



**Imperial Oil**

**Renewal Application for Water Licence S03L1-001  
Surveillance Network Program  
Surface Water Management Summary  
(Section 14 of 20)**

Submitted to the Sahtu Land and Water Board by Imperial Oil Resources N.W.T Limited

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## 14.0 Surface Water Management Summary

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### 14.1 Introduction

Imperial Oil Resources N.W.T. Limited (IOR) maintains a Surveillance Network Program (SNP) as part of its Norman Wells Operations (NWO). The SNP is operated under the terms and conditions of the Water Licence (S03L1-001 as amended). As part of the SNP, IOR undertakes surface water management activities. The major elements of this program include:

- collecting representative samples for field testing and/or laboratory analysis; and
- performing controlled releases of surface water that meets the guidelines in the Water Licence.

### 14.2 Surface Water Facilities

Surface Water Run-Off Facilities (SWROF) defined under Part A of the Water Licence include:

- Refinery Impound Basin;
- LT11 Impound Basin (also referenced as historic Battery 3);
- Refinery Water Flood Basin;
- CPF Impound Area (also referenced as LT2 Retention Area);
- miscellaneous Mainland Impound Areas;
- miscellaneous Bear Island Impound Areas;
- miscellaneous Goose Island Impound Areas; and
- associated ditches provided for the collection, storage, and discharge of surface run-off waters.

### 14.3 Regulatory Requirements

Conditions regulating the controlled release of water from a SWROF to adjacent lands are covered in following items of the Water Licence:

- Part A: Scope and Definitions Item 2 Definitions;
  - set out the definition of the SWROF.
- Part B: General Conditions Item 3.Items b, e, g, v;
  - sets out data capture and reporting requirements for SWROF.
- Part B: General Conditions Item 4;
  - references the SNP Annex to the licence.

- Part B: General Conditions Item 5;
  - sets out the powers of the SLWB to modify the SNP compliance dates.
- Part B: General Conditions Item 6;
  - sets out measurement requirements for volume of water used.
- Part D: Conditions Applying to Waste Disposal Item 4;
  - requires water to be released in a controlled manner.
- Part D Conditions Applying to Waste Disposal Item 5;
  - sets out water discharge quality requirements.
- Portions of the SNP Annex attached to the Licence provide additional details of sampling and analytical requirements for SWROF and the QA/QC Manual.

As required, IOR has developed and maintains a Quality Assurance/Quality Control (QA/QC) Manual that details on-site sample collection and testing requirements. This has been provided to the SLWB and Analyst (as designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*).

#### **14.4 Laboratory Analysis & Field Testing**

Surface water run-off and collection occurs annually at NWO. Higher flows of surface water run-off are seen during the spring as the snow is melting. Surface water run-off facilities, such as impound basins, ditches, bermed areas, excavations, and bunkers must be monitored and sampled prior to water being released off of the site. Releases from these locations typically occur from May to October each year.

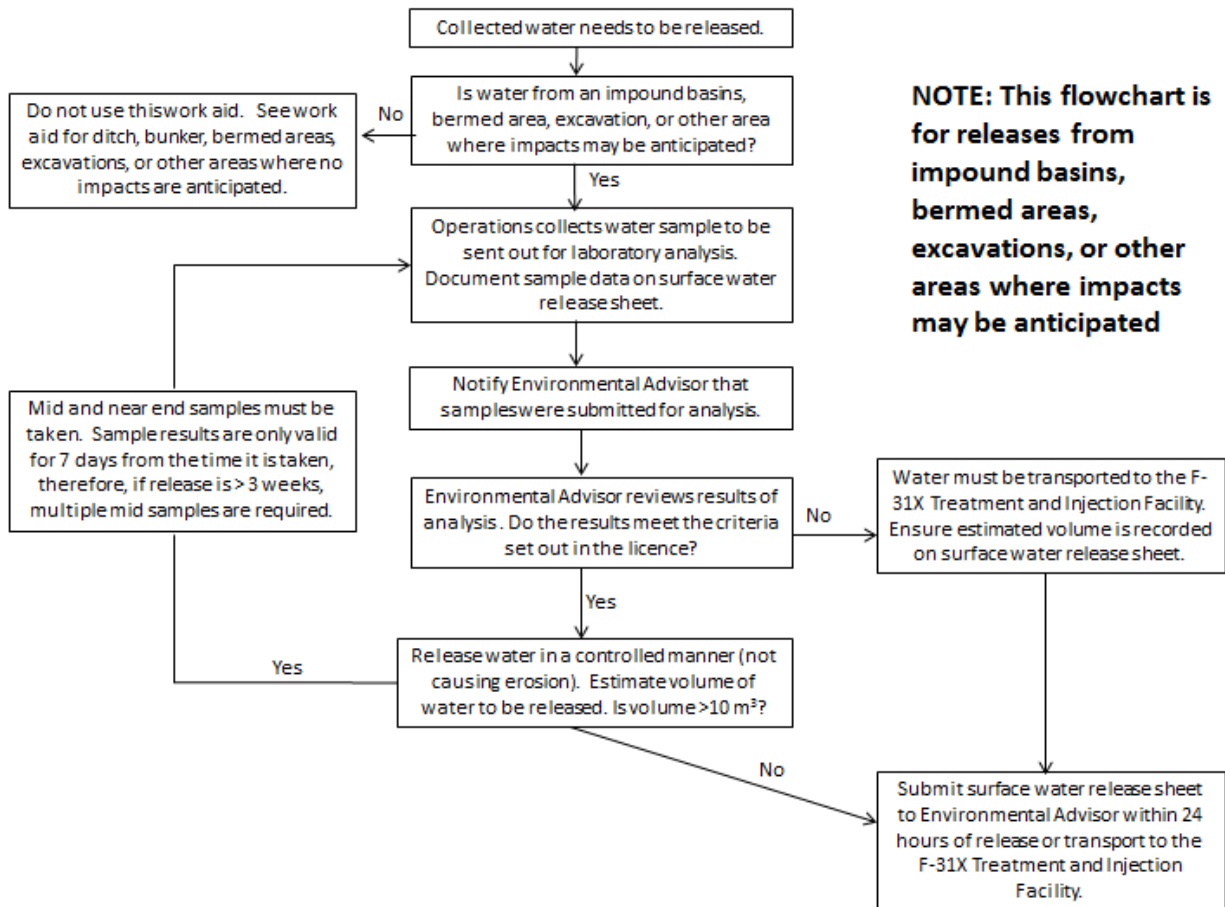
There are two separate requirements for surface water releases:

- for impound basins, bermed areas, excavations, and other areas where impacts are anticipated (based on historical activities), samples of the surface water must have laboratory analysis completed prior to being released; and
- for release from ditches, bunkers, bermed areas, excavations, and other areas where no impacts are anticipated (based on historical activities), the surface water can be tested using field methods prior to the water being released.

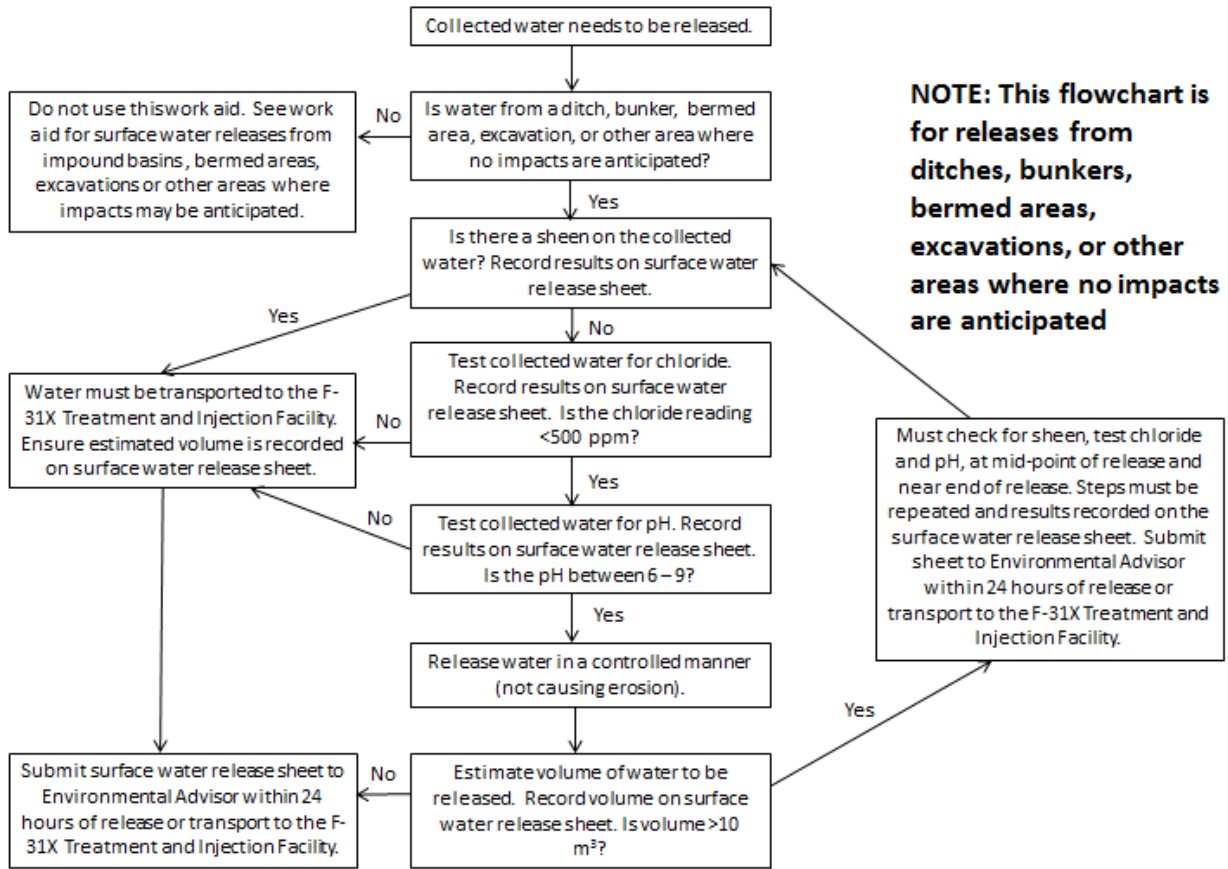
IOR has developed internal training aids and presentations based on the requirements in the current Water Licence to ensure releases and samples collected are managed, controlled, and documented appropriately. The surface water release process followed in these training aids is

presented in Figures A and B . Each spring, the Environmental Advisor reviews the requirements for surface water releases with all employees and contractors who will be involved with this work.

**Figure A: Surface Water Release Work Aid for Releases from Impound Basins, Bermed Areas, Excavations, or Other Areas Where Impacts are Anticipated**



**Figure B: Surface Water Release Work Aid for Releases from Ditches, Bunkers, Bermed Areas, Excavations, or Other Areas Where No Impacts are Anticipated**



Field testing includes:

- visual inspection for any oily sheen on the water;
- chlorides (using field test method); and
- pH (using field test method).

Surface water field test results are compared to the guidelines set out in the Water Licence. A summary of these guidelines is presented in Table A:

**Table A: Guidelines for Field Test Parameters**

Field Test Parameter	Guideline
Visual inspection for an oily sheen	No visible sheen
Chlorides	Less than 500 mg/L
pH	Between 6.0 and 9.0

Where surface water impacts may exist, a representative grab sample is collected for laboratory analysis. Analytical testing includes the following parameters:

- oil and grease;
- phenols;
- total suspended solids;
- pH;
- specific conductivity; and
- total dissolved solids.

Surface water analytical results are compared to the guidelines set out in the Water Licence. A summary of these guidelines is presented in Table B.

**Table B: Guidelines for Analytical Parameters**

Analytical Parameter	Max Grab Concentration
Oil & Grease	10.00 mg/L
Phenols	0.14 mg/L
Total Suspended Solids	N/A
pH	Between 6.0 and 9.0
Specific Conductivity	N/A
Total Dissolved Solids	N/A

## 14.5 Summary of Existing Performance

A summary of surface water management activities is reported to the SLWB as part of IOR's Annual Water Use Report. This includes details on the SWROF, volume of water released at each location, field and laboratory results. Copies of these reports are posted to the SLWB registry and are available online at: [www.slwb.com](http://www.slwb.com). Monthly results are also summarized and reported in the Monthly Water Use Report.

A summary of surface water run off results compared to the guideline limits in the Water Licence is presented in Section 14.6. A summary of surface water release volumes is presented in Section 14.7.



## **14.6 Surface Water Quality Results**

### **14.6.1 Field Testing Results**

A review of field test results from all surface water releases at NWO indicates no recorded values above the guideline limits set out in the Water Licence.

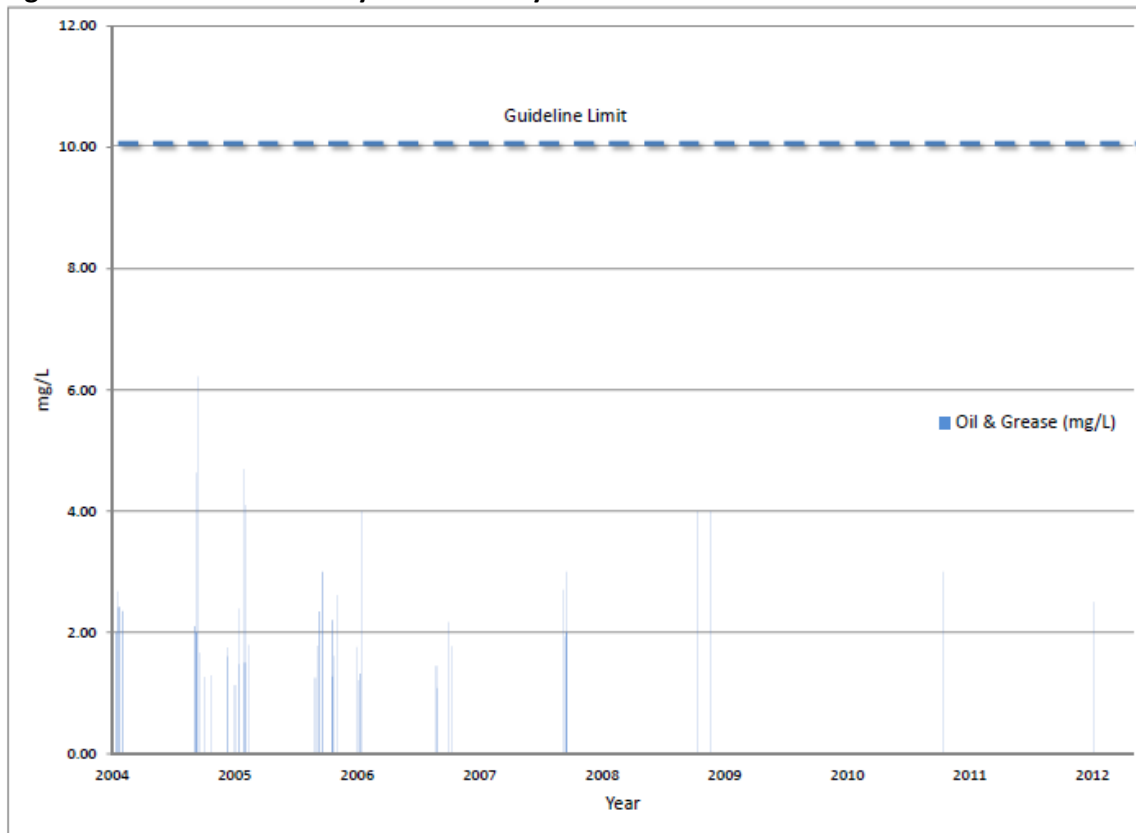
### **14.6.2 Laboratory Analytical Results**

Review of laboratory results for all surface water releases at NWO indicates that oil and grease and pH values did not exceed guideline limits set out in the Water Licence.

Between 2004 and 2006, phenol concentrations were observed as being in excess of the limit set out in the original 2004 Water Licence. Naturally occurring concentrations of phenols in the area were not originally considered in the guideline limits. An amendment to the Water Licence was made by the SLWB in 2006 in which the guideline limit changed in order to take into account naturally occurring phenols. All phenol results since that time have been recorded lower than the guidelines limit.

A comparison of the oil and grease, phenol, and pH results against applicable guideline limits is presented in Figures C, D, and E respectively.

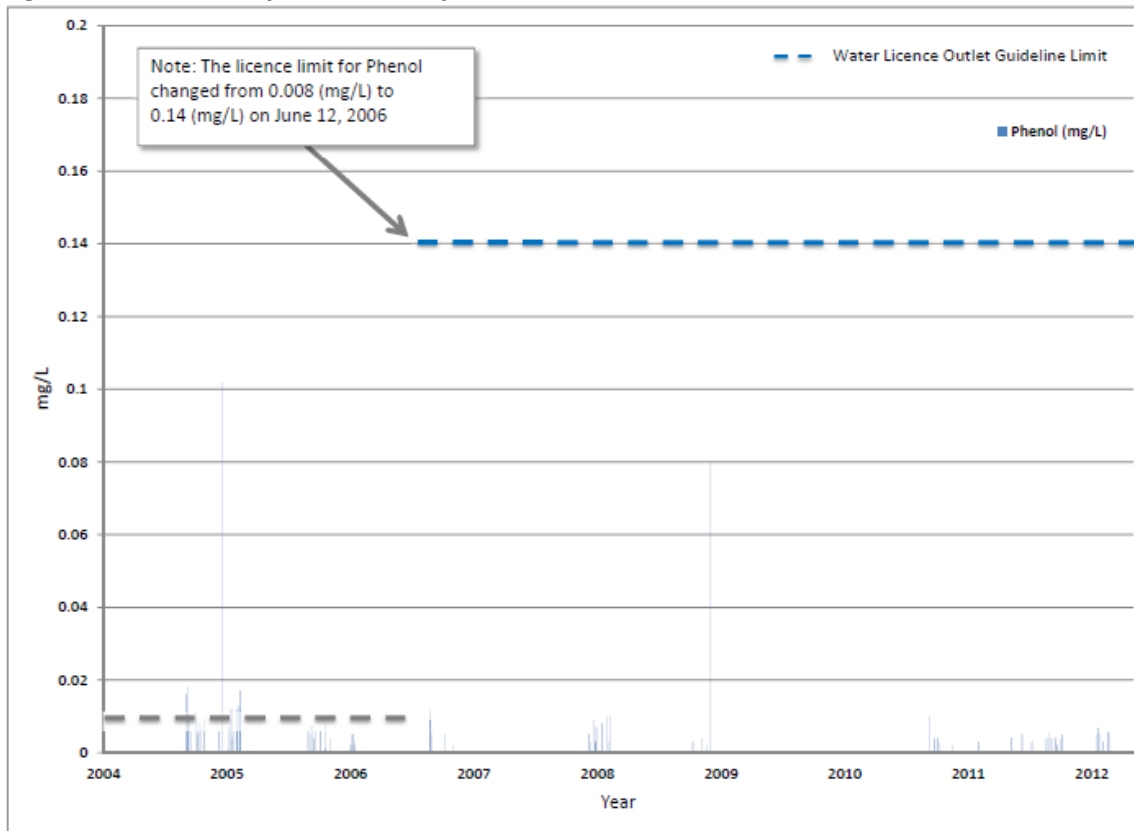
**Figure C: Oil and Grease Analytical Summary 2004 – 2012**



Note: Zero values displayed here represent the detection limit of the analytical method used. Additional details regarding individual water tests are available in the annual reports, available on the SLWB registry ([www.slwb.com](http://www.slwb.com)).

Figure C shows that all surface water released over the period August 30, 2004, to December 31, 2012, met the guideline limit for oil and grease. This corresponds to a 100% compliance rate.

**Figure D: Phenol Analytical Summary 2004 – 2012**



- Notes:
1. Guideline Limit shown as amended June 12, 2006. See SLWB Staff Reports #6 and #8 for further details.
  2. Detection limit in 2004 was 0.005 mg/L. Starting in 2005, the detection was improved to between 0.001 mg/L and 0.002 mg/L

In the spring of 2005, it was noted that surface water run-off areas contained water with concentrations of phenols in excess of the guideline limits set out in the Water Licence dated August 30, 2004. Subsequent analysis of water quality in the Norman Wells area by Golder Associates Ltd. showed background concentrations of phenols above the guideline limit of 0.008 mg/L. On June 12, 2006, the Water Licence was amended and the guideline limit for phenol was revised from 0.008 mg/L to 0.14 mg/L to take into account the naturally occurring phenols. During this period, between August 30, 2004, and June 12, 2006, a total of 16 exceedances were observed. IOR received permission from the SLWB to release this water.

**Figure E: Summary of pH Results 2004 – 2012**

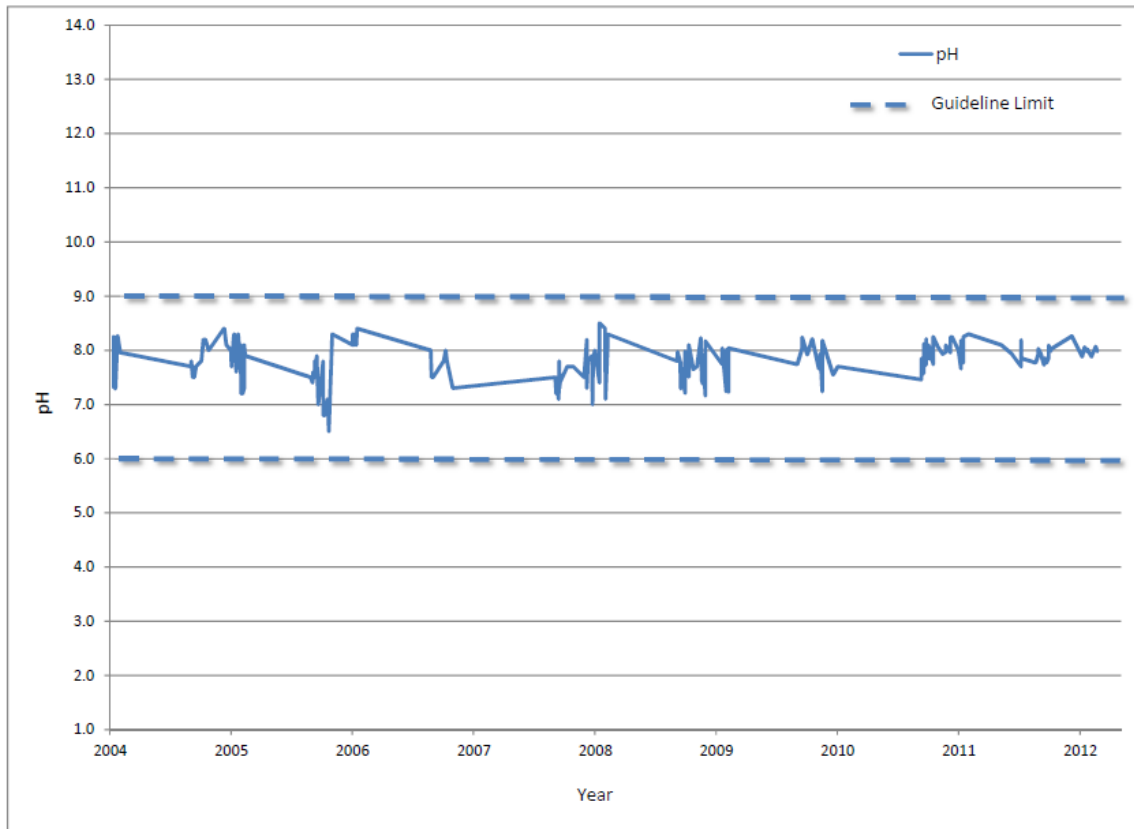


Figure E shows that all surface water released over the period August 30, 2004, to January 31, 2012, met the guideline limit for pH. This corresponds to a 100% compliance rate.

## 14.7 Surface Release Volumes

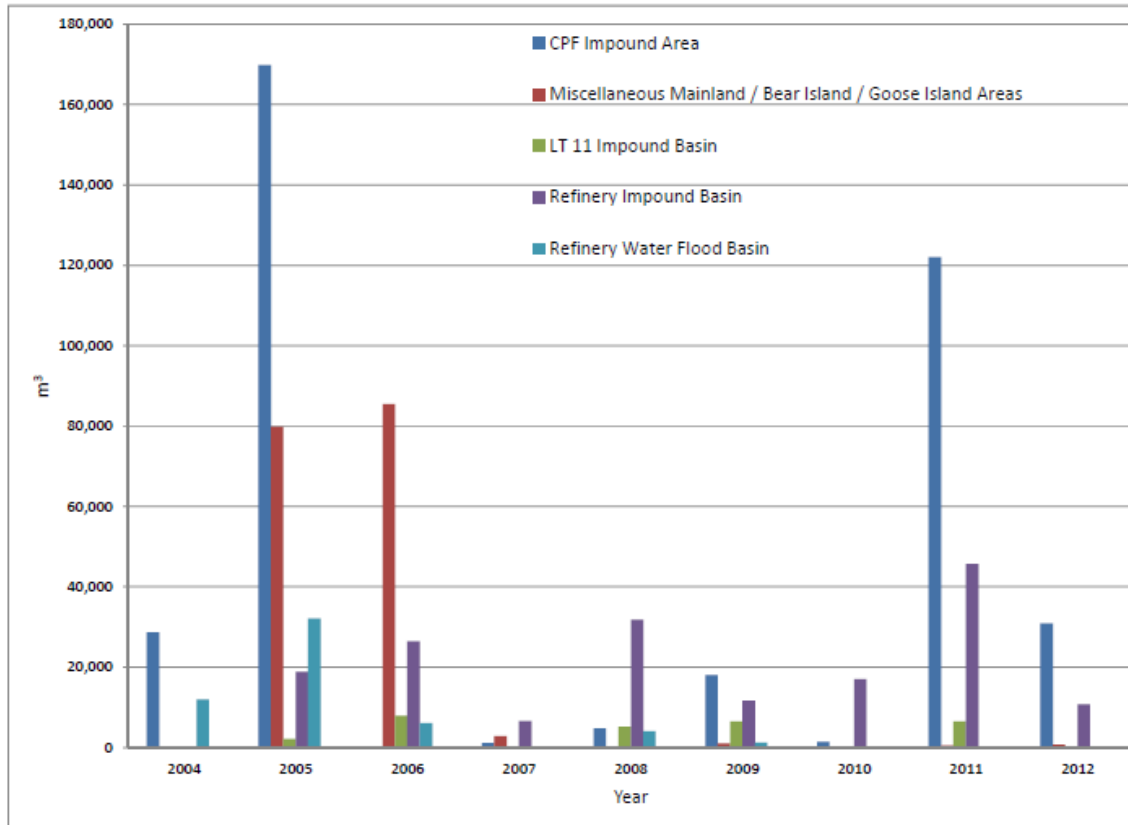
From August 30, 2004, to December 31, 2012, a total of 800,381m<sup>3</sup> of surface water has been released. Table C below presents a summary of annual volumes of surface water released from the SWROF. This information is presented graphically in Figure F.

**Table C: Summary of Surface Water Release Volumes**

Year	CPF Impound Area	Miscellaneous Mainland/ Bear Island/ Goose Island	LT 11 Impound Basin	Refinery Impound Basin	Refinery Water Flood Basin	Total
2004	28,738	0	0	0	11,960	40,698
2005	169,779	79,810	2,147	18,846	32,079	302,661
2006	0	85,427	7,913	26,465	6,090	125,896
2007	1,140	2,856	0	6,631	0	10,627
2008	4,774	181	5,251	31,769	4,026	46,001
2009	18,049	1,049	6,529	11,645	1,270	38,542
2010	1,480	97	0	16,999	0	18,576
2011	122,032	581	6,500	45,732	0	174,845
2012	30,945	730	128	10,733	0	42,535
<b>Total</b>	<b>376,937</b>	<b>170,731</b>	<b>28,468</b>	<b>168,820</b>	<b>55,425</b>	<b>800,381</b>

Note: Surface water summaries for the CPF Impound Area may include water that was diverted from the settling pond in the CPF Impound Area. Settling water is occasionally diverted to the CPF Impound Area when maintenance is needed on the settling pond (i.e. cleaning of pond or valve maintenance) or there are difficulties managing the water level of the pond during break-up as the Mackenzie River rises. Further details are available online from the SLWB Registry ([www.slwb.com](http://www.slwb.com)).

**Figure F: Summary of Surface Water Discharge (m<sup>3</sup>)**



## 14.8 Proposed Changes and Rationale

### *Proposed Amendment:*

Amend the surface water monitoring requirements stipulated in the Surveillance Network Program Attachment to the Water Licence as described in Table D:

**Table D: Proposed Changes to the Surface Water Testing Schedule**

Sample Type	Existing Requirement	Proposed Changes	Field or Lab	Proposed Guideline Limit
Surface water areas where no impacts are anticipated	Visible sheen	No Change	Field	No Sheen
	Chlorides	No Change	Field	500 mg/L
	pH	No Change	Field	6.0-9.0
Surface water areas where impacts may be anticipated	Phenols	No Change	Lab	0.14 mg/L
	Oil & Grease	TPH	Lab	10.00 mg/L
	Total Suspended Solids	No Change	Lab	N/A
	pH	No Change	Lab	N/A
	Specific Conductivity	No Change	Lab	N/A
	Total Dissolved Solids	No Change	Lab	N/A
	Chloride	No Change	Lab	500 mg/L

### *Rationale*

Oil & grease in surface water is measured prior to discharge as part of the Water Licence. However, this parameter does not distinguish between petroleum related oil & grease and the oil & grease associated with animal fats and other non-petroleum products. As such, IOR proposes replacing the oil & grease analysis with Total Petroleum Hydrocarbons (TPH). TPH has a lower detection limit than oil & grease, and will provide data that are more useful for detecting potential impacts.

### *Proposed Amendment*

Modify wording in Part A: Scope and Definitions as follows:

“Surface Water Run-Off Facilities” means the Refinery Impounding Basin, Battery 3 Impounding Basin, Refinery Water Flood Basin, CPF Impounding Area, Miscellaneous Mainland Impounding Areas, Miscellaneous Bear Island Impounding Areas, Miscellaneous Goose Island Impounding Areas, *excavations, bunkers, bermed areas*, and associated ditches provided for the collection, storage and discharge of surface run-off waters from the Imperial Oil resources N.W.T. Limited lease

*Rationale*

The current Water Licence does not explicitly address water releases from excavations, bunkers, and bermed areas (other than impound basins). IOR proposes that releases from excavations, bunkers, and bermed areas be added to the list of SWROF to ensure clarity.

*Proposed Amendment*

Add wording to Items 3 and 4 (reproduced here only in part due to length) of the Surveillance Network Program Attachment of the Water Licence as follows:

3. . . .Water to be released *or used on roads for dust suppression* from the Surface Water Run-Off Facilities where contaminants are suspected will be analyzed for the following. . .  
  
    . . .Water to be released *or used on roads for dust suppression* from the Surface Water Run-Off Facilities where no contaminants are suspected will be analyzed for the following. . .
4. . . .Water to be released *or used on roads for dust suppression* from areas not associated with the Surface Water Run-Off Facilities, SNP Stations and Sumps, where no contaminants are suspected, will be analyzed for the following. . .

*Rationale*

The current water licence does not specifically address the use of water for dust suppression. IOR proposes that it be added to ensure clarity.

*Proposed Amendment*

Add the following monitoring requirements for release of surface water from intact former sumps as described in Table E:

**Table E: Proposed Changes to Testing Surface Water on Intact Former Sumps for Discharge**

Existing Requirement	Proposed Changes	Field or Laboratory Test	Maximum Concentration of Sample
sulphate	Discontinue	N/A	
conductivity	No Change	Lab	
pH	No Change	Lab	Between 6 – 9
total suspended solids	No Change	Lab	
chloride	No Change	Lab	<500 mg/L
sodium	Discontinue	N/A	
potassium	Discontinue	N/A	
calcium	Discontinue	N/A	
magnesium	Discontinue	N/A	
oil and grease	TPH	Lab	10 mg/L
Microtox	Discontinue	N/A	
copper	Discontinue	N/A	
cadmium	Discontinue	N/A	
iron	Discontinue	N/A	
nickel	Discontinue	N/A	
lead	Discontinue	N/A	
zinc	Discontinue	N/A	
chromium	Discontinue	N/A	
total dissolved solids	Lab	Lab	
phenols	Lab	Lab	0.14 mg/L



### *Rationale*

There is no longer any supernatant fluid being generated on site that would require release to the environment. There are, however, instances where surface water runoff may collect on the surface of closed historical sumps that is not associated with or in contact with the sump contents. This change would eliminate potential ambiguity regarding the appropriate guidelines for the management of this water, and harmonize these guidelines with those for other surface water management.