

APPENDIX A

Wolfcamp Formation Fluid Analyses and Analyses of Frontier Maljamar Gas Plant TAG

Formation Fluid Analyses, Nearby Wells

Table A-1. Wolfcamp Formation Fluid Analyses

Parameter	Wolfcamp Formation	
	Baish A - 5/1/81 mg/L	Baish B - 5/1/81 mg/L
Ca ²⁺	972	680
Mg ²⁺	2360	2000
Na ⁺ (calc.)	57,298	34,704
CO ₃ ²⁻	0	0
HCO ₃ ²⁻	1220	481
SO ₄ ²⁻	4400	3900
Cl ⁻	50,000	33,000
H ₂ S	strong	strong
Iron (free)	11	14
pH	7.6	7.4
SG		
O ₂ (free)		
CaCO ₃ S.I.	1.4	0.9
CaSO ₄ S.I.	neg	neg

Data from SWD C-108 application for API # 30-025-00751, NMOCD files

LOCATION

FIELD 11/2

LAWRENCE

WATER ANALYSIS

(Ca ⁺⁺)	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
(Mg ⁺⁺)	572		1080		1507	124
(Na ⁺) Calc.	2360		2000		1723	86
(Na ⁺) Calc.	52,298		34,704		20,655	898
(CO ₃ ⁻)	0		0		0	
(HCO ₃ ⁻)	1220		451		915	15
(SO ₄ ⁻)	1400		3900		1050	21.8
(Cl ⁻)	52,298		33,050		38,000	1071
H ₂ S	STRONG		STR		1190	693
IRON (Free)	11		14		3.8	
PH @ 1F	7.6		7.4		6.25	
Sp. Gr. @ 1F					1.04	
O ₂ (Free)	5				9.3	
CaCO ₃ S.I.	1.4		.7		-1.6	
CaSO ₄ S.I.	Neg		neg		-1.2	
BY.... DATED	Champion 5-1-81	Champion 5-1-81	CRD	10-19-81		
	Brisk A	Brisk B	MCA	Brisk 2		

WOLF CAMP WATER
SAMPLE - ZONE
TO BE DISPOSED
INTO

MCA UNIT (G-SA)
WATER TO BE
INJECTED

Formation Fluid Analyses, Maljamar AGI #1



PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

October 22, 2012

RUSSELL BENTLEY

P B ENERGY

16285 PARK TEN PLACE, SUITE 400

HOUSTON, TX 77084

RE: MALJAMAR AGI #1

Enclosed are the results of analyses for samples received by the laboratory on 10/03/12 16:55.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-11-3. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list on accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/ga/lab_accred_certif.html.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Lab Director/Quality Manager



PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

Analytical Results For:

P 8 ENERGY
16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
#1	H202416-01	Water	03-Oct-12 00:00	03-Oct-12 16:55
#2	H202416-02	Water	03-Oct-12 00:00	03-Oct-12 16:55

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

P B ENERGY
16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

#1

H202416-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
---------	--------	-----------------	-------	----------	-------	---------	----------	--------	-------

Cardinal Laboratories
Inorganic Compounds

Alkalinity, Bicarbonate	195	5.00	mg/L	1	2091506	HM	17-Oct-12	310.1	
Calcium	1560	1.60	mg/L	1	2091504	HM	17-Oct-12	SM3500Ca-D	
Alkalinity, Carbonate	ND	0.00	mg/L	1	2091506	HM	17-Oct-12	310.1	
Chloride*	132000	4.00	mg/L	1	2100807	CK	17-Oct-12	4500-Cl-B	
Conductivity*	376000	1.00	uS/cm	1	2101702	HM	16-Oct-12	120.1	
Density	1.145		g/mL	4	2101719	HM	17-Oct-12	SM 2710F	
Magnesium	401	1.00	mg/L	1	2091504	HM	17-Oct-12	SM3500Mg-E	
pH*	7.70	0.100	pH Units	1	2101702	HM	16-Oct-12	150.1	
Potassium	325	1.00	mg/L	1	2091504	HM	17-Oct-12	HACH 8049	
Sodium	84400	1.00	mg/L	1	2091504	HM	17-Oct-12	Calculation	
Sulfate*	3340	10.0	mg/L	1	2101204	AP	12-Oct-12	375.4	
TDS*	225000	5.00	mg/L	1	2101003	HM	10-Oct-12	160.1	
Alkalinity, Total*	160	4.00	mg/L	1	2091506	HM	24-Sep-12	310.1	

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Celey D. Keene, Lab Director/Quality Manager



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Analytical Results For:

P B ENERGY
16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

#2

H202416-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories**Inorganic Compounds**

Alkalinity, Bicarbonate	317	5.00	mg/L	1	2091506	HM	17-Oct-12	310.1	
Calcium	1440	1.60	mg/L	1	2091504	HM	17-Oct-12	SM3500Ca-D	
Alkalinity, Carbonate	ND	0.00	mg/L	1	2091506	HM	17-Oct-12	310.1	
Chloride*	126000	4.00	mg/L	1	2100807	CK	17-Oct-12	4500-Cl-B	
Conductivity*	365000	1.00	uS/cm	1	2101702	HM	16-Oct-12	120.1	
Density	1.135		g/mL	4	2101719	HM	17-Oct-12	SM 2710F	
Magnesium	510	1.00	mg/L	1	2091504	HM	17-Oct-12	SM3500Mg-E	
pH*	7.51	0.100	pH Units	1	2101702	HM	16-Oct-12	150.1	
Potassium	340	1.00	mg/L	1	2091504	HM	17-Oct-12	HACH 8049	
Sodium	80700	1.00	mg/L	1	2091504	HM	17-Oct-12	Calculation	
Sulfate*	3710	10.0	mg/L	1	2101204	AP	12-Oct-12	375.4	
TDS*	213000	5.00	mg/L	1	2101003	HM	10-Oct-12	160.1	
Alkalinity, Total*	260	4.00	mg/L	1	2091506	HM	17-Oct-12	310.1	

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P B ENERGY
16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

Inorganic Compounds - Quality Control**Cardinal Laboratories**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2091504 - * DEFAULT PREP *******Blank (2091504-BLK1)**

Prepared: 13-Sep-12 Analyzed: 15-Sep-12

Calcium	ND	1.60	mg/L
Magnesium	ND	1.00	mg/L
Potassium	ND	1.00	mg/L

LCS (2091504-BS1)

Prepared: 13-Sep-12 Analyzed: 15-Sep-12

Calcium	20.8		mg/L	20.0	104	80-120
Magnesium	53.5		mg/L	50.0	107	80-120
Potassium	3.10		mg/L	3.00	103	80-120

Duplicate (2091504-DUP1)

Source: H202190-01

Prepared: 13-Sep-12 Analyzed: 15-Sep-12

Magnesium	486	1.00	mg/L	583	18.1	20
Potassium	800	1.00	mg/L	825	3.08	20
Calcium	2770	1.60	mg/L	2640	4.81	20

Batch 2091506 - General Prep - Wet Chem**Blank (2091506-BLK1)**

Prepared & Analyzed: 12-Sep-12

Alkalinity, Carbonate	ND	0.00	mg/L
Alkalinity, Bicarbonate	ND	5.00	mg/L
Alkalinity, Total	ND	4.00	mg/L

LCS (2091506-BS1)

Prepared & Analyzed: 12-Sep-12

Alkalinity, Carbonate	ND	0.00	mg/L			80-120
Alkalinity, Bicarbonate	132	5.00	mg/L			80-120
Alkalinity, Total	108	4.00	mg/L	100	108	80-120

LCS Dup (2091506-BS1)

Prepared & Analyzed: 12-Sep-12

Alkalinity, Carbonate	ND	0.00	mg/L			80-120	20
Alkalinity, Bicarbonate	137	5.00	mg/L			80-120	3.72
Alkalinity, Total	112	4.00	mg/L	100	112	80-120	3.64

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Celey D. Keene, Lab Director/Quality Manager



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Analytical Results For:

P B ENERGY
16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

Inorganic Compounds - Quality Control**Cardinal Laboratories**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2100807 - General Prep - Wet Chem										
Blank (2100807-BLK1)				Prepared & Analyzed: 08-Oct-12						
Chloride	ND	4.00	mg/L							
LCS (2100807-BS1)				Prepared & Analyzed: 08-Oct-12						
Chloride	100	4.00	mg/L	100		100	80-120			
LCS Dup (2100807-BSD1)				Prepared & Analyzed: 08-Oct-12						
Chloride	104	4.00	mg/L	100		104	80-120	3.92	20	
Batch 2101003 - Filtration										
Blank (2101003-BLK1)				Prepared & Analyzed: 09-Oct-12						
TDS	ND	5.00	mg/L							
LCS (2101003-BS1)				Prepared & Analyzed: 09-Oct-12						
TDS	251		mg/L	240		105	80-120			
Duplicate (2101003-DUP1)				Source: H202447-01 Prepared & Analyzed: 09-Oct-12						
TDS	5320	5.00	mg/L		5380			1.12	20	
Batch 2101204 - General Prep - Wet Chem										
Blank (2101204-BLK1)				Prepared & Analyzed: 12-Oct-12						
Sulfate	ND	10.0	mg/L							
LCS (2101204-BS1)				Prepared & Analyzed: 12-Oct-12						
Sulfate	16.7	10.0	mg/L	20.0		83.6	80-120			

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16285 PARK TEN PLACE, SUITE 400
HOUSTON TX, 77084

Project: MALJAMAR AGI #1
Project Number: NONE GIVEN
Project Manager: RUSSELL BENTLEY
Fax To: (281) 589-5865

Reported:
22-Oct-12 12:07

Inorganic Compounds - Quality Control**Cardinal Laboratories**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2101204 - General Prep - Wet Chem										
LCS Dup (2101204-BSD1)				Prepared & Analyzed: 12-Oct-12						
Sulfate	19.3	10.0	mg/L	20.0		96.6	80-120	14.4	20	
Batch 2101702 - General Prep - Wet Chem										
LCS (2101702-BS1)				Prepared & Analyzed: 16-Oct-12						
Conductivity	496		uS/cm	500		99.2	80-120			
pH	7.08		pH Units	7.00		101	90-110			
Duplicate (2101702-DUP1)				Source: H202484-01 Prepared & Analyzed: 16-Oct-12						
pH	7.27	0.100	pH Units		7.23			0.552	20	
Conductivity	5460	1.00	uS/cm		5450			0.183	20	

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Celey D. Keene, Lab Director/Quality Manager

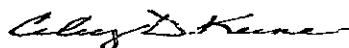
Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500C-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Page 9 of 9

Company Name: PB Energy Project Manager: Russell Bentley Address: City: State: Zip: Phone #: Fax #: Project #: Project Owner: Project Name: Maljamar AGI # 1 Project Location: Maljamar, NM Sampler Name: Russell Bentley		BILL TO		ANALYSIS REQUEST																			
		P.O. #: Company: Attn: Address: City: State: Zip: Phone #: Fax #:																					
FOR LAB USE ONLY		MATRIX		PRESERV		SAMPLING																	
Lab I.D. H202416 2	Sample I.D. #1 #2	(GRAB OR COMPOUND)	# CONTAINERS	GROUNDWATER WASTEWATER SOIL OIL SLUDGE OTHER:	ACID/BASE ICE / COOL OTHER	DATE 10/3/12 1	TIME	Carbon/Ammonia NH4 * Not enough sample NO3 * Not enough sample TDS Density															
PLEASE NOTE: This form is the property of the laboratory and is not to be used for any other purpose. It is to be used only for the analysis of the sample. All claims, including those for negligence and any other cause, shall be waived unless made in writing and received by Cardinal within 30 days after completion of the applicable analysis. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruption, loss of or damage to data, or loss of profits, arising out of or resulting from the use of this form or the analysis of the sample. Cardinal assumes no liability for any damage, loss, or injury, including without limitation, arising out of or resulting from the use of this form or the analysis of the sample.																							
Relinquished By: 		Date: 10/3/12 Time: 4:55		Received By: Jodi Henson				Phone Result: ☐ Yes ☐ No Add'l Phone #: Fax Result: ☐ Yes ☐ No Add'l Fax #: REMARKS: email invoice Bentley RE @ pbworld.cem															
Relinquished By: 		Date: 		Received By: 																			
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool Intact ☐ Yes ☒ No ☐ Yes ☐ No		CHECKED BY: 																			
280c																							

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

5) 393-2326
#26

Gas Analyses, Maljamar Gas Plant TAG

MANLEY GAS TESTING, INC.
P.O. DRAWER 193 ODESSA, TEXAS 79760
OFFICE(432)367-3024 FAX(432)367-1166 E-MAIL: MANLEYGAST@AOL.COM

CHARGE..... 150 - 0 DATE SAMPLED..... 01-24-11
REC. NO. 14 DATE RUN..... 02-02-11
TEST NUMBER.. 9693 EFPEC. DATE..... 02-01-11

STATION NO. ... 06311001

PRODUCER FRONTIER FIELD SERVICES

SAMPLE NAME.... ACID GAS FLARE TYPE: SPOT

RECEIVED FROM.. FRONTIER FIELD SERVICES LLC - MALJAMAR

FLOWING PRESSURE 14.1 PSIA FLOWING TEMPERATURE 87 F

SAMPLED BY: BM CYLINDER NO. ... 037

FRACTIONAL ANALYSIS
CALCULATED @ 14.650 PSIA AND 60F

	MOL%	GPM (REAL)	
HYDROGEN SULFIDE...	11.500		
NITROGEN.....	0.573		
CARBON DIOXIDE....	85.850		
METHANE.....	1.602		
ETHANE.....	0.296	0.079	H2S PPMV = 115000
PROPANE.....	0.105	0.029	
ISO-BUTANE.....	0.007	0.002	
NOR-BUTANE.....	0.026	0.008	
ISO-PENTANE.....	0.005	0.002	'Z' FACTOR (DRY) = 0.9940
NOR-PENTANE.....	0.007	0.003	'Z' FACTOR (WET) = 0.9936
HEXANES +.....	0.029	0.013	
TOTALS	100.000	0.136	CALC. MOL. WT. = 42.30

..CALCULATED SPECIFIC GRAVITIES..

REAL, DRY 1.4690
REAL, WET 1.4549

..CALCULATED GROSS HEATING VALUES..

BTU/CF - REAL, DRY 27
BTU/CF - REAL, WET 27

DISTRIBUTION AND REMARKS:

ENTERED

ANALYZED BY: JT
** R **

APPROVED: 