ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Lab #:	235497	Job #:	17407
Sample Name/Number:	HW01		
Company:	TechLaw, Inc.		
Date Sampled:	1/25/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0747			
Hydrogen	nd			
Argon	0.683			
Oxygen	0.20			
Nitrogen	49.91			
Carbon Dioxide	0.005			
Methane	48.69	-36.80	-202.4	
Ethane	0.432	-31.58	-177	
Ethylene	nd			
Propane	0.0004			
Propylene	0.0001			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-65.1	-9.81

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 501 Specific gravity, calculated: 0.769

Remarks:
** Ethane hydrogen isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

DIM0283035

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ANALYSIS REPORT

Lab #:	235496	Job #:	17407
Sample Name/Number:	HW02		
Company:	TechLaw, Inc.		
Date Sampled:	1/25/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0110			
Hydrogen	nd			
Argon	0.636			
Oxygen	1.12			
Nitrogen	41.09			
Carbon Dioxide	0.10			
Methane	56.36	-29.36	-160.5	
Ethane	0.683	-28.83	-169	
Ethylene	nd			
Propane	nd			
Propylene	0.0001			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-64.5	-9.76

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 583 Specific gravity, calculated: 0.739

Remarks:
** Ethane hydrogen isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235488	Job #:	17407
Sample Name/Number:	HW02z		
Company:	TechLaw, Inc.		
Date Sampled:	1/25/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0112			
Hydrogen	nd			
Argon	0.628			
Oxygen	0.80			
Nitrogen	40.72			
Carbon Dioxide	0.094			
Methane	57.06	-29.30	-160.6	
Ethane	0.687	-28.6	-166	
Ethylene	nd			
Propane	nd			
Propylene	0.0001			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-64.6	-9.66

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 590 Specific gravity, calculated: 0.736

Remarks:
** Ethane isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235489	Job #:	17407
Sample Name/Number:	HW04		
Company:	TechLaw, Inc.		
Date Sampled:	1/24/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.50			
Oxygen	2.28			
Nitrogen	84.37			
Carbon Dioxide	2.01			
Methane	9.76	-24.98	-121.8	
Ethane	0.0796	-31.2	-187	
Ethylene	nd			
Propane	0.0004			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-63.2	-9.48

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 100 Specific gravity, calculated: 0.947

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.74
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Ethane isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235490	Job #:	17407
Sample Name/Number:	HW05		
Company:	TechLaw, Inc.		
Date Sampled:	1/26/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.54			
Oxygen	4.82			
Nitrogen	84.97			
Carbon Dioxide	0.40			
Methane	8.24	-33.0	-162.9	
Ethane	0.0259			
Ethylene	nd			
Propane	nd			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-63.2	-9.36

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 84 Specific gravity, calculated: 0.948

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.68
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Methane carbon isotopes obtained online via GC-C-IRMS

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235491	Job #:	17407
Sample Name/Number:	HW06		
Company:	TechLaw, Inc.		
Date Sampled:	1/26/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0248			
Hydrogen	0.0222			
Argon	0.503			
Oxygen	1.04			
Nitrogen	32.03			
Carbon Dioxide	0.008			
Methane	65.62	-31.07	-169.0	
Ethane	0.746	-34.43	-195.0	
Ethylene	nd			
Propane	0.0068			
Propylene	0.0001			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-65.6	-9.85

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 678 Specific gravity, calculated: 0.700

Remarks:
**Ethane isotope data added on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235492	Job #:	17407
Sample Name/Number:	HW08a		
Company:	TechLaw, Inc.		
Date Sampled:	1/25/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	0.746			
Oxygen	5.31			
Nitrogen	36.31			
Carbon Dioxide	3.22			
Methane	53.64	-36.58	-209.9	
Ethane	0.767	-35.9	-189	
Ethylene	nd			
Propane	0.0030			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-61.0	-9.20

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 557 Specific gravity, calculated: 0.774

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.67
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Ethane isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235493	Job #:	17407
Sample Name/Number:	HW12		
Company:	TechLaw, Inc.		
Date Sampled:	1/26/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0434			
Hydrogen	nd			
Argon	0.115			
Oxygen	0.16			
Nitrogen	4.54			
Carbon Dioxide	0.073			
Methane	94.06	-35.90	-196.7	
Ethane	0.987	-35.33	-204.0	
Ethylene	nd			
Propane	0.0221			
Propylene	0.0002			
Iso-butane	0.0006			
N-butane	0.0012			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-64.6	-9.60

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 972 Specific gravity, calculated: 0.580

Remarks:
**Ethane isotope data added on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235498	Job #:	17407
Sample Name/Number:	HW14		
Company:	TechLaw, Inc.		
Date Sampled:	1/26/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.46			
Oxygen	2.70			
Nitrogen	72.02			
Carbon Dioxide	4.99			
Methane	18.74	-26.58	-140.3	
Ethane	0.0899	-26.6	-157	
Ethylene	nd			
Propane	nd			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-63.2	-9.54

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 191 Specific gravity, calculated: 0.927

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.74
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Ethane isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235494	Job #:	17407
Sample Name/Number:	HW17		
Company:	TechLaw, Inc.		
Date Sampled:	1/27/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.49			
Oxygen	2.06			
Nitrogen	80.93			
Carbon Dioxide	0.43			
Methane	14.97	-31.54	-167.8	
Ethane	0.118	-32.9	-169	
Ethylene	nd			
Propane	0.0011			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-64.9	-9.63

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 154 Specific gravity, calculated: 0.917

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.72
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Ethane isotopes obtained online via GC-C-IRMS. Added to the report on 4/26/2012.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235499	Job #:	17407
Sample Name/Number:	HW19		
Company:	TechLaw, Inc.		
Date Sampled:	1/23/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.63			
Oxygen	7.11			
Nitrogen	86.88			
Carbon Dioxide	4.38			
Methane	0.0011			
Ethane	nd			
Ethylene	nd			
Propane	nd			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-61.1	-9.13

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 0 Specific gravity, calculated: 1.008

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.73
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	235495	Job #:	17407
Sample Name/Number:	HW24		
Company:	TechLaw, Inc.		
Date Sampled:	1/27/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	A3TA		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	2/03/2012	Date Reported:	2/20/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	na			
Hydrogen	nd			
Argon	1.58			
Oxygen	1.29			
Nitrogen	94.00			
Carbon Dioxide	0.017			
Methane	3.11	-53.8	-165	
Ethane	nd			
Ethylene	nd			
Propane	nd			
Propylene	nd			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-64.8	-9.70

Total BTU/cu.ft. dry @ 60deg F & 14.73psia, calculated: 31 Specific gravity, calculated: 0.963

Remarks:
Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.65
*Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.
** Methane isotopes obtained online via the GC-C-IRMS

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.

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ANALYSIS REPORT

Lab #:	239878	Job #:	17692
Sample Name/Number:	HW60		
Company:	TechLaw, Inc.		
Date Sampled:	3/05/2012		
Container:	Dissolved Gas Bottle		
Field/Site Name:	Case# R33917		
Location:			
Formation/Depth:			
Sampling Point:			
Date Received:	3/13/2012	Date Reported:	4/03/2012

Component	Chemical mol. %	$\delta^{13}C$ ‰	δD ‰	$\delta^{18}O$ ‰
Carbon Monoxide	nd			
Hydrogen Sulfide	na			
Helium	0.0233			
Hydrogen	nd			
Argon	0.516			
Oxygen	0.066			
Nitrogen	29.47			
Carbon Dioxide	0.053			
Methane	69.86	-35.20	-193.0	
Ethane	0.0119			
Ethylene	nd			
Propane	nd			
Propylene	0.0001			
Iso-butane	nd			
N-butane	nd			
Iso-pentane	nd			
N-pentane	nd			
Hexanes +	nd			
Water			-66.1	-9.88

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 708 Specific gravity, calculated: 0.681

nd = not detected. na = not analyzed. Isotopic composition of hydrogen is relative to VSMOW. Isotopic composition of carbon is relative to VPDB. Isotopic composition of oxygen is relative to VSMOW, except for carbon dioxide which is relative to VPDB. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100%. Mol. % is approximately equal to vol. %.