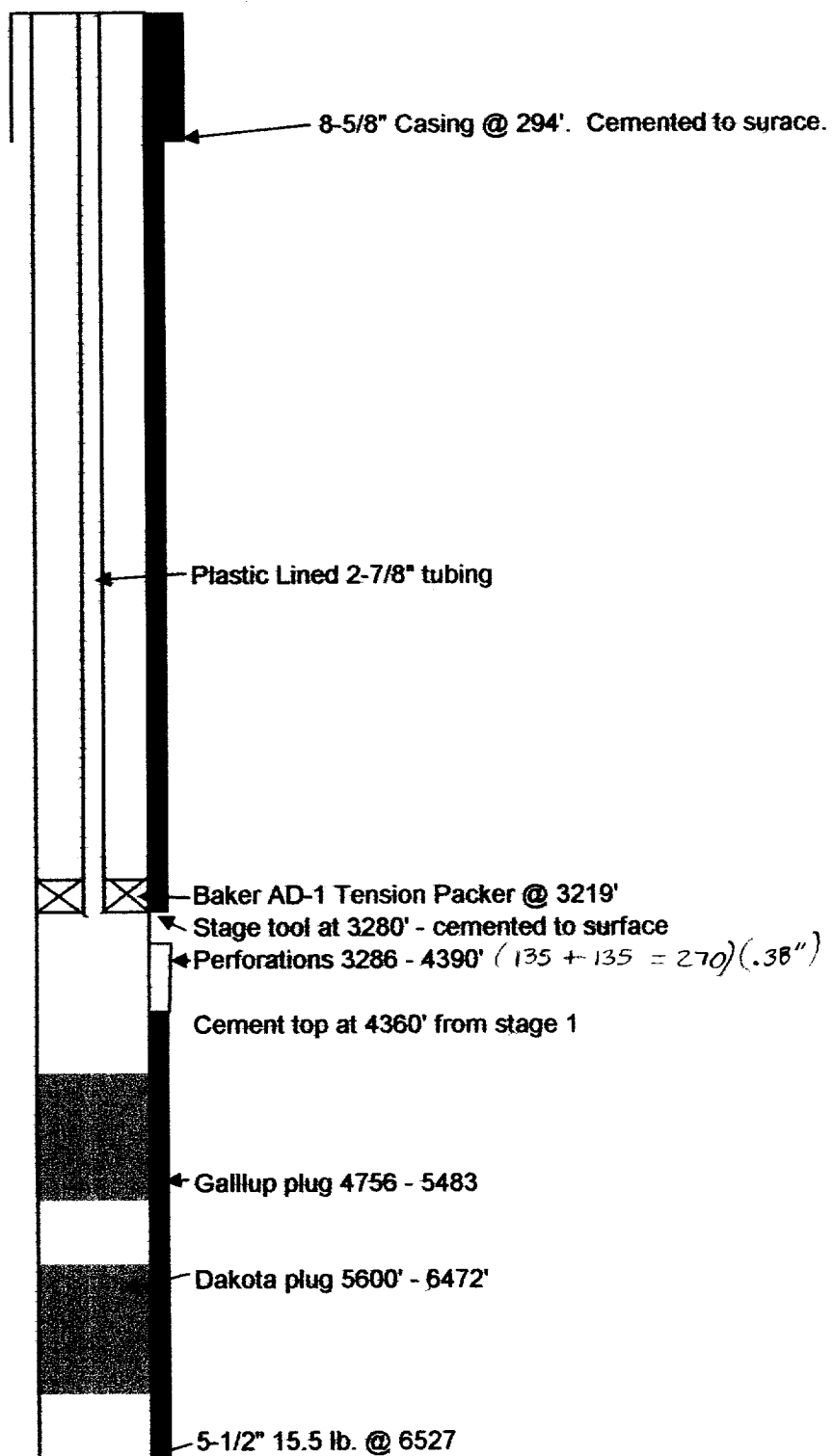
\$7,012.80

The above pricing does not include Federal, State, and Local taxes.

DUGAN PRODUCTION CORP.

Sanchez O'Brien 1 SWD, 1650' fsl & 990' fwl, 6-T.24N-R.9W

Wellbore Schematic



Melvin (Spike) Cordell



330-4670

Roger Hutchinson / BR

Set up school for BH