



Task Order#: 4502583269
 Site#: 70475535
 Site Location: NORMAN WELLS
 Project #: Surface Water Runoff
 Your C.O.C. #: 584720-01-01

Attention: CHRISTINE WICKENS

Imperial Oil Resources Ltd.
 Bag Service 5000
 Norman Wells, NT
 CANADA XOE OVO

Report Date: 2019/08/26
 Report #: R2772221
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B969704

Received: 2019/08/22, 09:43

Sample Matrix: Water
 # Samples Received: 5

Analyses	Quantity	Laboratory Method	Primary Reference
Chloride/Sulphate by Auto Colourimetry	5	AB SOP-00020 / AB SOP-00018	SM23-4500-Cl/SO4-E m
Conductivity @25C	5	AB SOP-00005	SM 23 2510 B m
pH @25°C (2)	5	AB SOP-00005	SM 23 4500 H+ B m
Phenols (4-AAP)	5	EENVSOP-00061	MMCW 154 1996 m
Total Dissolved Solids (Filt. Residue)	5	AB SOP-00065	SM 23 2540 C m
Hydrocarbon by IR (Mineral oil & grease) (1)	5	CAL SOP-00096	SM 23 5520C,F m
Total Suspended Solids (NFR)	5	AB SOP-00061	SM 23 2540 D m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard. All samples were analyzed within hold time unless otherwise flagged.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by BV Labs Calgary Environmental

(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.



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Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Rhecie Phayouphone, Key Account Specialist
Email: Rhecie.Phayouphone@bvlabs.com
Phone# (403)735-2283

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RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID				WI5467	WI5468	WI5469		
Sampling Date				2019/08/20 08:45	2019/08/20 09:00	2019/08/20 09:10		
COC Number				584720-01-01	584720-01-01	584720-01-01		
	UNITS	AO	OG	CPF IMPOUND BASIN START	LT11 MID 17	REFIMERY IMPOUND BASIN MID 17	RDL	QC Batch
Misc. Inorganics								
Conductivity	uS/cm	-	-	1500	750	930	2.0	9560260
pH	pH	-	7.0:10.5	7.38	7.51	8.19	N/A	9560247
Total Suspended Solids	mg/L	-	-	2.0	13	3.3	1.0	9559881
Total Dissolved Solids	mg/L	-	-	1300	500	610	10	9559997
Anions								
Dissolved Chloride (Cl)	mg/L	250	-	7.3	5.6	30	1.0	9560413
Misc. Organics								
Phenols	mg/L	-	-	0.0027	0.0054	0.0053	0.0015	9560779
Total Petroleum Hydrocarbon	mg/L	-	-	<2.0	<2.0	<2.0	2.0	9560320
No Fill	No Exceedance							
Grey	Exceeds 1 criteria policy/level							
Black	Exceeds both criteria/levels							
RDL = Reportable Detection Limit								
N/A = Not Applicable								



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RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID				WI5469				WI5470		
Sampling Date				2019/08/20 09:10				2019/08/20 09:20		
COC Number				584720-01-01				584720-01-01		
	UNITS	AO	OG	REFIMERY IMPOUND BASIN MID 17 Lab-Dup	RDL	QC Batch	REFINERY WATERFLOOD MID13	RDL	QC Batch	
Misc. Inorganics										
Conductivity	uS/cm	-	-	930	2.0	9560260	1000	2.0	9560260	
pH	pH	-	7.0:10.5	8.20	N/A	9560247	8.39	N/A	9560247	
Total Suspended Solids	mg/L	-	-				1.3	1.0	9559881	
Total Dissolved Solids	mg/L	-	-				570	10	9559997	
Anions										
Dissolved Chloride (Cl)	mg/L	250	-				35	1.0	9560413	
Misc. Organics										
Phenols	mg/L	-	-				0.0049	0.0015	9560779	
Total Petroleum Hydrocarbon	mg/L	-	-				<2.0	2.0	9560320	
No Fill	No Exceedance									
Grey	Exceeds 1 criteria policy/level									
Black	Exceeds both criteria/levels									
RDL = Reportable Detection Limit										
Lab-Dup = Laboratory Initiated Duplicate										
N/A = Not Applicable										



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RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID				WI5471		
Sampling Date				2019/08/20 09:30		
COC Number				584720-01-01		
	UNITS	AO	OG	RTK 105-112 MID 3	RDL	QC Batch
Misc. Inorganics						
Conductivity	uS/cm	-	-	660	2.0	9560260
pH	pH	-	7.0:10.5	7.80	N/A	9560247
Total Suspended Solids	mg/L	-	-	7.3	1.0	9559881
Total Dissolved Solids	mg/L	-	-	390	10	9559997
Anions						
Dissolved Chloride (Cl)	mg/L	250	-	15	1.0	9560413
Misc. Organics						
Phenols	mg/L	-	-	0.0034	0.0015	9560779
Total Petroleum Hydrocarbon	mg/L	-	-	<2.0	2.0	9560320
No Fill	No Exceedance					
Grey	Exceeds 1 criteria policy/level					
Black	Exceeds both criteria/levels					
RDL = Reportable Detection Limit						
N/A = Not Applicable						



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TEST SUMMARY

BV Labs ID: WI5467
Sample ID: CPF IMPOUND BASIN START
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride/Sulphate by Auto Colourimetry	KONE	9560413	N/A	2019/08/23	Marissa Richard
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar
Phenols (4-AAP)	TECH/4AAP	9560779	N/A	2019/08/23	Fengling Feng
Total Dissolved Solids (Filt. Residue)	BAL	9559997	2019/08/23	2019/08/25	Luminita Chiosa
Hydrocarbon by IR (Mineral oil & grease)	IR	9560320	2019/08/23	2019/08/23	Shu Yi (Linda) Lee
Total Suspended Solids (NFR)	BAL	9559881	2019/08/23	2019/08/23	May Al-Jarah

BV Labs ID: WI5468
Sample ID: LT11 MID 17
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride/Sulphate by Auto Colourimetry	KONE	9560413	N/A	2019/08/23	Marissa Richard
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar
Phenols (4-AAP)	TECH/4AAP	9560779	N/A	2019/08/23	Fengling Feng
Total Dissolved Solids (Filt. Residue)	BAL	9559997	2019/08/23	2019/08/25	Luminita Chiosa
Hydrocarbon by IR (Mineral oil & grease)	IR	9560320	2019/08/23	2019/08/23	Shu Yi (Linda) Lee
Total Suspended Solids (NFR)	BAL	9559881	2019/08/23	2019/08/23	May Al-Jarah

BV Labs ID: WI5469
Sample ID: REFIMERY IMPOUND BASIN MID 17
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride/Sulphate by Auto Colourimetry	KONE	9560413	N/A	2019/08/23	Marissa Richard
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar
Phenols (4-AAP)	TECH/4AAP	9560779	N/A	2019/08/23	Fengling Feng
Total Dissolved Solids (Filt. Residue)	BAL	9559997	2019/08/23	2019/08/25	Luminita Chiosa
Hydrocarbon by IR (Mineral oil & grease)	IR	9560320	2019/08/23	2019/08/23	Shu Yi (Linda) Lee
Total Suspended Solids (NFR)	BAL	9559881	2019/08/23	2019/08/23	May Al-Jarah

BV Labs ID: WI5469 Dup
Sample ID: REFIMERY IMPOUND BASIN MID 17
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar



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TEST SUMMARY

BV Labs ID: WI5470
Sample ID: REFINERY WATERFLOOD MID13
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride/Sulphate by Auto Colourimetry	KONE	9560413	N/A	2019/08/23	Marissa Richard
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar
Phenols (4-AAP)	TECH/4AAP	9560779	N/A	2019/08/23	Fengling Feng
Total Dissolved Solids (Filt. Residue)	BAL	9559997	2019/08/23	2019/08/25	Luminita Chiosa
Hydrocarbon by IR (Mineral oil & grease)	IR	9560320	2019/08/23	2019/08/23	Shu Yi (Linda) Lee
Total Suspended Solids (NFR)	BAL	9559881	2019/08/23	2019/08/23	May Al-Jarah

BV Labs ID: WI5471
Sample ID: RTK 105-112 MID 3
Matrix: Water

Collected: 2019/08/20
Relinquished: 2019/08/20
Received: 2019/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride/Sulphate by Auto Colourimetry	KONE	9560413	N/A	2019/08/23	Marissa Richard
Conductivity @25C	COND	9560260	N/A	2019/08/23	Malina Alamyar
pH @25°C	AT/ALK	9560247	N/A	2019/08/23	Malina Alamyar
Phenols (4-AAP)	TECH/4AAP	9560779	N/A	2019/08/23	Fengling Feng
Total Dissolved Solids (Filt. Residue)	BAL	9559997	2019/08/23	2019/08/25	Luminita Chiosa
Hydrocarbon by IR (Mineral oil & grease)	IR	9560320	2019/08/23	2019/08/23	Shu Yi (Linda) Lee
Total Suspended Solids (NFR)	BAL	9559881	2019/08/23	2019/08/23	May Al-Jarah



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C
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AO,OG: The guidelines that have been included in this report have been taken from the Canadian Drinking Water Quality Summary Table, February 2017 and the Guideline Technical Document – Lead, March 2019.

Criteria A = Maximum Acceptable Concentration (MAC) / Criteria B = Aesthetic Objectives (AO) / Criteria C = Operational Guidance Values (OG)
It is recommended to consult these guidelines when interpreting your data since there are non-numerical guidelines that are not included on this report.

Turbidity Guidelines:

1. Chemically assisted filtration: less than or equal to 0.3 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 1.0 NTU at any time.
2. Slow sand / diatomaceous earth filtration: less than or equal to 1.0 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 3.0 NTU at any time.
3. Membrane filtration: less than or equal to 0.1 NTU in 99% of the measurements made or at least 99% of the time each calendar month. Shall not exceed 0.3 NTU at any time.
4. To ensure effectiveness of disinfection and for good operation of the distribution system, it is recommended that water entering the distribution system have turbidity levels of 1.0 NTU or less.

Measurement of Uncertainty has not been accounted for when stating conformity to the selected criteria, where applicable.

Results relate only to the items tested.



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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9559881	MJA	Method Blank	Total Suspended Solids	2019/08/23	<1.0		mg/L	
9559997	LCA	Method Blank	Total Dissolved Solids	2019/08/25	<10		mg/L	
9560260	MA4	Method Blank	Conductivity	2019/08/23	<2.0		uS/cm	
9560320	LL0	Method Blank	Total Petroleum Hydrocarbon	2019/08/23	<2.0		mg/L	
9560413	MRD	Method Blank	Dissolved Chloride (Cl)	2019/08/23	<1.0		mg/L	
9560779	FFE	Method Blank	Phenols	2019/08/23	<0.0015		mg/L	
9560247	MA4	RPD [WI5469-01]	pH	2019/08/23	0.15		%	N/A
9560260	MA4	RPD [WI5469-01]	Conductivity	2019/08/23	0		%	10
9559881	MJA	LCS	Total Suspended Solids	2019/08/23		93	%	80 - 120
9559997	LCA	LCS	Total Dissolved Solids	2019/08/25		101	%	80 - 120
9560247	MA4	LCS	pH	2019/08/23		100	%	97 - 103
9560260	MA4	LCS	Conductivity	2019/08/23		101	%	90 - 110
9560320	LL0	LCS	Total Petroleum Hydrocarbon	2019/08/23		98	%	70 - 130
9560413	MRD	LCS	Dissolved Chloride (Cl)	2019/08/23		107	%	80 - 120
9560779	FFE	LCS	Phenols	2019/08/23		96	%	80 - 120

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

LCS: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

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