Revised March 23, 2017

RECEIVED:	REVIEWER:	TYPE:	APP NO:
9/01/2017	MAM	DHC	pMAM1724443156

ABOVE THIS TABLE FOR OCD DIVISION USE ONLY

NEW MEXICO OIL CONSERVATION DIVISION
- Geological & Engineering Bureau –
1220 South St. Francis Drive, Santa Fe, NM 87505

ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

Applicant: Cimarex Energy Co. Of Colorado **OGRID Number:** 162683
Well Name: Black Magic 6 Com #1 **API:** 30-015-34280
Pool: Walnut Canyon; Upper Penn (Gas), Purple Sage, Wolfcamp (Gas) **Pool Code:** 97566 98220

SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED BELOW

RECEIVED OCD
2017 SEP -1 A 10:54

1) **TYPE OF APPLICATION:** Check those which apply for [A]
A. Location – Spacing Unit – Simultaneous Dedication
☐ NSL ☐ NSP (PROJECT AREA) ☐ NSP (PRORATION UNIT) ☐ SD

B. Check one only for [I] or [II]
[I] Commingling – Storage – Measurement
☒ DHC ☐ CTB ☐ PLC ☐ PC ☐ OLS ☐ OLM
[II] Injection – Disposal – Pressure Increase – Enhanced Oil Recovery
☐ WFX ☐ PMX ☐ SWD ☐ IPI ☐ EOR ☐ PPR

FOR OCD ONLY
☐ Notice Complete
☐ Application Content Complete

2) **NOTIFICATION REQUIRED TO:** Check those which apply.
A. ☐ Offset operators or lease holders
B. ☐ Royalty, overriding royalty owners, revenue owners
C. ☐ Application requires published notice
D. ☐ Notification and/or concurrent approval by SLO
E. ☐ Notification and/or concurrent approval by BLM
F. ☐ Surface owner
G. ☐ For all of the above, proof of notification or publication is attached, and/or,
H. ☒ No notice required

3) **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information and notifications are submitted to the Division.

Note: Statement must be completed by an individual with managerial and/or supervisory capacity.

Amithy Crawford
Print or Type Name

Signature

9/1/0217
Date

432-620-1909
Phone Number

acrawford@cimarex.com
e-mail Address

District I
1625 N. French Drive, Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

APPLICATION FOR DOWNHOLE COMMINGLING

Form C-107A
Revised June 10, 2003

APPLICATION TYPE
__X__ Single Well
____ Establish Pre-Approved Pools
EXISTING WELLBORE
__X__ Yes ____ No

Cimarex Energy Co. of Colorado (Operator) 600 N. Marienfeld St., Ste. 600; Midland, TX 79701 (Address)

Black Magic 6 Com (Lease) 001 (Well No.) A-6-25S-26E (Unit Letter-Section-Township-Range) Eddy (County)

OGRID No.____ Property Code____ API No. 30-015-34280 Lease Type: __X__ Federal ____ State____ Fee

DATA ELEMENT	UPPER ZONE	LOWER ZONE
Pool Name	Purple Sage Wolfcamp(Gas)	Walnut Canyon; Upper Penn (Gas)
Pool Code	98220	97566
Top and Bottom of Pay Section (Perforated or Open-Hole Interval)	9848'-8396'	10098'-9894'
Method of Production (Flowing or Artificial Lift)	Flowing	Flowing
Bottomhole Pressure (Note: Pressure data will not be required if the bottom perforation in the lower zone is within 150% of the depth of the top perforation in the upper zone)	Within 150% of top perf	Within 150% of top perf
Oil Gravity or Gas BTU (Degree API or Gas BTU)	Oil: 51.8° API Gas: 1225.8 BTU dry / 1204.6 BTU wet @ 14.73 psi	Oil: 53.5° API Gas: 1142.4 BTU dry / 1122.6 BTU wet @ 14.73 psi
Producing, Shut-In or New Zone	New Zone	New Zone
Date and Oil/Gas/Water Rates of Last Production. (Note: For new zones with no production history, applicant shall be required to attach production estimates and supporting data.)	Date: N/A Rates: 44 BOPD, 583 MCFPD, 883 BWPD	Date: N/A Rates: 52 BOPD, 684 MCFPD, 1037 BWPD
Fixed Allocation Percentage (Note: If allocation is based upon something other than current or past production, supporting data or explanation will be required.)	Oil 46 Gas 46	Oil 54 Gas 54

ADDITIONAL DATA

Are all working, royalty and overriding royalty interests identical in all commingled zones? Yes__X__ No____
If not, have all working, royalty and overriding royalty interest owners been notified by certified mail? Yes____ No____

Are all produced fluids from all commingled zones compatible with each other? Yes__X__ No____

Will commingling decrease the value of production? Yes____ No__X__

If this well is on, or communitized with, state or federal lands, has either the Commissioner of Public Lands or the United States Bureau of Land Management been notified in writing of this application? Yes__X__ No____

NMOCD Reference Case No. applicable to this well: DHC-3871-A

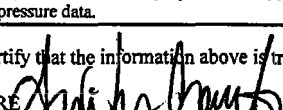
Attachments:
C-102 for each zone to be commingled showing its spacing unit and acreage dedication.
Production curve for each zone for at least one year. (If not available, attach explanation.)
For zones with no production history, estimated production rates and supporting data.
Data to support allocation method or formula.
Notification list of working, royalty and overriding royalty interests for uncommon interest cases.
Any additional statements, data or documents required to support commingling.

PRE-APPROVED POOLS

If application is to establish Pre-Approved Pools, the following additional information will be required:

List of other orders approving downhole commingling within the proposed Pre-Approved Pools
List of all operators within the proposed Pre-Approved Pools
Proof that all operators within the proposed Pre-Approved Pools were provided notice of this application.
Bottomhole pressure data.

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE  TITLE Regulatory Analyst DATE 9/1/2017

TYPE OR PRINT NAME Amithy Crawford TELEPHONE NO. 432-620-1909

E-MAIL ADDRESS acrawford@cimarex.com

District I
1625 N. French Dr., Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720
District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-102
Revised August 1, 2011
Submit one copy to appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

1 API Number	2 Pool Code	3 Pool Name
30-015-34280	98220	Purple Sage Wolfcamp Gas

4 Property Code	5 Property Name	6 Well Number
35027	Black Magic 6 Com	1

7 OGRID No.	8 Operator Name	9 Elevation
162683	Cimarex Energy Co. of Colorado	3387

10 Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
A	6	25S	26E		1250	North	1250	East	Eddy

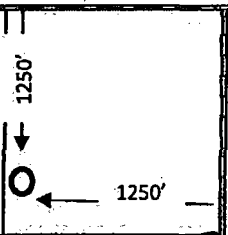
11 Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County

12 Dedicated Acres	13 Joint or Infill	14 Consolidation Code	15 Order No.
319.4			

No allowable will be assigned to this completion until all interests have been consolidated or a non-standard unit has been approved by the division.

16



17 OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature — Date: 8/31/2017

Amithy Crawford
Printed Name

acrawford@cimarex.com
E-mail Address

18 SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Date of Survey

Signature and Seal of Professional Surveyor:

Certificate Number

District I
1625 N. French Dr., Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720
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State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

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Revised August 1, 2011
Submit one copy to appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
30-015-34280	97566	Walnut Canyon; Upper Penn (Gas)

[4] Property Code	[5] Property Name	[6] Well Number
35027	Black Magic 6 Com	1

[7] OGRID No.	[8] Operator Name	[9] Elevation
162683	Cimarex Energy Co. of Colorado	3387

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
A	6	25S	26E		1250	North	1250	East	Eddy

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
319.4			

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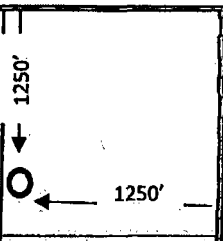
[16]



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Signature — Date: 8/31/2017

Amithy Crawford
Printed Name

Acrawford@cimarex.com
E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Date of Survey

Signature and Seal of Professional Surveyor:

Certificate Number

Cimarex Energy Co.
202 S. Cheyenne Ave.
Suite 1000
Tulsa, Oklahoma 74103-4346
PHONE: 918.585.1100
FAX: 918.585.1133

CIMAREX

Michael McMillian
Oil Conservation Division
New Mexico Department of Energy,
Minerals and Natural Resources
1220 South Saint Francis Drive
Santa Fe, New Mexico 87505

Re: Black Magic 6 Com 1
API 30-015-34280
Section 6, Township 25 South, Range 26 East, N.M.P.M.
Eddy County, New Mexico.

Dear Mr. McMillian:

The Black Magic 6 Com 1 well is located in the NE/4 of Sec. 6, 25S, 26E, Eddy County NM.

Cimarex is the operator of the E/2 of Sec. 6, 25S, 26E, Eddy County, NM as to all depths from the surface of the Earth down to the base of the Morrow formation. Ownership in the Black Magic 6 Com 1 are identical within these depths.

Sincerely,

Caitlin Pierce
Production Landman
cpierce@cimarex.com
Direct: 432-571-7862

State of New Mexico
Energy, Minerals and Natural Resources Department

Administrative Order DHC-3871-A
Order Date: Janauary 13, 2017
Application Reference Number: pMAM1701052451

Cimarex Energy Co. of Colorado
600 North Marienfeld Street, Suite 600
Midland, Tx. 79701

Attention: Ms. Terri Stathem

Black Magic 6 Com. Well No. 1
API No. 30-015-34280
Lot 1, Section 6, Township 25 South, Range 26 East, NMPM
Eddy County, New Mexico

Pool Names:	WALNUT CANYON; UPPER PENN (GAS)	Gas (97566)
	SAGE DRAW; WOLFCAMP (GAS)	Gas (84407)

Reference is made to your recent application for an exception to Division Rule 19.15.12.9A. NMAC of the Division Rules and Regulations to permit the above-described well to commingle production from the subject pools in the wellbore.

It appears that the subject well qualifies for approval for such exception pursuant to the provisions of Division Rule 19.15.12.11A. NMAC, and since reservoir damage or waste will not result from such downhole commingling, and correlative rights will not be violated thereby, you are hereby authorized to commingle the production as described above and any Division Order which authorized the dual completion or otherwise required separation of the zones is hereby placed in abeyance.

In accordance with Division Rule 19.15.12.11A (6) NMAC, the production attributed to any commingled pool within the well shall not exceed the allowable applicable to that pool.

As per the application, the assignment of allowable and allocation of oil and gas production from the subject well for the Walnut Canyon; Upper Penn (Gas) Pool and Sage Draw; Wolfcamp (Gas) Pool shall be based on the remaining gas in place (RGIP) calculations, which in turn is based on offset analogy production and well log analysis for each pool.

Assignment of allowable and allocation of production from the well shall be as follows:

SAGE DRAW; WOLFCAMP (GAS)	Pct. Oil: 61	Pct. Gas: 61
WALNUT CANYON; UPPER PENN (GAS)	Pct. Oil: 39	Pct. Gas: 39

It is also understood that notice of this application, pursuant to Division Rule 19.15.4.12 A (6), is not required since the interest ownership between the zones to be commingled is common throughout.

REMARKS: The operator shall notify the Division's District II office upon implementation of commingling operations.

This Administrative Order supersedes Administrative Order DHC-3871, issued on April 12, 2007. Administrative Order DHC-3871 approved down hole commingling in the Atoka and Morrow formations. The amendment is for down hole commingling the Wolfcamp and Upper Penn formations only.

This Order is subject to like approval from the Bureau of Land Management.

Pursuant to Division Rule 19.15.12.11B. NMAC, the commingling authority granted herein may be rescinded by the Division Director if conservation is not being best served by such commingling.

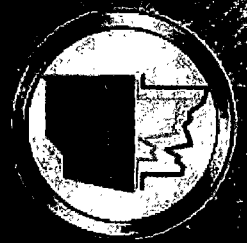
David R. Catanach
Director

DRC/mam

cc: New Mexico Oil Conservation Division – Artesia
Bureau of Land Management - Carlsbad

Cimarex Energy Company
Black Magic 6 Com 1

Completion Profiler



Completion Profile Analysis

Company	*Cimarex Energy Company*
Well Name	*Black Magic 6 Com 1*
Field	*Chosa Draw*
Location	*Eddy County, New Mexico*
Customer Name	*Steven Runyan*
Date of Survey	*July 27, 2017*
Date of Analysis	*July 31, 2017*
Logging Engineer	*Paulo Rios*
Analyst	*Mike Wells*

All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful misconduct on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Table of Contents

Survey Objectives

- Identify gas producing intervals.
- Identify oil producing intervals.
- Identify the source of water production.
- Quantitative production profile.

Logging Procedures

Date	Time	Comment
07/27/17	07:30	Arrive on location
07/27/17	09:00	Gauge run start
07/27/17	11:00	Gauge run stop
07/27/17	11:13	Program Completion Profile String
07/27/17	11:35	Start GIH pass
07/27/17	12:23	Stop GIH pass
07/27/17	12:34	Start logging passes
07/27/17	14:39	Stop logging passes
07/27/17	14:40	Start out of well pass
07/27/17	15:20	Stop out of well pass

Interval Logged: [From 8,394 to 9,983 ft.]
60 ft/min
90 ft/min
120 ft/min

Well Information

Casing: 4.500" 11.6 lb/ft surface to 12,075 ft PBTD: 11,814 ft

Tubing: 2.375" 4.7 lb/ft surface to 8,360 ft

Perforation Data																							
Stage 5 - Wolfcamp																							
8,396	to	8,397	8,413	to	8,414	8,424	to	8,425	8,434	to	8,435	8,442	to	8,443									
8,451	to	8,452	8,462	to	8,463	8,470	to	8,471	8,478	to	8,479	8,487	to	8,488									
8,494	to	8,495	8,506	to	8,507	8,513	to	8,514	8,532	to	8,533	8,544	to	8,545									
8,555	to	8,556	8,563	to	8,564	8,571	to	8,573	8,587	to	8,578	8,591	to	8,580									
Stage 4 - Wolfcamp																							
8,960	to	8,961	8,975	to	8,976	8,987	to	8,988	8,997	to	8,998	9,015	to	9,016									
9,029	to	9,030	9,044	to	9,045	9,063	to	9,064	9,077	to	9,078	9,088	to	9,089									
9,100	to	9,101	9,109	to	9,110	9,118	to	9,119	9,127	to	9,128	9,135	to	9,136									
9,144	to	9,145	9,154	to	9,155	9,164	to	9,166	9,175	to	9,177	9,185	to	9,189									
Stage 3 - Wolfcamp																							
9,218	to	9,219	9,233	to	9,234	9,244	to	9,245	9,254	to	9,255	9,266	to	9,267									
9,278	to	9,279	9,291	to	9,292	9,302	to	9,303	9,314	to	9,315	9,324	to	9,325									
9,336	to	9,337	9,348	to	9,349	9,359	to	9,360	9,371	to	9,372	9,382	to	9,383									
9,396	to	9,397	9,408	to	9,409	9,420	to	9,422	9,432	to	9,434	9,442	to	9,445									
Stage 2 - Wolfcamp																							
9,642	to	9,643	9,649	to	9,650	9,656	to	9,657	9,666	to	9,667	9,679	to	9,680									
9,690	to	9,691	9,699	to	9,700	9,710	to	9,711	9,726	to	9,727	9,734	to	9,735									
9,744	to	9,745	9,754	to	9,755	9,766	to	9,767	9,777	to	9,778	9,788	to	9,789									
9,798	to	9,799	9,809	to	9,810	9,822	to	9,824	9,834	to	9,836	9,844	to	9,848									
Stage 1 - Cisco Canyon																							
9,894	to	9,895	9,904	to	9,905	9,915	to	9,916	9,926	to	9,927	9,939	to	9,940									
9,950	to	9,951	9,960	to	9,961	9,973	to	9,974	9,981	to	9,982	9,989	to	9,990									
9,997	to	9,998	10,006	to	10,007	10,016	to	10,017	10,029	to	10,030	10,040	to	10,041									
10,050	to	10,051	10,061	to	10,062	10,072	to	10,074	10,082	to	10,084	10,094	to	10,098									

Tool String

The 1.700" Completion Profiler string comprised the following sensors:

Battery housing; RS-232/CCL; Memory/CPU; Gamma Ray; Pressure/Temperature Combo; Centralizer; Induction Collar Locator; Fluid Density; Fluid Dielectric; Centralizer; Spinner Flowmeter.

Results

The following table summarizes the production from each frac stage.

MEASURED SURFACE RATES Flow Rates Reported at STP									
	Tubing	Gas		Oil			Water		
	Psi	MCFD		BFPD			BFPD		
Avg	300 psi	1244 Mcf/d		50 bpd			653 bpd		

GAS / OIL / WATER PRODUCTION PROFILE Flow Rates Reported at STP									
Zone Intervals feet	Q-Gas MCFD	Qp-Gas MCFD	Percent of Total	Q-Oil BFPD	Qp-Oil BFPD	Percent of Total	Q-Water BFPD	Qp-Water BFPD	Percent of Total
Surface to 8396	1325.0 Mcf/d		100.00 %	53.27 bpd		100.00 %	589.80 bpd		100.00 %
Stage 5 - Wolfcamp			11.07 %			11.07 %			67.96 %
8396 to 8573	1325.0 Mcf/d	146.6 Mcf/d		53.27 bpd	5.90 bpd		589.80 bpd	400.85 bpd	
Stage 4 - Wolfcamp			21.81 %			21.81 %			18.68 %
8960 to 9189	1178.4 Mcf/d	289.0 Mcf/d		47.37 bpd	11.62 bpd		188.94 bpd	110.17 bpd	
Stage 3 - Wolfcamp			7.99 %			7.99 %			4.01 %
9218 to 9445	889.4 Mcf/d	105.9 Mcf/d		35.75 bpd	4.26 bpd		78.77 bpd	23.62 bpd	
Stage 2 - Wolfcamp			4.76 %			4.76 %			8.36 %
9642 to 9848	783.5 Mcf/d	63.0 Mcf/d		31.50 bpd	2.53 bpd		55.15 bpd	49.29 bpd	
Stage 1 - Cisco Canyon			43.16 %			43.16 %			0.88 %
9894 to 9982	720.5 Mcf/d	571.9 Mcf/d		28.96 bpd	22.99 bpd		5.87 bpd	5.19 bpd	
Flow Contribution from Below Log Depth			11.22 %			11.22 %			0.12 %
9983 to Below	148.6 Mcf/d		11.22 %	5.97 bpd		11.22 %	0.68 bpd		0.12 %

The following table summarizes the production from each producing interval.

GAS / OIL / WATER PRODUCTION PROFILE Flow Rates Reported at STP										
Zone Intervals feet	Q-Gas MCFD	Qp-Gas MCFD	Percent of Total	Q-Oil BFPD	Qp-Oil BFPD	Percent of Total	Q-Water BFPD	Qp-Water BFPD	Percent of Total
Surface to 8396	1325.0 Mcf/d		100.00 %	53.27 bpd		100.00 %	589.80 bpd		100.00 %
Stage 5 - Wolfcamp			11.07 %			11.07 %			67.96 %
8396 to 8397	1325.0 Mcf/d	6.7 Mcf/d	0.50 %	53.27 bpd	0.27 bpd	0.50 %	589.80 bpd	66.34 bpd	11.25 %
8413 to 8414	1318.4 Mcf/d	7.1 Mcf/d	0.54 %	53.00 bpd	0.29 bpd	0.54 %	523.46 bpd	46.99 bpd	7.97 %
8424 to 8425	1311.2 Mcf/d	7.8 Mcf/d	0.59 %	52.71 bpd	0.31 bpd	0.59 %	476.47 bpd	50.86 bpd	8.62 %
8434 to 8435	1303.5 Mcf/d	6.4 Mcf/d	0.48 %	52.40 bpd	0.26 bpd	0.48 %	425.61 bpd	186.36 bpd	31.60 %
8442 to 8443	1297.1 Mcf/d	8.3 Mcf/d	0.63 %	52.14 bpd	0.33 bpd	0.63 %	239.25 bpd	2.49 bpd	0.42 %
8451 to 8452	1288.7 Mcf/d	14.7 Mcf/d	1.11 %	51.81 bpd	0.59 bpd	1.11 %	236.76 bpd	2.99 bpd	0.51 %
8462 to 8463	1274.1 Mcf/d	8.2 Mcf/d	0.62 %	51.22 bpd	0.33 bpd	0.62 %	233.77 bpd	2.22 bpd	0.38 %
8470 to 8471	1265.8 Mcf/d	9.0 Mcf/d	0.68 %	50.89 bpd	0.36 bpd	0.68 %	231.55 bpd	2.76 bpd	0.47 %
8478 to 8479	1256.9 Mcf/d	5.9 Mcf/d	0.44 %	50.53 bpd	0.24 bpd	0.44 %	228.79 bpd	2.90 bpd	0.49 %
8487 to 8488	1251.0 Mcf/d	7.7 Mcf/d	0.58 %	50.29 bpd	0.31 bpd	0.58 %	225.89 bpd	2.12 bpd	0.36 %
8494 to 8495	1243.3 Mcf/d	13.5 Mcf/d	1.02 %	49.98 bpd	0.54 bpd	1.02 %	223.76 bpd	17.93 bpd	3.04 %
8506 to 8507	1229.8 Mcf/d	7.4 Mcf/d	0.56 %	49.44 bpd	0.30 bpd	0.56 %	205.83 bpd	2.39 bpd	0.41 %
8513 to 8514	1222.4 Mcf/d	4.3 Mcf/d	0.33 %	49.14 bpd	0.17 bpd	0.33 %	203.45 bpd	2.19 bpd	0.37 %
8532 to 8533	1218.1 Mcf/d	10.3 Mcf/d	0.77 %	48.97 bpd	0.41 bpd	0.77 %	201.26 bpd	2.57 bpd	0.44 %
8544 to 8545	1207.8 Mcf/d	9.2 Mcf/d	0.70 %	48.55 bpd	0.37 bpd	0.70 %	198.69 bpd	2.20 bpd	0.37 %
8555 to 8556	1198.6 Mcf/d	6.0 Mcf/d	0.46 %	48.18 bpd	0.24 bpd	0.46 %	196.48 bpd	2.32 bpd	0.39 %
8563 to 8564	1192.5 Mcf/d	7.1 Mcf/d	0.54 %	47.94 bpd	0.28 bpd	0.53 %	194.16 bpd	2.85 bpd	0.48 %
8571 to 8573	1185.4 Mcf/d	7.0 Mcf/d	0.53 %	47.66 bpd	0.28 bpd	0.53 %	191.31 bpd	2.37 bpd	0.40 %
Stage 4 - Wolfcamp			21.81 %			21.81 %			18.68 %
8960 to 8961	1178.4 Mcf/d	24.2 Mcf/d	1.83 %	47.37 bpd	0.97 bpd	1.83 %	188.94 bpd	1.95 bpd	0.33 %
8975 to 8976	1154.2 Mcf/d	23.8 Mcf/d	1.80 %	46.40 bpd	0.96 bpd	1.80 %	187.00 bpd	3.55 bpd	0.60 %
8987 to 8988	1130.3 Mcf/d	25.4 Mcf/d	1.92 %	45.44 bpd	1.02 bpd	1.92 %	183.45 bpd	2.22 bpd	0.38 %
8997 to 8998	1104.9 Mcf/d	27.6 Mcf/d	2.08 %	44.42 bpd	1.11 bpd	2.08 %	181.23 bpd	2.66 bpd	0.45 %
9015 to 9016	1077.4 Mcf/d	47.0 Mcf/d	3.55 %	43.31 bpd	1.89 bpd	3.55 %	178.57 bpd	15.78 bpd	2.68 %
9029 to 9030	1030.4 Mcf/d	7.6 Mcf/d	0.57 %	41.42 bpd	0.31 bpd	0.57 %	162.79 bpd	1.45 bpd	0.25 %
9044 to 9045	1022.8 Mcf/d	5.8 Mcf/d	0.44 %	41.12 bpd	0.23 bpd	0.44 %	161.34 bpd	2.16 bpd	0.37 %
9063 to 9064	1016.9 Mcf/d	7.0 Mcf/d	0.53 %	40.88 bpd	0.28 bpd	0.53 %	159.18 bpd	2.09 bpd	0.35 %
9077 to 9078	1010.0 Mcf/d	18.5 Mcf/d	1.39 %	40.60 bpd	0.74 bpd	1.39 %	157.09 bpd	1.57 bpd	0.27 %
9088 to 9089	991.5 Mcf/d	9.6 Mcf/d	0.72 %	39.86 bpd	0.38 bpd	0.72 %	155.52 bpd	1.62 bpd	0.28 %
9100 to 9101	981.9 Mcf/d	6.5 Mcf/d	0.49 %	39.47 bpd	0.26 bpd	0.49 %	153.89 bpd	52.07 bpd	8.83 %
9109 to 9110	975.4 Mcf/d	6.1 Mcf/d	0.46 %	39.21 bpd	0.24 bpd	0.46 %	101.83 bpd	2.25 bpd	0.38 %
9118 to 9119	969.3 Mcf/d	6.0 Mcf/d	0.46 %	38.97 bpd	0.24 bpd	0.46 %	99.58 bpd	2.43 bpd	0.41 %
9127 to 9128	963.3 Mcf/d	6.2 Mcf/d	0.47 %	38.72 bpd	0.25 bpd	0.47 %	97.14 bpd	2.63 bpd	0.45 %
9135 to 9136	957.1 Mcf/d	5.7 Mcf/d	0.43 %	38.48 bpd	0.23 bpd	0.43 %	94.51 bpd	1.97 bpd	0.34 %
9144 to 9145	951.3 Mcf/d	7.4 Mcf/d	0.56 %	38.24 bpd	0.30 bpd	0.56 %	92.54 bpd	2.58 bpd	0.44 %
9154 to 9155	943.9 Mcf/d	8.0 Mcf/d	0.60 %	37.95 bpd	0.32 bpd	0.60 %	89.96 bpd	2.58 bpd	0.44 %
9164 to 9166	935.9 Mcf/d	33.8 Mcf/d	2.55 %	37.63 bpd	1.36 bpd	2.55 %	87.38 bpd	2.27 bpd	0.39 %
9175 to 9177	902.2 Mcf/d	5.8 Mcf/d	0.44 %	36.27 bpd	0.23 bpd	0.44 %	85.11 bpd	2.44 bpd	0.41 %
9185 to 9189	896.4 Mcf/d	7.0 Mcf/d	0.53 %	36.04 bpd	0.28 bpd	0.53 %	82.67 bpd	3.89 bpd	0.66 %

Stage 3 - Wolfcamp					**7.99 %**			**7.99 %**			**4.00 %**
9218	to **9219**	889.4 Mcf/d	10.4 Mcf/d	**0.79 %**	35.75 bpd	0.42 bpd	**0.79 %**	78.77 bpd	1.91 bpd	**0.32 %**
9233	to **9234**	879.0 Mcf/d	9.5 Mcf/d	**0.72 %**	35.33 bpd	0.38 bpd	**0.72 %**	76.86 bpd	2.23 bpd	**0.38 %**
9244	to **9245**	869.4 Mcf/d	8.1 Mcf/d	**0.62 %**	34.95 bpd	0.33 bpd	**0.62 %**	74.63 bpd	2.26 bpd	**0.38 %**
9254	to **9255**	861.3 Mcf/d	9.5 Mcf/d	**0.72 %**	34.62 bpd	0.38 bpd	**0.72 %**	72.37 bpd	2.21 bpd	**0.37 %**
9266	to **9267**	851.8 Mcf/d	9.2 Mcf/d	**0.70 %**	34.24 bpd	0.37 bpd	**0.70 %**	70.16 bpd	1.97 bpd	**0.34 %**
9278	to **9279**	842.6 Mcf/d	8.5 Mcf/d	**0.64 %**	33.87 bpd	0.34 bpd	**0.64 %**	68.19 bpd	2.37 bpd	**0.40 %**
9291	to **9292**	834.1 Mcf/d	28.3 Mcf/d	**2.14 %**	33.53 bpd	1.14 bpd	**2.14 %**	65.81 bpd	2.15 bpd	**0.36 %**
9302	to **9303**	805.8 Mcf/d	6.7 Mcf/d	**0.50 %**	32.39 bpd	0.27 bpd	**0.50 %**	63.66 bpd	1.96 bpd	**0.33 %**
9314	to **9315**	799.1 Mcf/d	0.6 Mcf/d	**0.05 %**	32.12 bpd	0.02 bpd	**0.05 %**	61.70 bpd	0.35 bpd	**0.06 %**
9324	to **9325**	798.5 Mcf/d	1.3 Mcf/d	**0.10 %**	32.10 bpd	0.05 bpd	**0.10 %**	61.35 bpd	0.68 bpd	**0.12 %**
9336	to **9337**	797.2 Mcf/d	2.0 Mcf/d	**0.15 %**	32.05 bpd	0.08 bpd	**0.15 %**	60.67 bpd	0.19 bpd	**0.03 %**
9348	to **9349**	795.1 Mcf/d	1.5 Mcf/d	**0.11 %**	31.96 bpd	0.06 bpd	**0.11 %**	60.48 bpd	0.70 bpd	**0.12 %**
9359	to **9360**	793.6 Mcf/d	0.3 Mcf/d	**0.03 %**	31.90 bpd	0.01 bpd	**0.03 %**	59.78 bpd	0.21 bpd	**0.04 %**
9371	to **9372**	793.3 Mcf/d	2.3 Mcf/d	**0.17 %**	31.89 bpd	0.09 bpd	**0.17 %**	59.57 bpd	0.44 bpd	**0.07 %**
9382	to **9383**	791.0 Mcf/d	0.3 Mcf/d	**0.02 %**	31.80 bpd	0.01 bpd	**0.02 %**	59.14 bpd	0.50 bpd	**0.09 %**
9396	to **9397**	790.7 Mcf/d	2.4 Mcf/d	**0.18 %**	31.79 bpd	0.10 bpd	**0.18 %**	58.63 bpd	0.40 bpd	**0.07 %**
9408	to **9409**	788.3 Mcf/d	1.1 Mcf/d	**0.09 %**	31.69 bpd	0.05 bpd	**0.09 %**	58.23 bpd	0.77 bpd	**0.13 %**
9420	to **9422**	787.2 Mcf/d	0.5 Mcf/d	**0.04 %**	31.64 bpd	0.02 bpd	**0.04 %**	57.46 bpd	0.88 bpd	**0.15 %**
9432	to **9434**	786.7 Mcf/d	2.1 Mcf/d	**0.16 %**	31.62 bpd	0.08 bpd	**0.16 %**	56.58 bpd	0.72 bpd	**0.12 %**
9442	to **9445**	784.6 Mcf/d	1.1 Mcf/d	**0.08 %**	31.54 bpd	0.04 bpd	**0.08 %**	55.86 bpd	0.71 bpd	**0.12 %**
Stage 2 - Wolfcamp				**4.75 %**			**4.76 %**			**8.35 %**
9642	to **9643**	783.5 Mcf/d	3.8 Mcf/d	**0.29 %**	31.50 bpd	0.15 bpd	**0.29 %**	55.15 bpd	1.19 bpd	**0.20 %**
9649	to **9650**	779.7 Mcf/d	1.1 Mcf/d	**0.09 %**	31.34 bpd	0.05 bpd	**0.09 %**	53.97 bpd	1.85 bpd	**0.31 %**
9656	to **9657**	778.5 Mcf/d	3.2 Mcf/d	**0.24 %**	31.30 bpd	0.13 bpd	**0.24 %**	52.12 bpd	2.40 bpd	**0.41 %**
9666	to **9667**	775.3 Mcf/d	4.3 Mcf/d	**0.33 %**	31.17 bpd	0.17 bpd	**0.33 %**	49.72 bpd	1.83 bpd	**0.31 %**
9679	to **9680**	771.0 Mcf/d	3.0 Mcf/d	**0.23 %**	30.99 bpd	0.12 bpd	**0.23 %**	47.89 bpd	1.34 bpd	**0.23 %**
9690	to **9691**	768.0 Mcf/d	3.0 Mcf/d	**0.22 %**	30.87 bpd	0.12 bpd	**0.22 %**	46.56 bpd	1.91 bpd	**0.32 %**
9699	to **9700**	765.0 Mcf/d	1.7 Mcf/d	**0.13 %**	30.75 bpd	0.07 bpd	**0.13 %**	44.64 bpd	1.28 bpd	**0.22 %**
9710	to **9711**	763.3 Mcf/d	1.5 Mcf/d	**0.11 %**	30.68 bpd	0.06 bpd	**0.11 %**	43.37 bpd	7.14 bpd	**1.21 %**
9726	to **9727**	761.8 Mcf/d	2.6 Mcf/d	**0.19 %**	30.63 bpd	0.10 bpd	**0.19 %**	36.23 bpd	1.28 bpd	**0.22 %**
9734	to **9735**	759.2 Mcf/d	4.2 Mcf/d	**0.32 %**	30.52 bpd	0.17 bpd	**0.32 %**	34.95 bpd	1.51 bpd	**0.26 %**
9744	to **9745**	755.0 Mcf/d	3.5 Mcf/d	**0.26 %**	30.35 bpd	0.14 bpd	**0.26 %**	33.45 bpd	1.81 bpd	**0.31 %**
9754	to **9755**	751.5 Mcf/d	0.5 Mcf/d	**0.04 %**	30.21 bpd	0.02 bpd	**0.04 %**	31.64 bpd	1.71 bpd	**0.29 %**
9766	to **9767**	751.0 Mcf/d	1.8 Mcf/d	**0.13 %**	30.19 bpd	0.07 bpd	**0.13 %**	29.93 bpd	8.18 bpd	**1.39 %**
9777	to **9778**	749.2 Mcf/d	2.2 Mcf/d	**0.17 %**	30.12 bpd	0.09 bpd	**0.17 %**	21.75 bpd	1.26 bpd	**0.21 %**
9788	to **9789**	747.0 Mcf/d	2.3 Mcf/d	**0.17 %**	30.03 bpd	0.09 bpd	**0.17 %**	20.49 bpd	7.26 bpd	**1.23 %**
9798	to **9799**	744.7 Mcf/d	2.5 Mcf/d	**0.19 %**	29.94 bpd	0.10 bpd	**0.19 %**	13.22 bpd	1.23 bpd	**0.21 %**
9809	to **9810**	742.2 Mcf/d	1.9 Mcf/d	**0.14 %**	29.84 bpd	0.08 bpd	**0.14 %**	12.00 bpd	1.86 bpd	**0.32 %**
9822	to **9824**	740.3 Mcf/d	6.7 Mcf/d	**0.51 %**	29.76 bpd	0.27 bpd	**0.51 %**	10.14 bpd	1.26 bpd	**0.21 %**
9834	to **9836**	733.5 Mcf/d	6.1 Mcf/d	**0.46 %**	29.49 bpd	0.24 bpd	**0.46 %**	8.89 bpd	1.31 bpd	**0.22 %**
9844	to **9848**	727.5 Mcf/d	7.0 Mcf/d	**0.53 %**	29.24 bpd	0.28 bpd	**0.53 %**	7.58 bpd	1.71 bpd	**0.29 %**

Stage 1 - Cisco Canyon				43.16 %			43.16 %			0.88 %
9894 to 9895	720.5 Mcf/d	150.8 Mcf/d		11.38 %	28.96 bpd	6.06 bpd	11.38 %	5.87 bpd	0.50 bpd	0.09 %
9904 to 9905	569.6 Mcf/d	31.4 Mcf/d		2.37 %	22.90 bpd	1.26 bpd	2.37 %	5.36 bpd	0.64 bpd	0.11 %
9915 to 9916	538.2 Mcf/d	21.7 Mcf/d		1.63 %	21.64 bpd	0.87 bpd	1.63 %	4.73 bpd	0.44 bpd	0.07 %
9926 to 9927	516.6 Mcf/d	49.7 Mcf/d		3.75 %	20.77 bpd	2.00 bpd	3.75 %	4.29 bpd	0.93 bpd	0.16 %
9939 to 9940	466.9 Mcf/d	171.5 Mcf/d		12.94 %	18.77 bpd	6.89 bpd	12.94 %	3.36 bpd	1.01 bpd	0.17 %
9950 to 9951	295.4 Mcf/d	40.4 Mcf/d		3.05 %	11.88 bpd	1.62 bpd	3.05 %	2.36 bpd	0.54 bpd	0.09 %
9960 to 9961	255.0 Mcf/d	19.5 Mcf/d		1.47 %	10.25 bpd	0.78 bpd	1.47 %	1.81 bpd	0.39 bpd	0.07 %
9973 to 9974	235.5 Mcf/d	37.9 Mcf/d		2.86 %	9.47 bpd	1.52 bpd	2.86 %	1.43 bpd	0.35 bpd	0.06 %
9981 to 9982	197.7 Mcf/d	49.1 Mcf/d		3.70 %	7.95 bpd	1.97 bpd	3.70 %	1.07 bpd	0.39 bpd	0.07 %
Flow Contribution from Below Log Depth				11.22 %			11.22 %			0.12 %
9983 to Below	148.6 Mcf/d			11.22 %	5.97 bpd		11.22 %	0.68 bpd		0.12 %

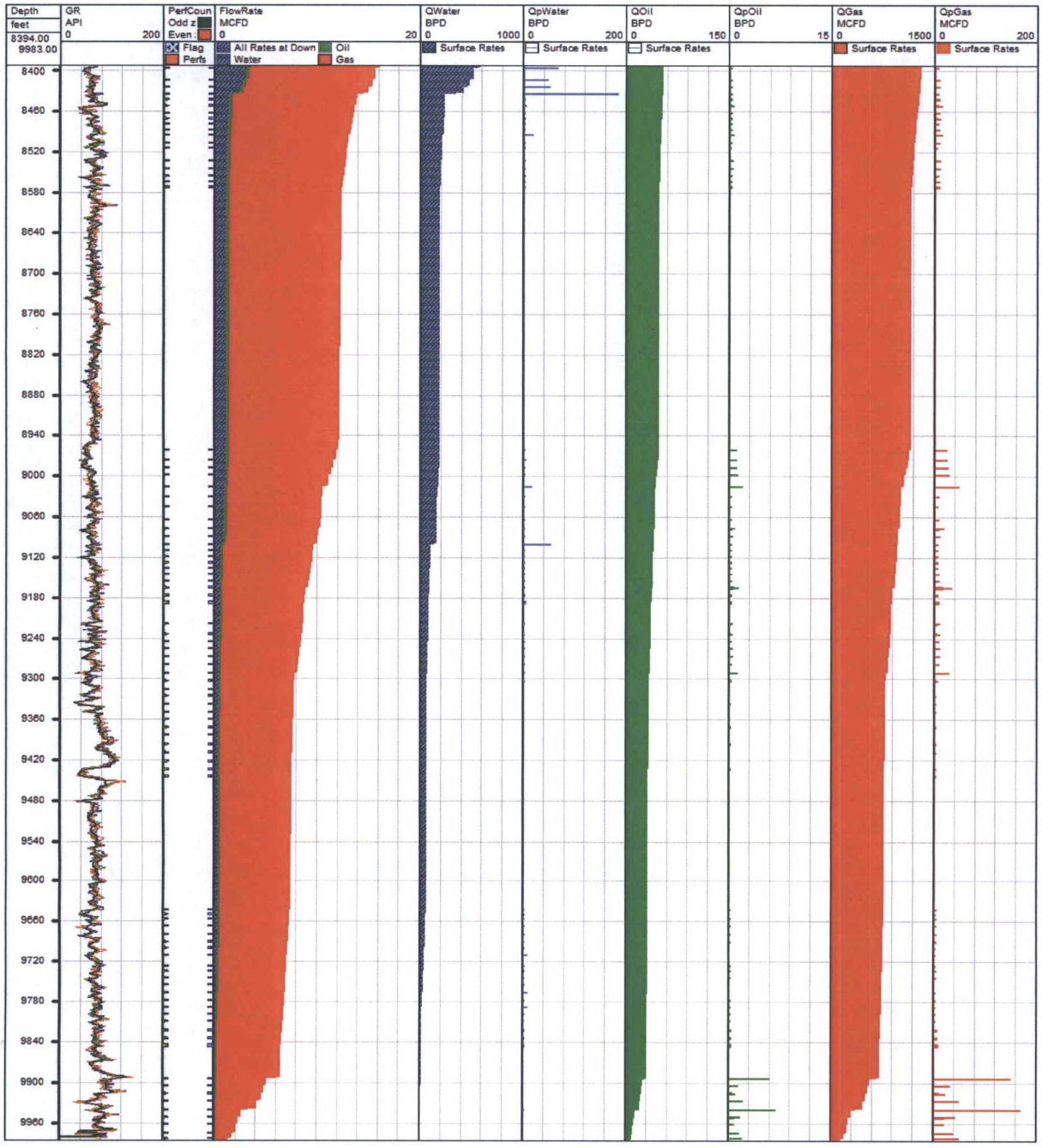
Analysis Summary

1. The analysis was conducted as 3-phase. The reported oil production of 105 BOPD is too low to accurately quantify. The downhole oil rate, at 100% flow, accounts for less than 5% of the total mass flow and less than 2% of the total volumetric rate, assuming free gas entry and solution gas breaking out downhole. The GOR is assumed to be even across all zones

2. The perforations below 9,983 feet were not logged due to wellbore restrictions. Total production from these intervals was calculated based on the data below the 9,982 feet perforations.

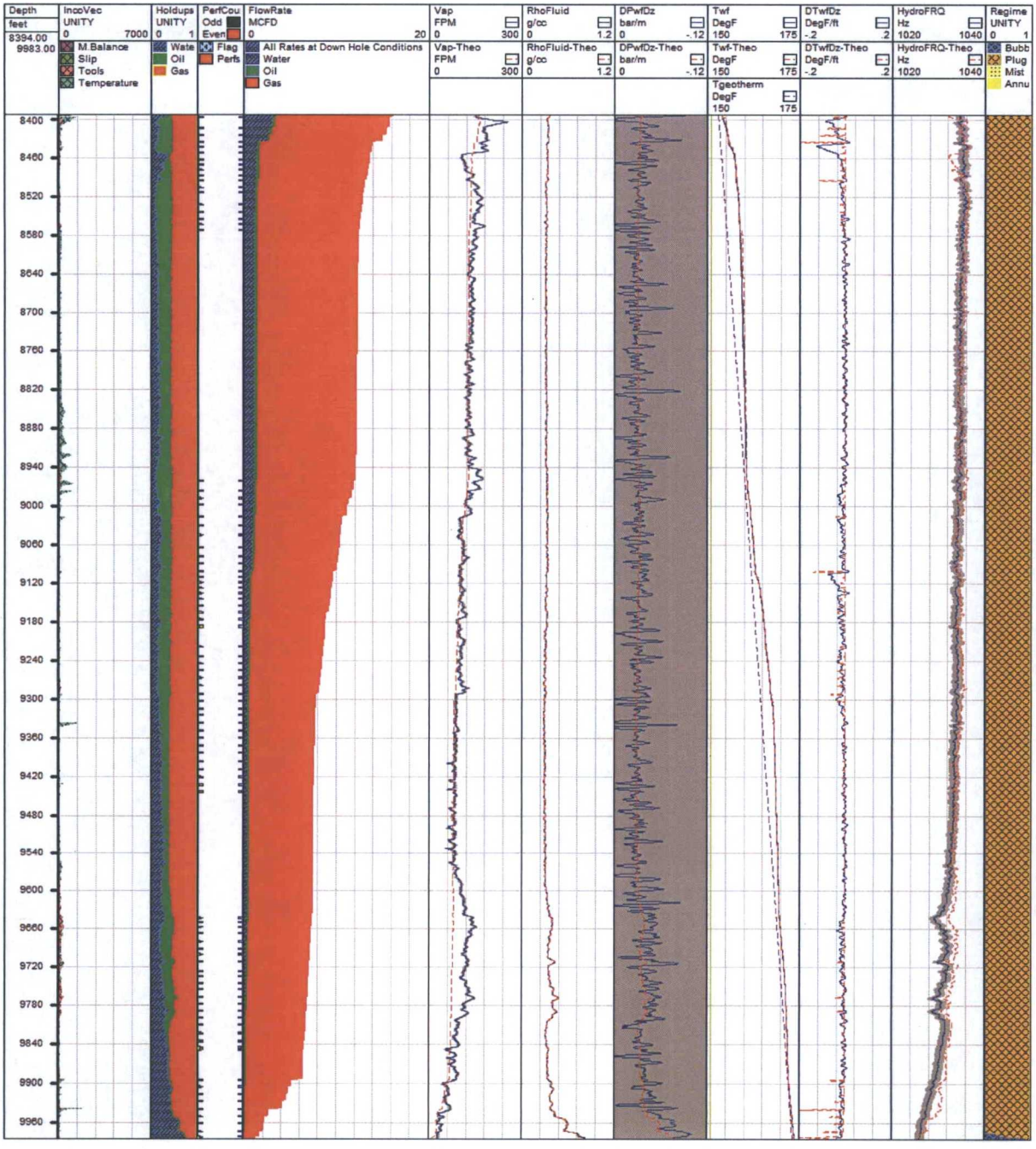
Completion Profile Analysis

Production Rates At Surface Conditions



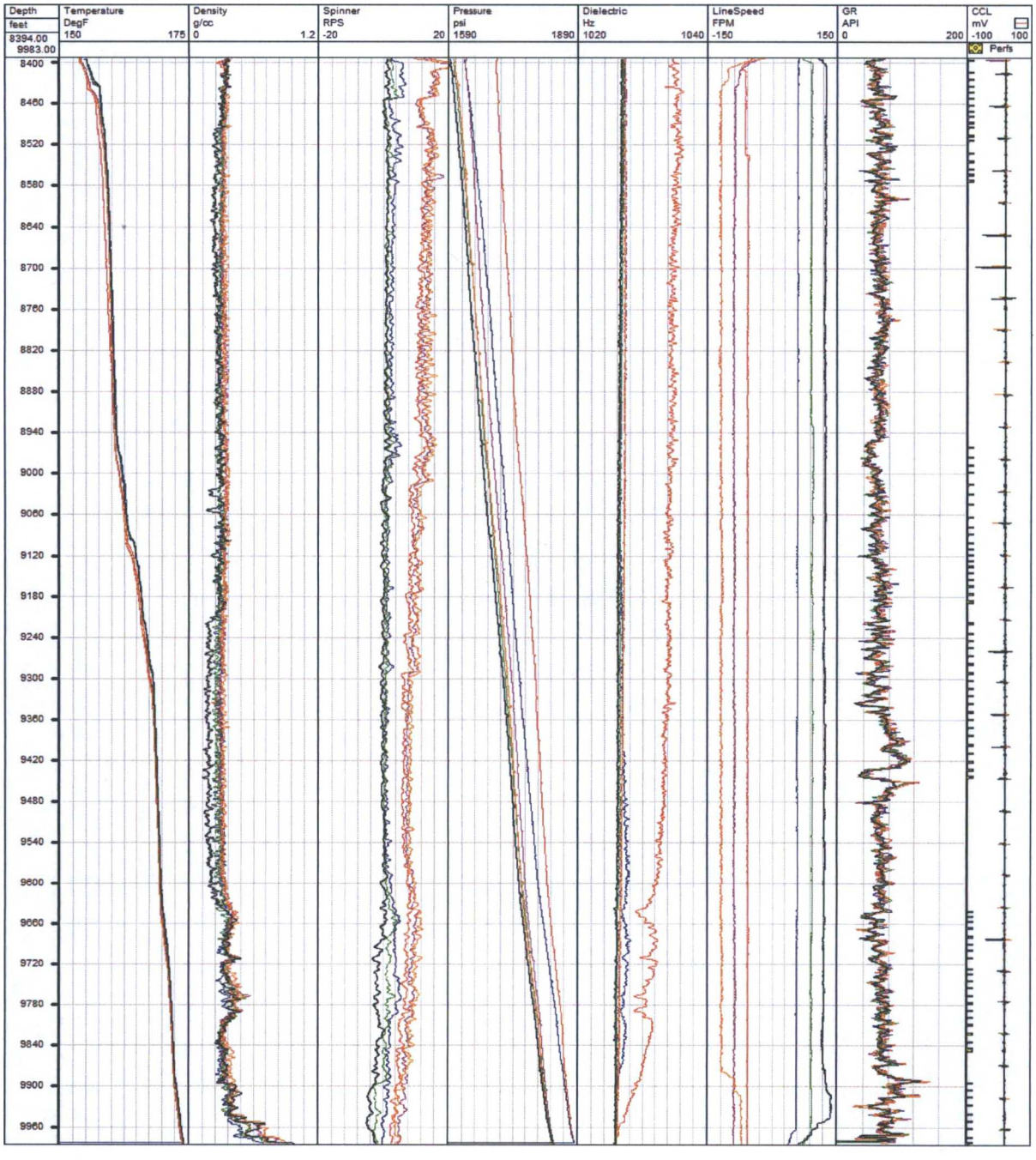
Completion Profile Analysis

Flow Model at Downhole Conditions With Comparison of Theoretical Response to Recorded Data

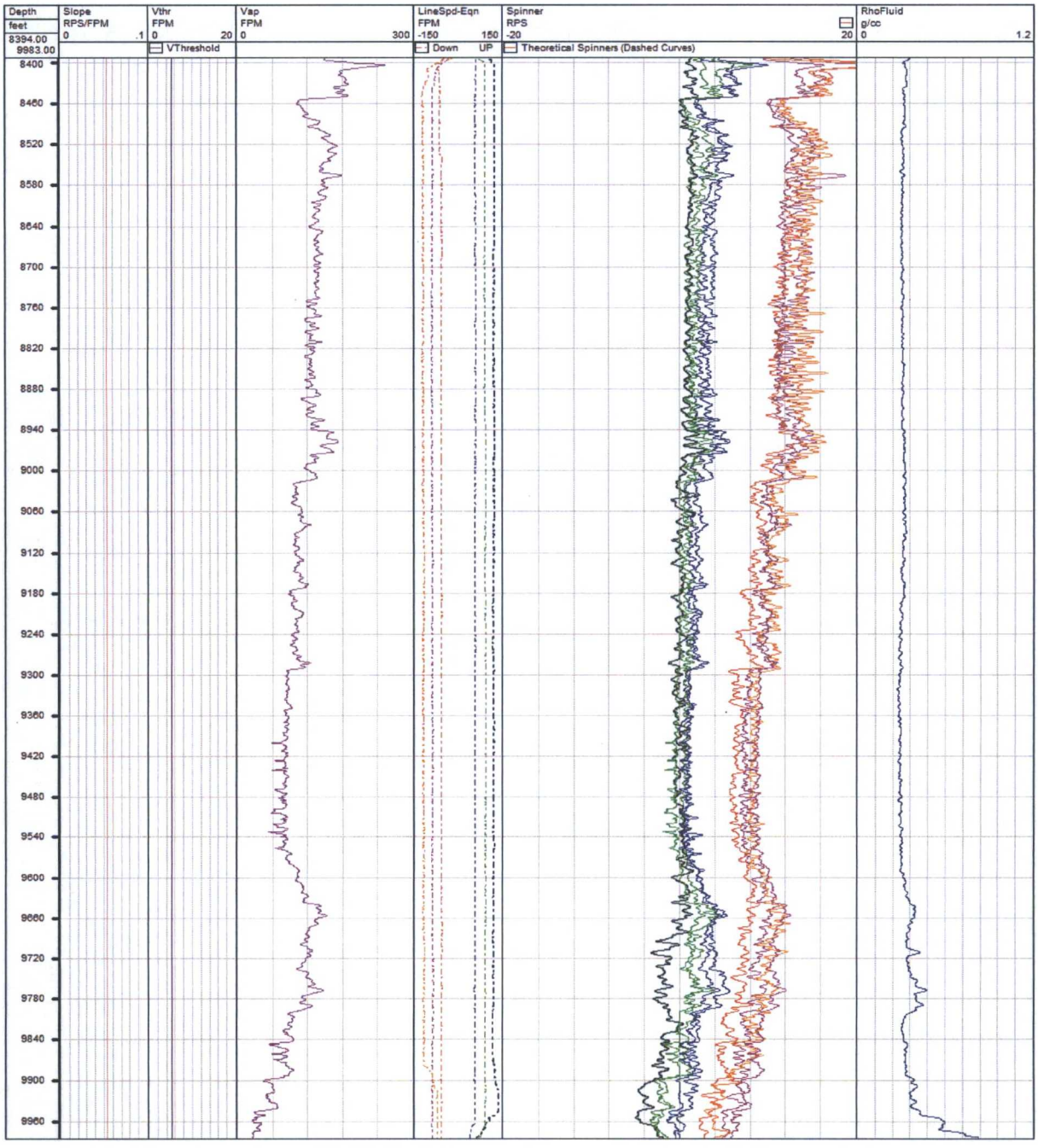


Completion Profile Analysis

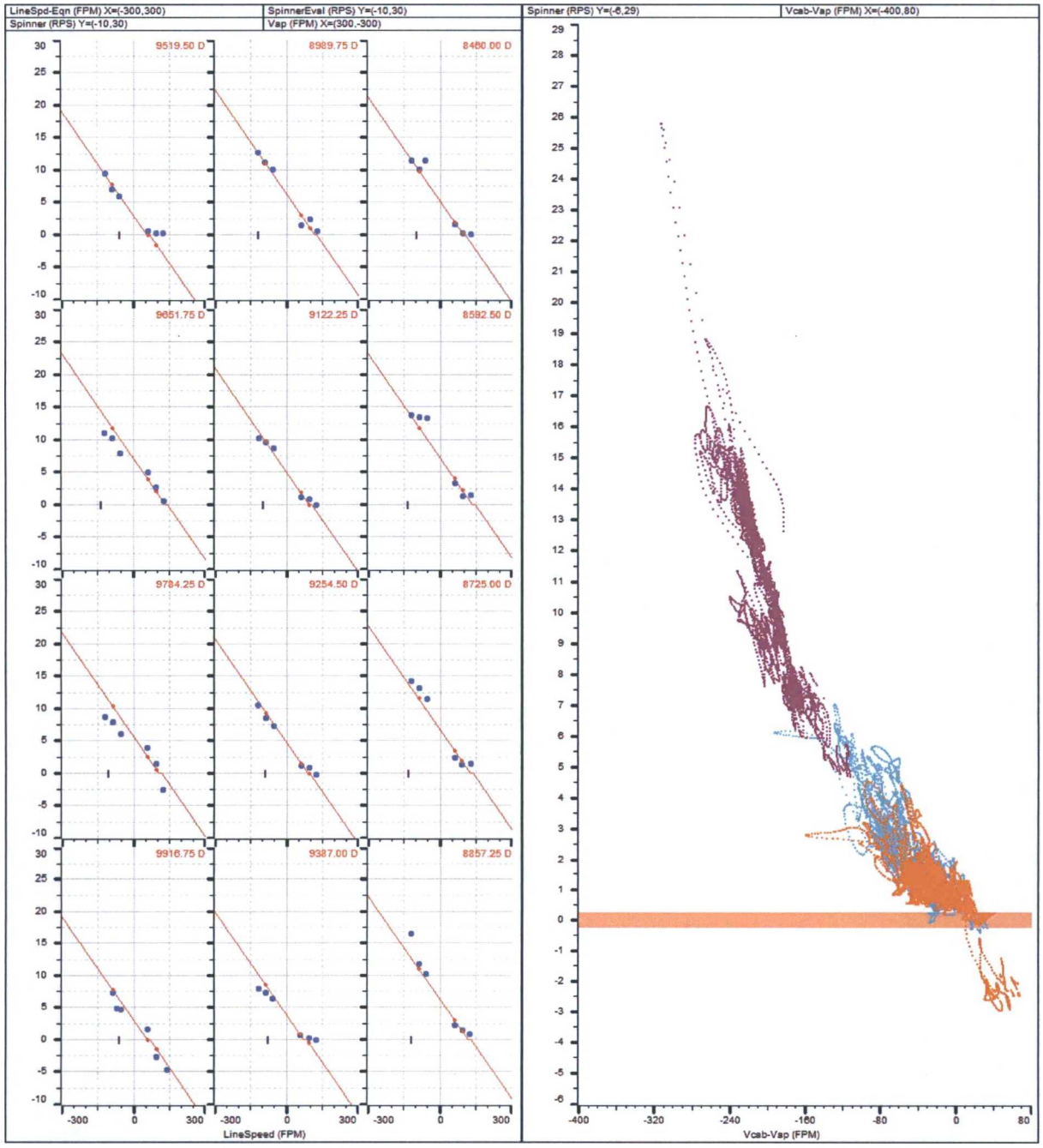
Overlay of all Log Data



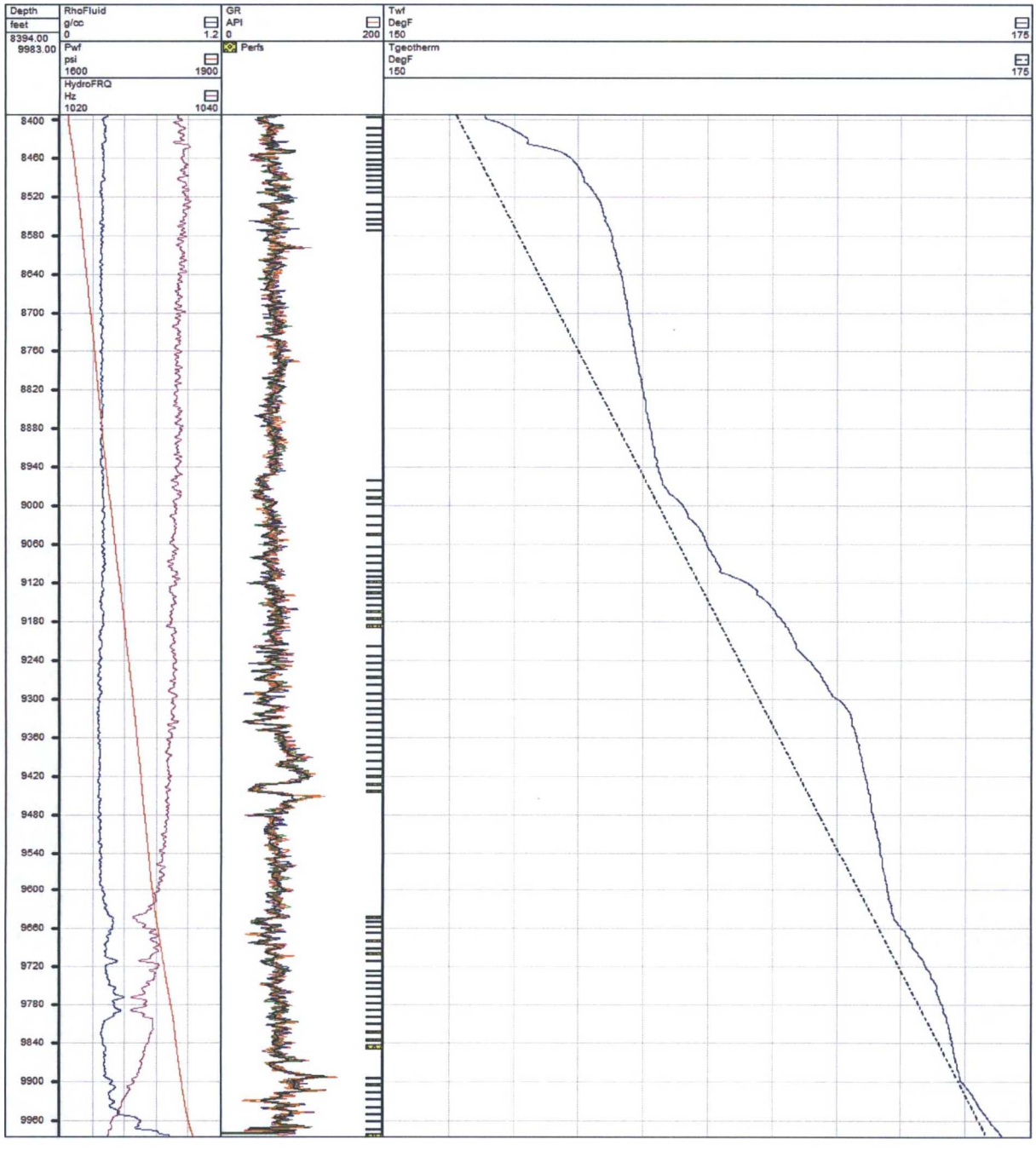
Apparent Fluid Velocity Derived from Spinner



Spinner Calibration Plots
Relationship between R.P.S. and Fluid Velocity (fpm)



Geothermal Gradient



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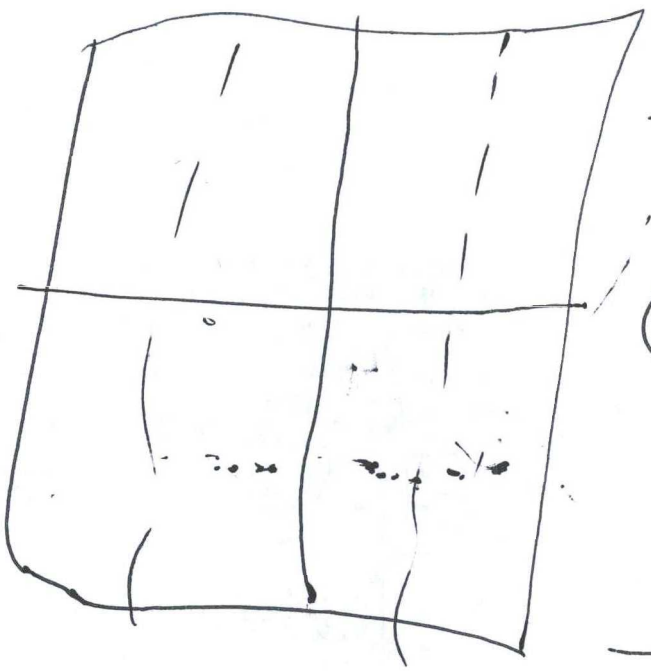

14100
Pool name

14002

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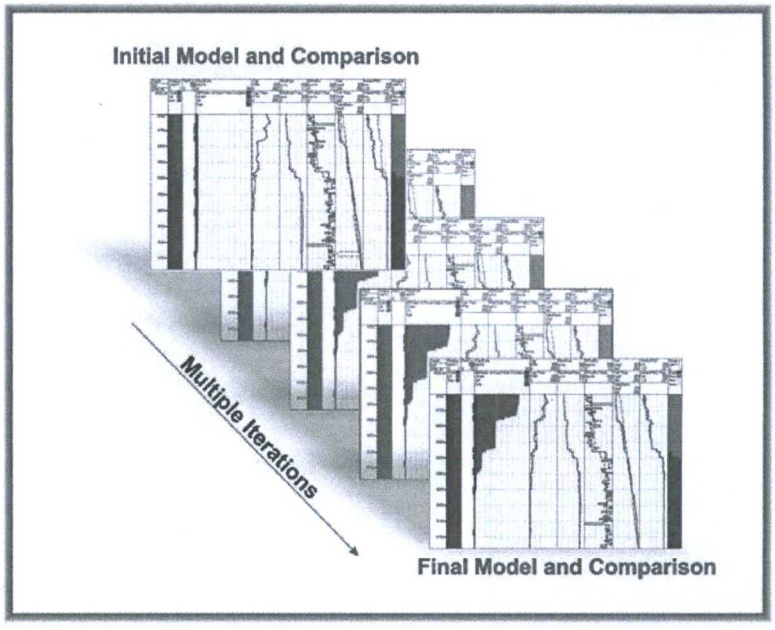
Brief Description of Process

The analysis is performed using a global stochastic optimization technique.
In this technique an initial flow model is estimated. Then from this model the theoretical log responses are derived. The theoretical responses are compared to all available data and the model is adjusted until the best possible match of the theoretical and actual data is obtained.



A comparison between the model responses and the recorded data is shown in this report. Good correlation between the theoretical and log data curves indicates that the flow model is in agreement with the log data and the actual well production profile. Discrepancies between the theoretical and raw data curves can be due to tool deficiencies, conflicts between the parameters or conditions that make the underlying empirical models (such as flow regimes) less applicable.

- The flow regimes were determined, directly from the flow rates and holdups, according to the Taitel-Dukler analytic model.
- The profile factors, to calculate the average effective fluid velocity from the apparent velocity, were based on the Reynolds number, calculated from the phase velocities and phase properties.
- Where gas was present the density, heat capacity and Joule-Thompson coefficients were derived from the Lee Kesler Pitzer equation of states.
- Solution gas in oil was derived from the Vasquez and Beggs or Oistein Glaso correlation.

The analysis was performed in five steps:

- The data preparation to filter the data, compute gradients and error estimates.
- The flow meter analysis to compute the apparent velocity.
- The profile determination to identify the potential producing and/or injecting zones.
- The computation of the flow rates (model) by global optimization.
- The computation of surface production rates and reporting

Well Information

Parameters used for Analysis

SPGG	UNITY	.682
APIOil	UNITY	51.3
Salinity	ppk	35.0
DPipe	in	3.99
PipeAngle	DegAng	0
Geotherm	°F/ft	.0129
TgeoRef	°F	173
DgeoRef	ft	9982

Downhole Measured and Computed Parameters

Depth	Pwf	Twf	ρ_{gas}	ρ_{oil}	ρ_{water}	RhoFluid	B_{gas}	Vap
feet	psi	DegF	g/cc	g/cc	g/cc	g/cc	UNITY	FPM
8394.00	1614	154	.0883	.744	1.01	.356	.00945	150
8507.50	1631	158	.0883	.742	1.01	.311	.00945	157
8621.00	1646	159	.0889	.742	1.01	.296	.00939	135
8734.50	1660	160	.0896	.742	1.01	.302	.00931	134
8848.00	1674	160	.0902	.742	1.01	.315	.00925	125
8961.50	1688	161	.0909	.742	1.01	.316	.00918	148
9075.00	1704	163	.0913	.741	1.01	.330	.00914	111
9188.50	1720	166	.0915	.740	1.01	.312	.00912	96.7
9302.00	1736	168	.0919	.739	1.01	.286	.00908	83.4
9415.50	1750	169	.0925	.739	1.00	.285	.00902	83.5
9529.00	1764	169	.0931	.739	1.00	.308	.00896	82.9
9642.50	1780	170	.0938	.738	1.00	.392	.00889	142
9756.00	1802	171	.0947	.738	1.00	.403	.00881	127
9869.50	1822	172	.0956	.738	1.00	.329	.00873	64.1
9983.00	1849	174	.0966	.737	1.00	.851	.00864	23.9

Definitions

Curve Name	Description
PerfCount	Perforations
Temperature	Temperature (data from individual log passes)
Twf	Average Temperature
Twf-Theo	Theoretical Average Temperature
Tgeotherm	Geothermal Temperature
TgeoRef	Reference Temperature for Geothermal Temperature calculations
DgeoRef	Reference Depth for Geothermal Temperature calculations
Geotherm	Geothermal Gradient across logged interval
DTwfDz	Differential Temperature
DTwfDz-Theo	Theoretical Differential Temperature
Density	Fluid Density (data from individual log passes)
RhoFluid	Average Fluid Density
RhoFluid-Theo	Theoretical Average Fluid Density
Spinner	Spinner (data from individual log passes)
SpinnerFlt	Spinner-Filtered Data
Slope	Spinner Slope
Vthr	Spinner Threshold
Vap	Apparent Velocity
Vap-Theo	Theoretical Apparent Velocity
Pressure	Pressure (data from individual log passes)
Pwf	Average Pressure
DPwfDz	Differential Pressure
DPwfDz-Theo	Theoretical Differential Pressure
HydroFrq	Average Fluid Dielectric
Line Speed	Line Speed (data from individual log passes)
GR	Gamma Ray/SpectraScan
DPipe	Inside diameter of the casing/tubing across logged interval
PipeAngle	Average pipe angle across logged interval (horizontal wellbore, default - 90)
APIOil	Degree API of the oil
SPGG	Specific Gravity of the gas
Flowrate	Total Flowrate at downhole conditions
Holdup	Gas/Oil/Water Holdup Fraction
QGas	Total Gas Production at surface conditions
QpGas	Incremental Gas Production at surface conditions
QOil	Total Oil Production (if present downhole) at surface conditions
QpOil	Incremental Oil Production (if present downhole) at surface conditions
QWater	Total Water Production at surface conditions
QpWater	Incremental Water Production at surface conditions
Regime	Flow Regimes (bubble, plug, mist, annular)

Tool Specifications

O.D.	1-11/16 in. (42.86 mm)
Length	11.9 ft.(3.63 m) in combination 23.28 ft. (7.1 m) stand alone
Pressure Rating	15,000 psi (103421.4 Kpa)
Temperature Rating	350°F (177°C)

Flow Measurement

Measurement of fluid velocity is made using the *Spinner Flowmeter*. This is calibrated by making logging passes at different line speeds to establish the relationship between instrument velocity in feet/minute and the spinner response in revolutions/second (RPS). With this relationship the measured RPS can be converted to fluid velocity in ft/minute. With a known pipe I. D. this can be used to calculate the flow rate in BPD.

$Q_{BPD} = ft/min \times 1.4 \times I.D.^2$

Mass flow rate can be computed using the *Temperature* data. This is based on an enthalpy model, taking into consideration; kinetic energy, frictional and Joule-Thompson heating as well as conduction and convection into the formation.

In gas wells the volumetric fraction of liquids (water) can be very small. Therefore water production may not be quantifiable by velocity measurement alone. Because of water's high mass relative to gas, mass flowrate computed from the *Temperature* data can be better at quantifying the water production.

Holdup Measurement

Holdup (γ) - The fraction of each phase in the wellbore (Water, Oil, Gas fraction) This should not be confused with Cut. i.e. 100% water holdup exists in the static rathole but does not flow.

The *Fluid Density* instrument uses a small gamma ray source and a gamma ray detector to measure the density of the wellbore fluid mixture. The mixture density is used to calculate the holdup fraction.

$\gamma water = (\rho mixture - \rho gas) / (\rho water - \rho gas)$

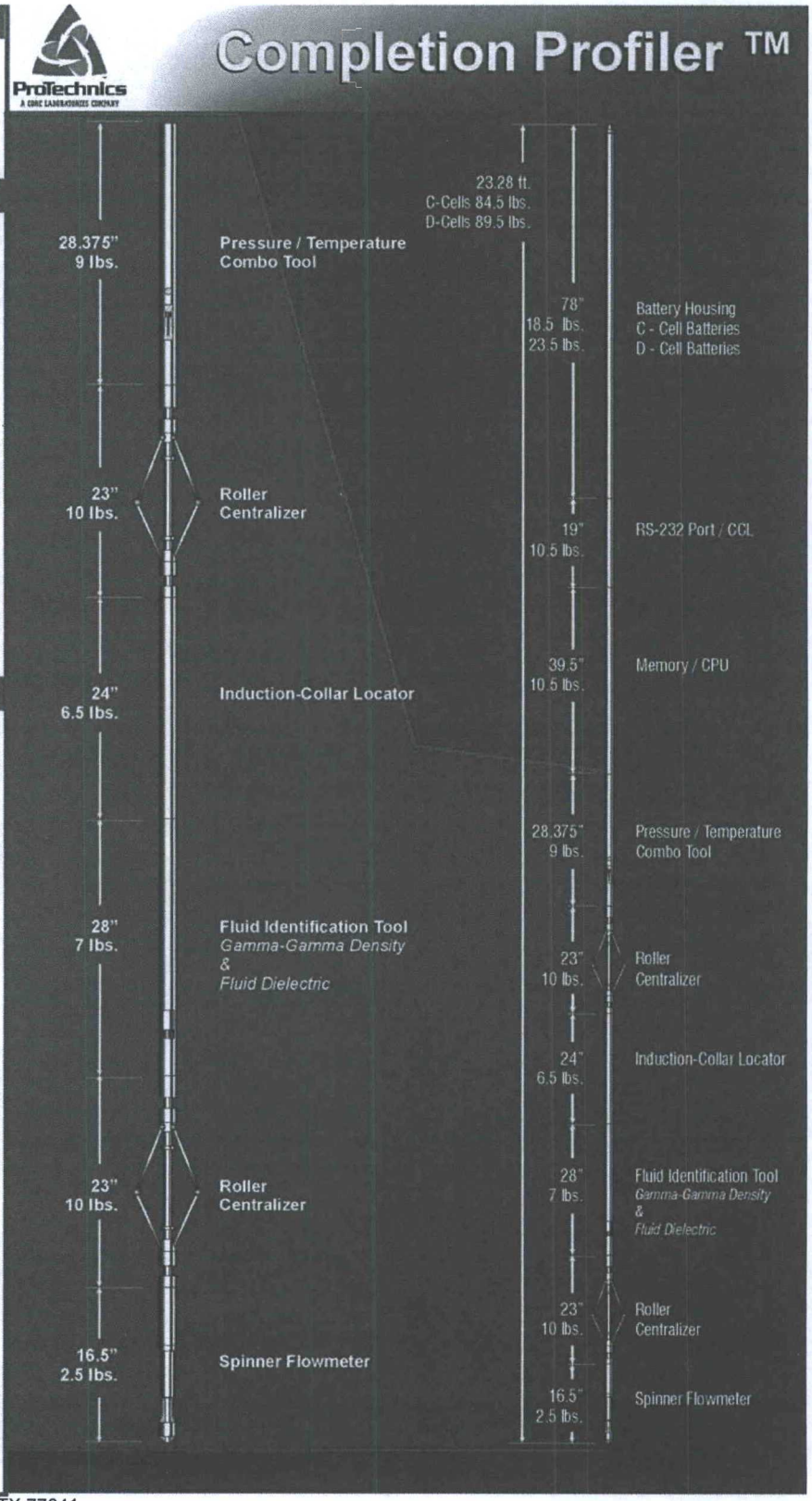
[For two-phase gas-water production]

ρ: density (gm/cc)

The *Fluid Dielectric* instrument works like an electric capacitor. The capacitor plates are exposed to the wellbore fluids and are a fixed size and distance apart. The value of the capacitance will change as the dielectric of the fluids between the plates change. The instrument response is then used to calculate the hydrocarbon and water fractions. This is possible because of the unique dielectric constant of water, oil and gas.
Water = 78, Oil = 4 and Gas = 1

The *Pressure* data can also be used to corroborate the fluid holdup measurements. This is done by measuring the pressure gradient or the derivative of the pressure curve with respect to depth. The resulting curve in psi/ft can be used to determine the water and gas fractions.

Note:
In three phase flow both fluid density and dielectric measurements are necessary. The dielectric is used to determine the water holdup then the density is used to calculate the remaining gas and oil holdups.



Model Results With Recorded Data