Report of Analysis

Client: Plains Marketing, LP
Job Location: Plains Marketing-Manitou Terminal
Our Reference Number: US01155-0000122
Client Reference Number: TBD

Sample ID: 2014-NDMD-000125-001
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Truck Lact 1 Submitted Sample
Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	
	Temperature (T)	50	°C
	VPCRx (T°C)	27.60	psi
	Sample Type	Non-pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	12.31	psi
	VPCR 4 (80°F)	9.92	psi
	VPCR 4 (60°F)	7.90	psi
	VPCR 4 (40°F)	6.59	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	9.86	psi
	Container Size	1-L	
ASTM D86	Distillation		
	Initial Boiling Point	87.6	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	4	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.149	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	C	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.03	Vol %
	Toluene	0.86	Vol %
	Ethylbenzene	0.38	Vol %
	m & p-Xylene	0.36	Vol %
	o-Xylene	0.11	Vol %
	Xylenes	0.47	Vol %

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Report of Analysis

Sample ID: 2014-NDMD-000125-002
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Truck Lact 2 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	
	Temperature (T)	50	°C
	VPCRx (T°C)	27.99	psi
	Sample Type	Non-pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	13.74	psi
	VPCR 4 (80°F)	10.93	psi
	VPCR 4 (60°F)	8.65	psi
	VPCR 4 (40°F)	6.96	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	12 11	psi
	Container Size	1-L	
ASTM D86	Distillation		
	Initial Boiling Point	81.7	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.0250	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	C	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.25	Vol %
	Toluene	0.57	Vol %
	Ethylbenzene	0.17	Vol %
	m & p-Xylene	0.13	Vol %
	o-Xylene	0.34	Vol %
	Xylenes	0.47	Vol %

Sample ID: 2014-NDMD-000125-003
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Truck Lact 3 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14 April 2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		

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Report of Analysis

Sample ID: 2014-NDMD-000125-003
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Truck Lact 3 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	
	Temperature (T)	50	°C
	VPCRx (T°C)	28.90	psi
	Sample Type	Non-pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	14.22	psi
	VPCR 4 (80°F)	11.45	psi
	VPCR 4 (60°F)	9.16	psi
	VPCR 4 (40°F)	7.51	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	12 17	psi
ASTM D86	Distillation		
	Initial Boiling Point	82.5	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.156	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	C	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.05	Vol %
	Toluene	0.18	Vol %
	Ethylbenzene	0.51	Vol %
	m & p-Xylene	0.43	Vol %
	o-Xylene	0.19	Vol %
	Xylenes	0.62	Vol %

Sample ID 2014-NDMD-000125-004
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Truck Lact 4 Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-004
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Truck Lact 4 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	30.26	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	18.50	psi
	VPCR 4 (80°F)	14.30	psi
	VPCR 4 (60°F)	11.06	psi
	VPCR 4 (40°F)	8.55	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	12.36	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	82.2	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.138	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	E	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.05	Vol %
	Toluene	0.17	Vol %
	Ethylbenzene	0.47	Vol %
	m & p-Xylene	0.45	Vol %
	o-Xylene	0.16	Vol %
	Xylenes	0.61	Vol %

Sample ID 2014-NDMD-000125-005
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Truck Lact 5 Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Sample ID: 2014-NDMD-000125-005
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Truck Lact 5 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	26.65	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	12.63	psi
	VPCR 4 (80°F)	9.93	psi
	VPCR 4 (60°F)	7.75	psi
	VPCR 4 (40°F)	6.13	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	10.55	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	86.9	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.0553	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	D	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.26	Vol %
	Toluene	0.44	Vol %
	Ethylbenzene	0.21	Vol %
	m & p-Xylene	0.78	Vol %
	o-Xylene	0.31	Vol %
	Xylenes	1.09	Vol %

Sample ID 2014-NDMD-000125-006
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Truck Lact 6 Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-006
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Truck Lact 6 Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	24.55	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	10.95	psi
	VPCR 4 (80°F)	8.65	psi
	VPCR 4 (60°F)	6.80	psi
	VPCR 4 (40°F)	5.49	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	9.44	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	89.6	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.154	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	E	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.05	Vol %
	Toluene	0.15	Vol %
	Ethylbenzene	0.51	Vol %
	m & p-Xylene	0.43	Vol %
	o-Xylene	0.15	Vol %
	Xylenes	0.58	Vol %

Sample ID 2014-NDMD-000125-007
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Highland North Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-007
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Highland North Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	27.48	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	13.85	psi
	VPCR 4 (80°F)	11.00	psi
	VPCR 4 (60°F)	8.76	psi
	VPCR 4 (40°F)	7.09	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	11.44	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	82.9	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.144	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	C	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.15	Vol %
	Toluene	0.40	Vol %
	Ethylbenzene	0.50	Vol %
	m & p-Xylene	0.64	Vol %
	o-Xylene	0.27	Vol %
	Xylenes	0.91	Vol %

Sample ID 2014-NDMD-000125-008
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Highland South Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-008
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Highland South Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	26.75	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	12.60	psi
	VPCR 4 (80°F)	10.02	psi
	VPCR 4 (60°F)	7.99	psi
	VPCR 4 (40°F)	6.49	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	11.02	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	84.4	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.145	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	D	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.16	Vol %
	Toluene	0.42	Vol %
	Ethylbenzene	0.36	Vol %
	m & p-Xylene	0.66	Vol %
	o-Xylene	0.25	Vol %
	Xylenes	0.90	Vol %

Sample ID 2014-NDMD-000125-009
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Receipt Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-009
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Receipt Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	31.03	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	15.66	psi
	VPCR 4 (80°F)	12.41	psi
	VPCR 4 (60°F)	9.79	psi
	VPCR 4 (40°F)	7.86	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	11.14	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	79.4	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.136	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	D	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.11	Vol %
	Toluene	0.31	Vol %
	Ethylbenzene	0.48	Vol %
	m & p-Xylene	0.57	Vol %
	o-Xylene	0.25	Vol %
	Xylenes	0.82	Vol %

Sample ID 2014-NDMD-000125-010
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Tank 1000 Manitou Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-010
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Tank 1000 Manitou Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	28.90	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	13.73	psi
	VPCR 4 (80°F)	10.80	psi
	VPCR 4 (60°F)	8.47	psi
	VPCR 4 (40°F)	6.78	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	11.52	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	81.8	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.117	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	C	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.14	Vol %
	Toluene	0.36	Vol %
	Ethylbenzene	0.31	Vol %
	m & p-Xylene	0.67	Vol %
	o-Xylene	0.23	Vol %
	Xylenes	0.90	Vol %

Sample ID 2014-NDMD-000125-011
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Tank 2000 Manitou Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Tel.: +1 [redacted] Email: [redacted]

Report of Analysis

Sample ID: 2014-NDMD-000125-011
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Tank 2000 Manitou Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	29.28	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	16.31	psi
	VPCR 4 (80°F)	12.73	psi
	VPCR 4 (60°F)	9.86	psi
	VPCR 4 (40°F)	7.62	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	13.50	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	80.0	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.132	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	E	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.11	Vol %
	Toluene	0.31	Vol %
	Ethylbenzene	0.48	Vol %
	m & p-Xylene	0.59	Vol %
	o-Xylene	0.25	Vol %
	Xylenes	0.85	Vol %

Sample ID 2014-NDMD-000125-012
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Tank 103 Van Hook Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID: 2014-NDMD-000125-012
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Tank 103 Van Hook Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	31.90	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	15.38	psi
	VPCR 4 (80°F)	12.22	psi
	VPCR 4 (60°F)	9.65	psi
	VPCR 4 (40°F)	7.77	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	12.69	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	81.2	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.137	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	E	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.07	Vol %
	Toluene	0.20	Vol %
	Ethylbenzene	0.49	Vol %
	m & p-Xylene	0.48	Vol %
	o-Xylene	0.17	Vol %
	Xylenes	0.65	Vol %

Sample ID 2014-NDMD-000125-013
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Robinson Lake Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Sample ID: 2014-NDMD-000125-013
Sample Designated As: Bakken Crude Oil
Ve el/Location Plains
Representing: Robinson Lake Submitted Sample

Date Taken: 14-April-2014
Date Submitted: 14-April-2014
Date Te ted 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	29.89	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	14.75	psi
	VPCR 4 (80°F)	11.64	psi
	VPCR 4 (60°F)	9.18	psi
	VPCR 4 (40°F)	7.29	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	12.33	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	79.4	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	7	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.140	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	B+	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.01	Vol %
	Toluene	0.03	Vol %
	Ethylbenzene	0.05	Vol %
	m & p-Xylene	0.05	Vol %
	o-Xylene	0.02	Vol %
	Xylenes	0.08	Vol %

Sample ID 2014-NDMD-000125-014
Sample Designated As: Bakken Crude Oil
Vessel/Location: Plains
Representing: Stat Oil Connection Submitted Sample

Date Taken 14-April-2014
Date Submitted: 14-April-2014
Date Tested: 21-April-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Vapor-Liquid Ratio (x)	0.02	

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Report of Analysis

Sample ID:	2014-NDMD-000125-014	**Date Taken:**	14-April-2014
Sample Designated As:	Bakken Crude Oil	**Date Submitted:**	14-April-2014
Ve el/Location	Plains	**Date Te ted**	21-April-2014
Representing:	Stat Oil Connection Submitted Sample	**Drawn By:**	Intertek

Method	Test	Result	Units
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	Temperature (T)	50	°C
	VPCRx (T°C)	30.70	psi
	Sample Type	Non pressurized Container	
ASTM D6377	Determination of Vapor Pressure of Crude Oil: VPCRx (Expansion Method)		
	VPCR 4 (100°F)	15.43	psi
	VPCR 4 (80°F)	12.28	psi
	VPCR 4 (60°F)	9.64	psi
	VPCR 4 (40°F)	7.70	psi
ASTM D5191	Vapor Pressure of Petroleum Products (Mini-Method)		
	Dry Vapor Pressure Equivalent, ASTM	13.04	psi
	Container Size	1 L	
ASTM D86	Distillation		
	Initial Boiling Point	82.5	°F
ASTM D56	Flash Point by Tag Closed Cup Tester		
	Observed Flash Point	<50	°F
ITM 3468	Determination of Hydrogen Sulfide in Vapor Phase of Volatile Samples		
	Test temperature	77	F
	Hydrogen Sulfide in vapor phase	< 1	ppm v/v
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	0.139	Wt %
ISM TM0172	NACE Corrosion		
	NACE Corrosion Rating	B	
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	Benzene	0.18	Vol %
	Toluene	0.52	Vol %
	Ethylbenzene	0.54	Vol %
	m & p-Xylene	0.98	Vol %
	o-Xylene	0.36	Vol %
	Xylenes	1.33	Vol %

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Report of Analysis

This final report has been reviewed for accuracy, completeness, and comparison against specifications when available. The reported results are only representative of the samples submitted for testing. This report shall not be reproduced except in full without written approval of the laboratory.

Signed: _____ Date: _____

Intertek
Jordan Reinbold, Laboratory Technician

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