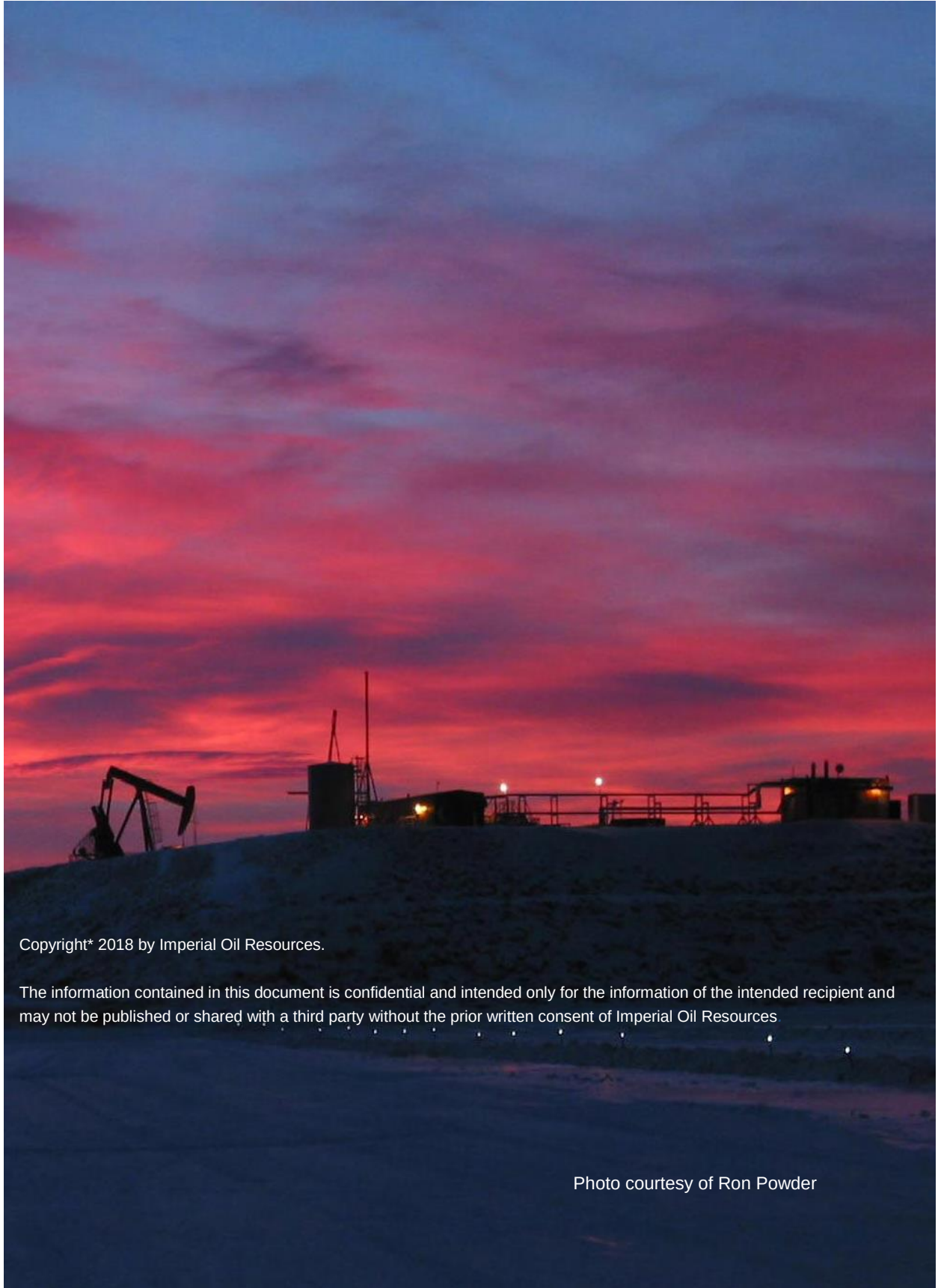


Norman Wells Operations 2020 Annual Water Use Report

Operations Authorization 1210-001
Report No. 35

March 2021

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1.0 Introduction

As required by Type A Water Licence S13L1-007 (Part B: Item 13), the Licensee shall file an Annual Report with the Board no later than March 31st of the year following the calendar year reported. Details on the licence requirements and corresponding applicable section(s) within the report can be found below.

Table 1-1: Concordance Table

Licence Requirement		Section of Report
a)	The monthly and annual quantities in cubic meters of freshwater obtained from all sources	3.0
b)	The monthly and annual quantities in cubic meters of each and all Waste discharged	3.0– 5.0
c)	The monthly and annual quantity in cubic meters of Waste discharged to the Mackenzie River at SNP station S13L1-007-2	3.0
d)	The monthly and annual quantities in cubic meters of freshwater and produced water injected to the Waterflood	4.0
e)	The monthly and annual quantities in cubic meters of Waters contained and discharged from the Surface Water Run-off Facilities	5.0
f)	The monthly and annual quantity in cubic meters of Produced Water recovered from the oilfield reservoir	4.0
g)	Tabular summaries of all data generated under the Surveillance Network Program (SNP)	Appendix A & B
h)	A list of unauthorized discharges, identification of waterbodies affected and the current status of mitigation measures	7.0
i)	An annual drilling schedule for the upcoming year to the Board	8.0
j)	The annual amounts in cubic meters of water and Waste generated from all drilling activities	8.0
k)	A summary of measures taken to minimize net water withdrawals from the hydrological cycle as required in Part D, Item 4 of the licence	3.0– 5.0
l)	Details on the handling, storage, treatment and disposal of Waste from the Norman Wells Proven Area	9.0
m)	A review of spill training and communication exercises of the previous year, including the success and failure, as well as recommendations for improvement	10.0
n)	A general schedule for any planned oil spill exercises for the following year	10.0
o)	A summary of any Modification(s) and / or major maintenance work carried out as per Part G of the licence	11.0
p)	Any other details on Water(s) use or Waste(s) disposal requested by the Board no later than March 31st of the following calendar year reported	n/a
q)	A summary of all spills and Unauthorized Discharges and follow up actions taken that occurred during the previous calendar year	8.0

2.0 Site Summary

Imperial Oil Resources Northwest Territories (N.W.T.) Limited (Imperial) is an upstream oil and gas facility located approximately 700 km northwest of Yellowknife, N.W.T. Operations include a central processing facility (CPF), which receives production from the mainland (along the north-eastern shore of the Mackenzie River), natural islands (Bear and Goose Island), and six artificial islands.

Imperial holds a Type A Water Licence S13L1-007 which was issued by the Sahtu Land and Water Board (SLWB) on March 5th, 2015 and is valid for 10 years. The licence serves to regulate the use of water and the deposits of waste as it relates to Imperial's site. Imperial also holds a Canada Energy Regulator (CER) Operations Authorization (OA) 1210-001 issued December 31st, 2014, also valid for 10 years. This authorization serves to regulate the oil and gas activity on Imperial's federally regulated site.

A key piece of Imperial's Norman Wells Operation (NWO) and the Type A licence is the Surveillance Network Program (SNP). The SNP is detailed in Annex A of the licence and sets out the requirements for the three branches of the SNP program including but not limited to sampling expectations, water quality release limits, and reporting. The three branches of the SNP are listed below.

- Freshwater – Mackenzie River water
- Surface Water – snow and rainwater
- Groundwater – below surface water

More information on the SNP can be found within the Water Licence S13L1-007, Annex A. All other conditions are described above in **Section 1.0**.

As a result of an unplanned event within the plant (INC2020-080 and NT-NU Spill Report 20-248), operations at the Norman Wells facility ceased at the end of July 2020 and restarted in early October 2020. This two month non-operating period is reflected in the data presented throughout this report.

3.0 SNP – Freshwater

The *SNP - Freshwater* covers the testing and analysis of the river water entering and leaving the central processing facility (CPF). There are two sampling locations, referred to as SNP Stations included in the SNP program. The stations are S13L1-007-1 (CPF inlet) and S13L1-007-2 (CPF outlet). The CPF inlet is the point at which the freshwater from the Mackenzie River enters the facility and the CPF outlet (or effluent) is the last point before it returns back to the Mackenzie River. This sampling is described in more detail in **Section 3.3**.

3.1 Mackenzie River Withdrawal and Return Volumes

In 2020, Imperial withdrew approximately 1.6 million cubic metres (m³) of water from the Mackenzie River (the maximum licence allowable limit is 3.5 million m³). All of this water was used for cooling in the CPF (**Figure 3-1**). Once the water was used for cooling, water was either returned to the Mackenzie River or injected to the reservoir via the freshwater injection system.

Figure 3-1: Mackenzie River Water Uses

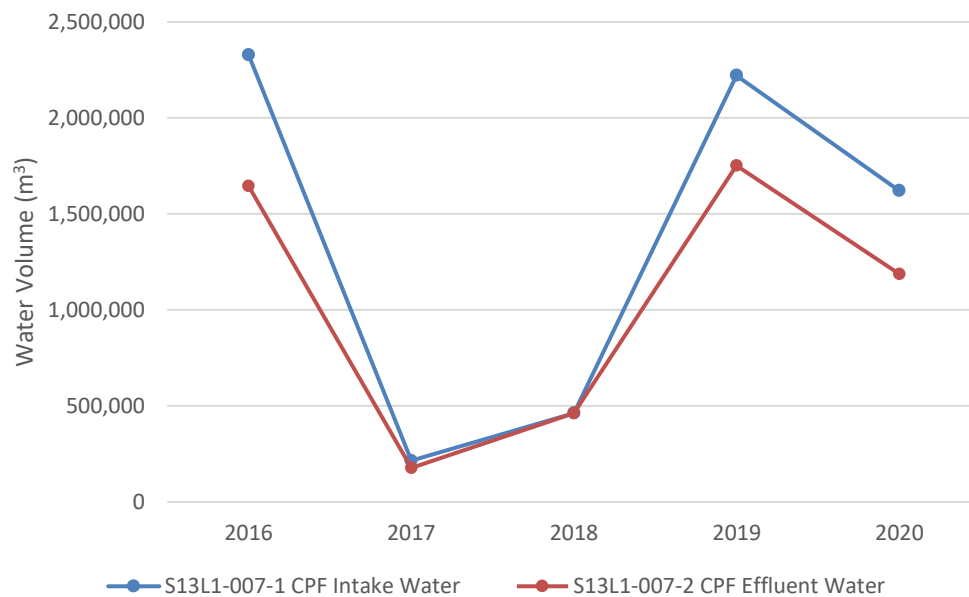


Details on the monthly quantities of freshwater withdrawn and discharged to the Mackenzie River can be found below in **Table 3-1**. All injection volumes can be found in **Table 4-1**. **Figure 3-2** shows the volume of water withdrawn from and returned to the Mackenzie River each year over a five year period. Freshwater intake and demand for cooling water will generally decrease over time as production volumes decrease.

Table 3-1: 2020 CPF Inlet and Outlet Volumes

Month	CPF Inlet (S13L1-007-1) (m ³)	CPF Outlet (S13L1-007-2) (m ³)
Jan	161,857	133,837
Feb	138,612	87,588
Mar	154,795	89,907
Apr	153,034	96,131
May	155,633	88,332
Jun	175,429	168,256
Jul	207,574	181,613
Aug	0	1,115
Sep	10,655	9,834
Oct	156,920	121,202
Nov	150,920	109,780
Dec	155,708	99,266
Total	1,621,138	1,186,859

Figure 3-2: Mackenzie River Withdrawal and Return Volumes (2016-2020)

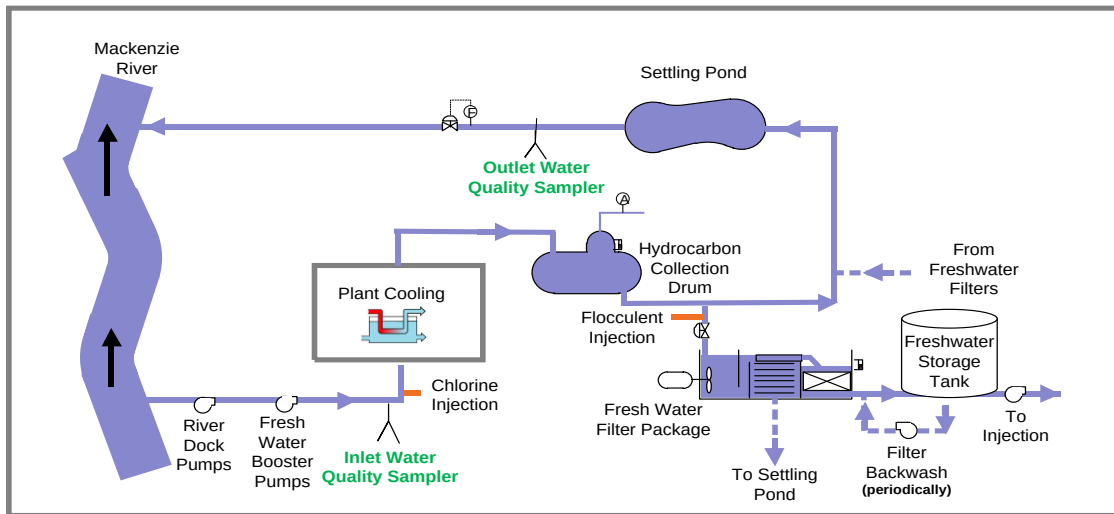


3.2 Volumes of Water Withdrawn from Other Sources

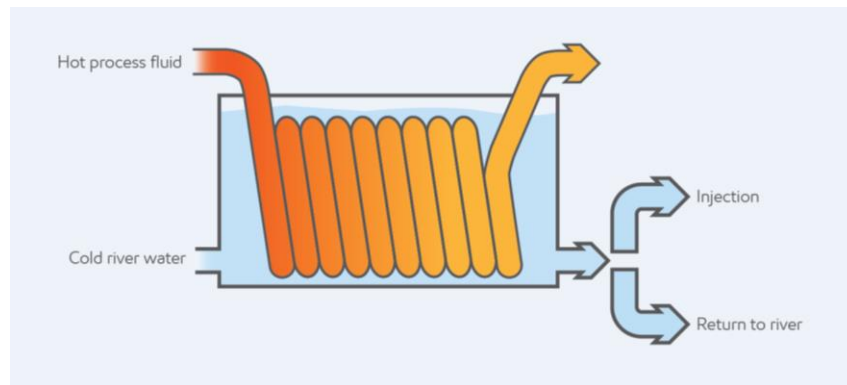
In 2020, Imperial did not withdraw any water from other sources.

3.3 Freshwater Cooling Loop Explained

As water enters the CPF facility it is tested as per licence conditions at the CPF inlet (**Figure 3-3**). After testing, chlorine is added to kill bacteria in the piping and prevent damage to the equipment. This is the same type of chlorine used to disinfect drinking water systems. In 2020, the chlorine injection was in operation periodically throughout the year (**Table A-3**). As outlined in **Section 3.1** of the *Norman Wells Quality Assurance & Quality Control Manual* (January 2018), two chemicals are added to the freshwater to reduce the amount of silt and sediment in the freshwater.

Figure 3-3: Freshwater Cooling Loop Flow Diagram

Once a water sample has been taken and chlorine is added, the water then flows through heat exchangers within the plant for the sole purposes of cooling. The Mackenzie River water does not come into contact with any process fluids during cooling. There is no chance for the water to become contaminated because the water and oil are separated by a steel barrier (**Figure 3-4**). After cooling, the water passes through the hydrocarbon collection drum. This hydrocarbon collection drum is engineer designed with sensors that can detect light hydrocarbons. It is also equipped with automatic shut in valves as a preventative measure in the unlikely event that light hydrocarbons were to be detected in the freshwater (e.g., exchanger failure).

Figure 3-4: Simple Heat Exchanger

Once the water has passed through the hydrocarbon collection drum it either goes to the field for injection into the reservoir or to the settling pond where it is returned to the Mackenzie River. As the water is released from the settling pond it is tested as per licence conditions at a testing location referred to as the CPF outlet (**Figure 3-3**).

3.4 SNP – Freshwater Data Summary

All water results are reported to the SLWB as per licence conditions in the Monthly Water Use Report and are provided annually in this report (**Appendix A**).

During spring break-up in May 2020, investigatory sampling was conducted in response to hydrocarbon detections within the freshwater system. Between May 18th and May 23rd, hydrocarbon concentrations exceeding SL131-007 discharge criteria were observed at SNP S13L1-007 -1 (CPF Inlet), the settling pond, and the plant hydrocarbon collection drum. No release of water occurred during this period. CIRNAC, the SLWB, and the CER were notified of these results and an investigation commenced to determine the cause of the hydrocarbons. Data collected during this event is summarized in **Appendix A** and was included in the SLWB Monthly Water Use Report (May 2020).

The investigation concluded that the source of hydrocarbons was natural seepage being drawn in from the Mackenzie River at the freshwater system river water intake location. No potential operational sources of hydrocarbons were identified throughout the investigation. Additional sampling completed between May 24th and May 28th confirmed that hydrocarbons were no longer being detected in the freshwater system (all sampling results met S13L1-007 discharge criteria). Analytical data was presented to the CER and CIRNAC. Approval was obtained from CIRNAC to resume normal operation of the freshwater system, including release of water to the Mackenzie River.

4.0 Freshwater and Produced Water Injection

To maintain a constant pressure in the reservoir, all volumes removed from the producing reservoir must be replaced. Pressure is maintained by injecting fluid (such as produced water or freshwater) into the reservoir through injection wells. This is referred to as a waterflood. Without water injection, the reservoir pressure would fall and production would quickly decline.

Water that is generated with the production of oil is called produced water and is re-injected into the reservoir. The volume of produced water is not enough to replace the amount of oil recovered; therefore, freshwater is used to supplement injection volumes required. The total volume of water injected in 2020 was approximately 2.0 million m³ and was made up of freshwater and produced water (**Table 4-1**).

Table 4-1: 2020 Freshwater and Produced Water Injection Volumes

Month	Freshwater Injection (m ³)	Produced Water Injection (m ³)	Total Water Injection (m ³)
Jan	28,020	183,649	211,670
Feb	51,024	168,446	219,470
Mar	64,888	187,329	252,217
Apr	56,904	169,137	226,041
May	43,135	152,392	195,527
Jun	7,174	168,567	175,741
Jul	25,961	156,524	182,485
Aug	0	0	0
Sep	0	0	0
Oct	35,718	148,876	184,594
Nov	41,140	148,095	189,234
Dec	56,442	147,959	204,401
Total	410,406	1,630,975	2,041,381

As waterfloods mature, the produced water to oil ratio from the wells typically increase resulting in increased produced water volumes with time. As a result, the volume of produced water injection increases and the demand for freshwater injection decreases. This is shown in **Figure 4-1**.

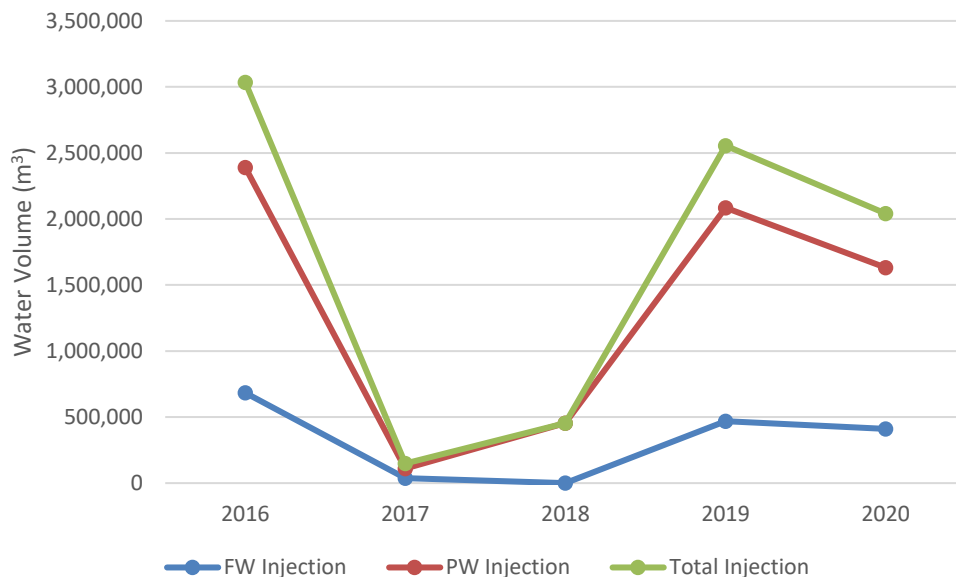


Figure 4-1: Freshwater and Produced Water Injection Volumes (2016-2020)

5.0 SNP – Surface Water

The *SNP - Surface Water* covers the testing and analysis of surface water run-off facilities. The major elements of the program include:

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

5.1 Surface Water Runoff Facilities (SWROF) Release Volumes

In 2020, 50,244 m³ of surface water was released from impound basins back to the environment (**Table 5-1**).

2,272 m³ of surface water was released back to the environment from ditches and bunkers on Goose Island, Bear Island, and the Mainland (**Table 5-1**).

Table 5-1: 2020 SWROF Release Volumes

Month	CPF Impound Basin	Mainland / Bear / Goose	LT 11 Impound Basin	D-42 Impound Basin	Refinery Impound Basin	Refinery Waterflood Basin
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	10,902	1,630	2,542	792	22,620	0
Jun	5,451	92	0	0	1,709	0
Jul	0	290	0	0	1,896	0
Aug	0	0	0	0	1,349	0
Sep	0	0	0	0	711	0
Oct	0	260	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Total	16,353	2,272	2,542	792	28,285	0

5.2 SNP – Surface Water Data Summary

There were no exceedances of water quality criteria or uncontrolled releases in 2020.

All water results are reported to the SLWB as per licence conditions in the Monthly Water Use Report and are provided annually in this report (**Appendix B**).

6.0 SNP - Groundwater

The 2020 *SNP Groundwater Monitoring Program* results can be found in **Appendix C**. A summary of the results is included below.

Monitoring well location BI-13-3-4.5 was found to be damaged during the September 2019 sampling event and has been replaced by contingency well BI-13-1-4. In 2020, a new well (BIBG-20-01-04) was installed and will be sampled in place of BIBG-12-1-7 and BIBG-10-1-4 going forward.

The 2020 groundwater results were analyzed as outlined in the Norman Wells Operation Groundwater Management Plan (dated September 2015). No anomalous chemistry, upward trend, or CCME FWAL guideline exceedances were identified that require additional follow-up at this time. Imperial will continue to execute the *SNP Groundwater Monitoring Program* and analyze the data annually.

7.0 Reportable Releases

Imperial reported all 2020 government reportable releases to the CER Online Event Reporting System and the Northwest Territories – Nunavut (NT - NU) Spill Report Line.

7.1 Incident Prevention and Reduction

Imperial's integrity and reliability processes utilize a structured approach of prevention, detection, response and recovery. A variety of activities related to release prevention, reduction, mitigation, response and training is undertaken annually. These activities are designed to eliminate potential releases, detect releases should they occur and if they do occur, ensure an effective and timely clean up. Key elements for achieving this strategy include:

- awareness training for employees and contractors
- pre-job preparation and hazard recognition
- surveillance and monitoring
- flowline leak detection
- routine integrity testing and maintenance
- regularly scheduled emergency response training and exercises and;
- incident reporting processes; management support for a strong incident reporting culture
- analysis of incident trending to evaluate and understand learnings to improve future performance

For any new workers to site (both employees and contractors) a safety and environmental training package is reviewed covering environmental topics such as release prevention, reporting, waste management, and wildlife. Other tools such as Environmental Alerts, a one page bulletin intended as a high level overview of key topics, may be used to communicate to workers specific environmental information on an as needed basis. Environmental incidents and associated learnings are reviewed real-time with the general workforce in daily operations and stewardship meetings.

7.2 Spill Summary

In 2020, Imperial reported fifteen events to the CER's Online Event Reporting System (OERS) and the Northwest Territories – Nunavut (NT-NU) Spill Report Line (**Table 7-1**).

Each event was reported on and responded to immediately. Incident investigation details and clean up statuses are provided to the CER through the Monthly Release Report and the OERS, and to the SLWB via a Supplemental Release Report (30 Day Report).

With the exception of the event that occurred on July 11, 2020 (INC2020-071 and NT-NU Spill Report Number 20-216), clean-up has been completed in all cases and the incident investigations have been closed. Follow-up activities related to INC2020-071 and NT-NU Spill Report Number 20-216 are being tracked separately with updates being provided to the CER (REM 2020-026) and SLWB.

Table 7-1: Details on 2020 NT-NU Reportable Releases

Date Occurred	CER INC Number	NT/NU Spill Number	Location of Incident	Product Released	Volume Released (m3)	Volume Contained (m3)	Volume Reaching the Environment (m3)	Executive Summary	Direct Cause	Status of Clean Up
01/14/2020	INC202 0-003	20-011	Central Processing Facility (North South Pipe Rack)	Glycol	400L	375L	75L	While completing end of day rounds in the plant, a glycol heat trace line failure was observed by an operator. Immediate response included placement of secondary containment drip trays under the release location and isolation of the source of the release. The volume of glycol released to the environment was estimated to be 75 L (the remaining release volume was contained within trip trays). Material released to the environment has been recovered and disposed of appropriately onsite	Equipment – Corrosion / Erosion - External	Complete
02/03/2020	INC202 0-013	20-031	Refrigeration Unit (E-133)	Propane	8kg	0kg	8kg	While conducting morning rounds, an Operator noticed liquid propane leaking from an insulated line associated with the heat exchanger system within the plant. The Operator communicated this observation to the control room and work commenced to isolate the system. The system was isolated within 10 minutes of the leak being identified. The material was observed to vaporize upon release. No released material was observed to have contacted the ground. The root cause identified was inadequate tools or equipment. No obvious defect was identified. Gasket flanges were replaced and valve packing tightened to stop the release.	Other – Act of 3rd Party/ Utilities/ Services Failure	Complete
04/3/2020	INC202 0-035	20-092	Chemical storage yard	Chemical Spill	1000L	900L	100L	While unloading totes from the storage dock at the chemical storage yard, one of the totes containing corrosion inhibitor was punctured with a fork lift resulting in release of the contents of the tote. The majority of the released material was contained within the chemical storage dock secondary containment (approximately 900 L). The remaining material was released to the environment (approximately 100 L). The released material has been recovered (via vac truck) and disposed of appropriately onsite.	People – Understood but Did Not Follow Acceptable Practices or Procedure	Complete
5/20/2020	INC202 0-049	20-144	Compressor Building	Natural Gas Liquid	5m3	5m3	0m3	At approximately 9:00PM on May 20, 2020 during Operator rounds, a potential release of NGL's from the E-112 exchanger to the freshwater cooling loop was identified. The suspected release source (E-112 exchanger) was isolated immediately when the potential release was identified, freshwater release to the river was stopped and an investigation commenced. The root cause of this release was determined to be a failed tube inside the heat exchanger.	Equipment – Other mechanical integrity	Complete

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Date Occurred	CER INC Number	NT/NU Spill Number	Location of Incident	Product Released	Volume Released (m3)	Volume Contained (m3)	Volume Reaching the Environment (m3)	Executive Summary	Direct Cause	Status of Clean Up
7/11/2020	INC202 0-071	20-216	Injection Well – Water BPT2	Produced Water	400m3	0m3	400m3	While working at BPT 2 (Bear Island Pipeline Terminal 2), an Operator noticed water bubbling at surface and a sheen. Work commenced to isolate the below grade produced water flowline in the vicinity of the bubbling. Bubbling stopped. The source of the bubbling was the produced water flowline. After isolation, the flowline pressure dropped to zero. Work was initiated recover pooled water in the vicinity of the suspected release location.	Equipment – Erosion/ Corrosion	In progress
7/17/2020	INC202 0-076	20-224	Tote at the chemical storage yard	Hydrofluoric Acid	440L	380L	60L	A contractor noticed a water like substance dripping from the chemical dock in yard A. A drip tray was placed under the material dripping from the chemical dock. Further investigation into the leak determined that the source of the release was a failed valve on a tote and that there was a failed patch inside the secondary containment of the chemical dock. Spilled material was immediately recovered via hydrovac and disposed of appropriately onsite.	Equipment – Other Mechanical Integrity	Complete
7/29/2020	INC202 0-079	20-243	Satellite Station Island 2 – Transport Tote	Corrosion Inhibitor	400L	400L	0L	Two totes supplying Corrosion inhibitor to the Island two satellite building were stacked within secondary containment. The top tote was connected to the bottom tote and used to fill the bottom tote. The top tote valve was opened to refill bottom and left unattended resulting in bottom tote overfilling and spilling in to secondary containment. No material was release outside of secondary containment (to the environment). Release material will be disposed of appropriately onsite (via the F-31x Disposal Facility).	Communication of Expectations LTA	Complete
7/31/2020	INC202 0-080	20-248	Central Processing Facility	Produced Gas and Salt Bath Heater Salt	2100 scm3 (gas) 6m3 (salt)	0m3 (gas) 4m3 (salt)	2100 scm3 (gas) 2m3 (salt)	On July 31st, 2020 at 17:45 there was a rapid combustion event (explosion) followed by a fire which was contained to the salt bath heater building. The event was identified by workers onsite and building gas detection. The CPF was immediately evacuated and an emergency shutdown of the facility was initiated. No personnel were injured. There were no identified impacts to air quality or off-lease releases as a result of the event.	Equipment – Corrosion/ Erosion	Complete
8/3/2020	INC202 0-081	20-250	Office Area – Local Worker Trailer	Waste Water /Effluent	3L	0L	3L	A job site portable toilet was not emptied resulting in overfill, spilling approximately 3L of effluent waste to soil. Released material was recovered by vac truck and disposed of appropriately. The direct cause of this event was determined to be personnel not following acceptable procedures (for servicing job site portable toilet). Corrective actions include evaluating and updating (if needed) contractor processes for documenting job site portable toilet servicing.	People – Understood but Did Not Follow Acceptable Practices or Procedure	Complete

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Date Occurred	CER INC Number	NT/NU Spill Number	Location of Incident	Product Released	Volume Released (m3)	Volume Contained (m3)	Volume Reaching the Environment (m3)	Executive Summary	Direct Cause	Status of Clean Up
9/3/2020	INC202 0-092	NT-NU 20-309	Warehouse Yard	Water Diluted heat Transfer Salt Solution	4m3	0m3	4m3	To manage water diluted heat transfer salt associated with the July 31, 2020 salt bath heater event (NT-NU 20-248 and CER Report INC2020-080), the water solution was transferred to an open top storage tank (located near the waste storage yard on the mainland) prior to planned proper disposal. The metal open top storage tank leaked, resulting in the release of the water diluted heat transfer salt material to the ground. Released material was recovered and disposed of appropriately onsite.	Other - Act of 3rd Party / Utilities / Services Failure	Complete
9/3/2020	INC202 0-093	NT-NU 20-314	BPT-01	Corrosion Inhibitor	350L	350L	0L	A tote of corrosion inhibitor at the Bear Island Pipeline Terminal 1 was located within secondary containment. A pinhole leak in the tote resulted in the release of material into secondary containment. No material was released outside of secondary containment (to the environment). Released material was disposed of appropriately onsite.	Equipment – Corrosion/Erosion – External	Complete
9/18/2020	INC202 0-097	NT-NU 20-343	Office Area – CPF Parking Area	Sewage	10L	0L	10L	A job site portable toilet was discovered with water running, resulting in a spill from the grey water tank. The service crew was mobilized to recover impacted soil and dispose of appropriately.	Equipment – Other Malfunctioned / Did Not Function	Complete
10/13/2020	INC202 0-108	NT-NU 20-396	Bear Island Pipeline Terminal 1	Corrosion Inhibitor	600L	600L	0L	A tote of corrosion inhibitor at the Bear Island Pipeline Terminal 1 was located within secondary containment. An equipment failure associated with a camlock fitting resulted in the release of material into secondary containment. No material was released outside of secondary containment (to the environment). The released material was recovered and disposed of appropriately onsite. The direct cause of this event was determined to be equipment failure (camlock fitting). Corrective actions included replacing the failed camlock fitting. Imperial is also evaluating replacement of aging totes within the field to mitigate the likelihood of similar events in the future.	Failed cam lock fitting	Complete

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Date Occurred	CER INC Number	NT/NU Spill Number	Location of Incident	Product Released	Volume Released (m3)	Volume Contained (m3)	Volume Reaching the Environment (m3)	Executive Summary	Direct Cause	Status of Clean Up
10/14/2020	INC202 0-109	NT-NU TBD	Central Processing Facility	Glycol	250L	120L	130L	The control room received a low level alarm for glycol levels within the heat trace system at the CPF. While investigating the reason for the low level alarm, operations personnel identified a glycol release from a heat trace line above the old compressor building. Secondary containment was placed under the release and work commenced to isolate the line. A portion of the released material was contained within secondary containment and the building. The remaining material was released to the soil (~130L). The released material was a 60% glycol 40% water mix. The direct cause of this event was determined be failure of the heat trace line as a result of corrosion. Corrective actions included replacing the failed carbon steel tubing with stainless steel tubing.	Carbon steel heat trace tubing failed	Complete
12/2/2020	n/a	n/a	Island 5	Corrosion inhibitor	25L	25L	0L	A tote of corrosion inhibitor at Island 5 was located within secondary containment. An equipment failure associated with a camlock fitting resulted in the release of material into secondary containment. The release was identified by a worker onsite. No material was released outside of secondary containment (to the environment). The released material was recovered and disposed of appropriately onsite. The direct cause of this event was determined to be equipment failure (camlock fitting). Corrective actions included replacing the failed camlock fitting. Imperial is also working with the tote manufacturer to evaluate whether changes to chemical storage equipment design (i.e. the camlock fitting and totes) would reduce the likelihood future similar failures.	n/a	Complete

8.0 Drilling Activity Summary

There was no drilling activity in 2020 nor are there plans to drill in 2021. All drilling sumps have been capped and are in the remediation process. There were no drilling fluid releases in 2020.

9.0 Waste

Waste generated on site is collected and disposed of at appropriate waste facilities both on and off site. In 2020, approximately 4 tonnes of hazardous waste and 405 tonnes of non-hazardous waste was transported to approved facilities outside of Norman Wells.

Two Imperial owned soil treatment facilities (bio cells) continue to operate, treating impacted material for reuse on site. In 2020, approximately 500 m³ of non biocell treatable soil was moved to the biocell for storage. At the end of 2020, a total of approximately 1500 m³ of non biocell treatable soil and 200 m³ of treatable soil was located in the biocell. No material was removed from the biocell in 2020.

An active *Waste Management Plan* serves as a resource document and field guide for waste management on-site, and includes additional details about the bio cell and other waste facilities at the NWO. As updates to this plan are made, the plan is filed with the SLWB.

10.0 Emergency Response

Imperial's Emergency Response Plan (ERP) includes set objectives for responding to emergencies in an effective and timely manner. These objectives include the following:

- manage risks, inherent in all operations to minimize releases;
- ensure that all employees understand their responsibility as it relates to emergencies and preventing them from occurring;
- develop and maintain emergency response capabilities locally and have the ability to quickly expand and leverage other resources; and,
- initiate appropriate response measures immediately and take all reasonable measures to ensure the safety of our workforce and the public and for the protection of the community and the environment.

In addition to the ERP mentioned above, a Spill Contingency and Response Plan (SCARP) also exists as a supplement the ERP. The SCARP is a more detailed field level strategy guide. Copies of both the ERP and SCARP are filed with the SLWB and CER and other agencies as appropriate.

The local Norman Wells workforce, in the event of an emergency, would be known as the emergency response team (ERT). The ERT completes regular training on roles and responsibilities, the structure and organization of the incident command system, emergency response equipment, as well as various response techniques (e.g., boom deployment and oil recovery on water). Within the scope of any training, the objectives of the exercise, learnings and any improvement areas are discussed throughout and followed up as required.

A summary of the exercises completed in 2020 is included in **Table 10-1**.

Table 10-1: 2020 Emergency Response Exercises

Date	Description
5-Feb-20	Actual Propane Leak
11-Feb-20	Gas Release (H2S, Hydrocarbon) in Process Area
3-Mar-20	Ice Road Traffic Incident
20-Apr-20	COVID 19 Response – contact exposure
22-May-20	Actual Fresh Water System Hydrocarbon Water Quality Issue
10-Jun-20	Responding to a Gas Alarm with Evacuation
10-Jul-20	Crude Oil Pool Fire
22-Jul-20	Deployment of Oil Skimmers
12-Aug-20	Marine Transport Incident
4-Nov-20	Well Blowout into Mackenzie River
18-Nov-20	Chlorine Release
20-Nov-20	Gas Alarm Response and Muster
22-Nov-20	Winter Helicopter & Man Down Medical Emergency (Injury, Illness, Fatality)

A summary of the exercises planned for 2021 is included in **Table 10-2**.

Table 10-2: 2021 Planned Emergency Response Exercises

Date	Exercise Scenario / Substance
Feb	Brittle Fracture leading to a Gas Release (H2S, Hydrocarbon)
March	Blocked Flare
April	Chlorine Release & Man Down Confined Space Rescue
May	Helicopter Overdue
TBD	BCP Exercise - Cyber Security
June	Office Fire Drill
June	Marine Transport Incident
July	Full plant shutdown, no exercises scheduled
July & Aug	Marine & Field Response Drills
Aug	Crude Oil Pool Fire & Firefighting (Grass/Timber)
Aug	Marine Transport Incident
Sept	Spill Response (Land, Water, Building)
Oct	TG Fire & Man Down Medical Emergency (Injury, Illness, Fatality)
Nov	Fire & Explosion (Products, Boilers, Vessels) include Propane BLEVE explosion
Dec	Ice Road Construction / Transport Incident

11.0 Work Summary

Below is a list of modification(s) and maintenance work carried out as per Part G of the licence in 2020:

- Temporary water withdrawal modification for tank hydrotest (June 19, 2020 Board Approval) – no water was withdrawn.

Acronyms

Acronym	Definition
AEMP	Aquatic Effects Monitoring Program
BPT	Bear Island Pipeline Terminal
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CER	Canada Energy Regulator
CPF	central processing facility
EC	specific conductivity
ERP	Emergency Response Plan
ERS	Event Reporting System
ERT	emergency response team
FWAL	Freshwater Aquatic Life
Imperial	Imperial Oil Resources N.W.T. Limited
L	litres
m ³	cubic metres
mg/l	milligrams per litre
n/a	Not applicable
NWO	Norman Wells Operations
N.W.T.	Northwest Territories
NT-NU	Northwest Territories – Nunavut
OA	Operations Authorization
OERS	Online Event Reporting System
SCARP	Spill Contingency and Response Plan
SLWB	Sahtu Land and Water Board
SNP	Surveillance Network Program
SWROF	Surface water runoff facilities
TPH	Total Petroleum Hydrocarbons
TSS	total suspended solids
uS/cm	micro Siemens per centimetre

12.0 Glossary

Term	Description
Acute lethality	An effluent is deemed acutely lethal if the undiluted (100%) effluent kills 50% or more of the fish or <i>Daphnia magna</i> in the test. Biological test method: Acute Lethality Test Using Rainbow Trout Report EPS 1/RM/9 July 1990 (with May 1996 and May 2007 amendments) and Acute Lethality of Effluents to <i>Daphnia magna</i> EPS 1/RM/14 Second Edition December 2000, or as may be amended from time to time.
Average concentration	The running average of any four consecutive analytical results submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program".
Bathymetric survey	A survey used to measure the topography on the bottom of a waterbody. Imperial conducts these surveys on the Mackenzie River to help identify and understand what changes have occurred on the river bottom.
Central processing facility (CPF)	The plant where oil, gas, and produced water, are collected from the oilfield and separated.
Exceedance	Results are above the maximum concentrations listed in Water Licence S13L1-007
Flowline	A line that is used to transport fluids from a well to a production facility or vice versa, and includes intrafield export and all gathering lines
Phenols	Any of a family of organic compounds characterized by a hydroxyl (-OH) group attached to a carbon atom that is part of an aromatic ring. Phenols are widely used in household products such as cleaners and mouthwash. They are commonly found in nature and can be obtained from essential oils of plants. Phenols can also be obtained from the distillation of coal tar or crude petroleum. (Source: www.britannica.com).
Produced water	Water extracted from the reservoir as a mixture with oil and gas
SNP Station S13L1-007-1	The Surveillance Network Station for the CPF intake water.
SNP Station S13L1-007-2	The Surveillance Network Station for the CPF cooling flow return.
Surface water run-off facilities	The Refinery Impounding basin, Battery 3 impounding basin (also known as LT 11), Refinery waterflood Basin, CPF impounding area (also known as LT 2), miscellaneous Mainland impounding areas, miscellaneous Bear Island impounding areas, miscellaneous Goose Island impounding areas, and associated ditches provided for the collection, storage, and discharge of surface run-off waters from the NWO.
Surveillance network program	A network of devices or sampling points designed to test environmental conditions for comparison against baseline data obtained from a point or area designated as a control. This is a method of tracking and identifying the spread of deleterious substances in the environment.
Waste	Waste as defined by Section 2 of the <i>Northwest Territories Waters Act</i>
Waterflood	The injections of water into the Norman Wells oilfield reservoir for pressure maintenance and enhanced oil production
Water intake	The wetwell pump and associated facilities installed in the Mackenzie River and the water line to the CPF

Appendix A CPF Inlet and Outlet Water Data

Table A-1: Total Petroleum Hydrocarbons and Phenols

	CPF Inlet Total Petroleum Hydrocarbons (mg/L)	CPF Inlet Phenols (mg/L)	CPF Outlet Total Petroleum Hydrocarbons (mg/L)	CPF Outlet Phenols (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	3.0 mg/L	0.07mg/L
6-Jan	<2.0	<0.0015	<2.0	<0.0015
13-Jan	<2.0	<0.0015	<2.0	<0.0015
20-Jan	<2.0	<0.0015	<2.0	<0.0015
27-Jan	<2.0	<0.0015	<2.0	<0.0015
3-Feb	<2.0	<0.0015	<2.0	<0.0015
10-Feb	<2.0	<0.0015	<2.0	<0.0015
17-Feb	<2.0	<0.0015	<2.0	<0.0015
25-Feb	<2.0	<0.0015	<2.0	<0.0015
2-Mar	<2.0	<0.0015	<2.0	<0.0015
9-Mar	<2.0	<0.0015	<2.0	<0.0015
16-Mar	<2.0	<0.0015	<2.0	<0.0015
23-Mar	<2.0	<0.0015	<2.0	<0.0015
30-Mar	<2.0	<0.0015	<2.0	<0.0015
6-Apr	<2.0	<0.0015	<2.0	<0.0015
13-Apr	<2.0	<0.0015	<2.0	<0.0015
20-Apr	<2.0	<0.0015	<2.0	<0.0015
27-Apr	<2.0	<0.0015	<2.0	<0.0015
4-May	<2.0	<0.0015	<2.0	<0.0015
11-May	<2.0	<0.0015	<2.0	<0.0015
18-May	9.3	0.0038	<2.0	0.0042
21-May	<2.0	0.0029	<2.0	0.0018
23-May	8.4	0.0021	<2.0	0.0034
25-May	<2.0	<0.0015	<2.0	0.0031
26-May	<2.0	<0.0015	<2.0	<0.0015
27-May	<2.0	-	<2.0	-
28-May	<2.0	-	<2.0	-
1-Jun	<2.0	<0.0015	<2.0	<0.0015
8-Jun	<2.0	<0.0015	<2.0	<0.0015
15-Jun	<2.0	0.0017	<2.0	0.0064
23-Jun	<2.0	<0.0015	<2.0	0.0086
29-Jun	<2.0	<0.0015	<2.0	<0.0015
6-Jul	<2.0	<0.0015	<2.0	<0.0015

	CPF Inlet Total Petroleum Hydrocarbons (mg/L)	CPF Inlet Phenols (mg/L)	CPF Outlet Total Petroleum Hydrocarbons (mg/L)	CPF Outlet Phenols (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	3.0 mg/L	0.07mg/L
14-Jul	<2.0	<0.0015	<2.0	<0.0015
20-Jul	<2.0	0.0016	<2.0	<0.0015
27-Jul	<2.0	<0.0015	<2.0	0.0016
4-Aug	<2.0	<0.0015	<2.0	<0.0015
5-Oct	<2.0	<0.0015	<2.0	<0.0015
13-Oct	<2.0	<0.0015	<2.0	<0.0015
19-Oct	<2.0	<0.0015	<2.0	<0.0015
26-Oct	<2.0	<0.0015	<2.0	<0.0015
2-Nov	<2.0	<0.0015	<2.0	<0.0015
9-Nov	<2.0	<0.0015	<2.0	<0.0015
16-Nov	<2.0	<0.0015	<2.0	0.0015
23-Nov	<2.0	<0.0015	<2.0	<0.0015
30-Nov	<2.0	<0.0015	<2.0	<0.0015
7-Dec	<2.0	<0.0015	<2.0	<0.0015
14-Dec	<2.0	0.0042	<2.0	0.0020
21-Dec	<2.0	<0.0015	<2.0	<0.0015
29-Dec	<2.0	<0.0015	<2.0	<0.0015

Table A-2: Total Suspended Solids (TSS), pH and Specific Conductivity (EC)

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
2-Jan	1.2	7.68	260	1.3	7.18	240
6-Jan	1.3	7.90	260	2.1	7.99	250
9-Jan	<1.0	7.97	260	<1.0	7.93	240
13-Jan	<1.0	7.94	260	2.3	6.97	250
16-Jan	1.6	7.79	250	<1.0	7.84	250
20-Jan	1.3	7.11	250	<1.0	7.73	240
23-Jan	<1.0	7.67	250	1.3	6.69	240
27-Jan	1.4	7.89	250	1.5	7.88	240
30-Jan	5.1	8.04	250	2.3	8.04	250
3-Feb	44	7.55	250	<1.0	6.96	250
6-Feb	<1.0	7.69	260	1.2	7.7	250
10-Feb	5.9	6.85	270	<1.0	7.7	250
13-Feb	6.5	7.45	260	1.7	6.8	250
17-Feb	3.6	7.01	260	<1.0	7.69	240
20-Feb	2.9	7.36	250	1.4	7.69	240
25-Feb	1.3	8.17	250	<1.0	8.11	250
27-Feb	17	8.11	260	2.9	8.06	250
2-Mar	2.6	8.09	260	1.8	8.09	250
5-Mar	3.9	8.04	250	2.6	8.01	240
9-Mar	<1.0	8.04	260	1.3	8.04	250
12-Mar	8.1	7.95	270	1.9	8.04	250
16-Mar	6.5	7.93	250	2.3	7.96	240
19-Mar	13.0	7.95	250	1.8	7.98	240
23-Mar	11.0	7.97	250	1.2	7.96	250
26-Mar	19.0	7.90	250	1.1	7.98	240
30-Mar	7.0	7.94	230	1.1	8.08	230
2-Apr	140.0	8.0	250	2.3	7.6	250
6-Apr	31.0	8.0	250	1.1	7.9	250
9-Apr	5.4	8.1	250	2.4	8.0	250
13-Apr	1.6	8.1	250	1.4	8.0	240
16-Apr	1.7	7.9	250	<1.0	8.0	240
20-Apr	9.3	8.1	250	<1.0	8.0	240

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	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
23-Apr	43.0	8.0	250	2.7	8.1	250
27-Apr	16.0	8.0	250	1.5	8.1	240
30-Apr	9.2	7.9	250	2.3	7.9	250
4-May	2.9	8.0	240	3.7	8.0	240
7-May	7.1	8.1	240	1.9	8.0	240
11-May	4.2	7.9	250	2.5	8.0	250
14-May	29.0	8.0	240	10.0	8.0	250
18-May	35.0	8.0	220	13.0	7.9	240
21-May	140.0	8.0	220	12.0	7.9	230
23-May*	58.0	7.8	250	5.9	7.5	240
25-May	66.0	7.8	260	6.5	7.7	340
26-May*	120.0	7.9	250	5.1	7.8	380
27-May*	-	-	-	-	-	-
28-May	76.0	8.1	240	4.3	8.0	410
1-Jun	29	7.5	230	5.8	6.8	260
4-Jun	89	8.1	240	14	8.0	250
8-Jun	11	7.9	250	12	7.6	260
11-Jun	24	7.5	250	14	8.0	250
15-Jun	17	7.9	260	21	8.0	250
18-Jun	36	8.2	280	27	8.0	250
23-Jun	160	7.8	250	42	7.3	260
25-Jun	41	8.1	300	85	8.1	260
29-Jun	110	7.8	250	100	7.8	260
2-Jul	100	8.2	260	31	8.1	250
6-Jul	180	8.1	260	25	8.1	260
9-Jul	66	8.3	260	22	7.9	270
14-Jul	120	7.9	270	56	7.8	270
16-Jul	20	8.0	340	89	7.9	270
20-Jul	310	8.2	340	54	8.0	280
23-Jul	170	8.2	280	61	8.1	280
27-Jul	36	8.0	270	27	8.1	280
30-Jul	110	8.0	270	33	8.0	270
4-Aug	420	8.0	280	8.5	8.0	280
1-Oct	11	8.1	290	36	7.8	320

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
5-Oct	67	8.0	270	8.7	8.0	290
8-Oct	53	7.9	270	18	8.0	270
13-Oct	17	7.9	280	7.7	8.0	280
15-Oct	16	7.6	320	14	6.6	270
19-Oct	180	7.4	290	40	7.9	270
22-Oct	3	8.0	270	11	7.6	260
26-Oct	25	8.1	270	4.8	8.0	280
29-Oct	6	8.1	280	15.0	8.0	270
2-Nov	<1.0	8.0	270	13	8.0	260
5-Nov	1.0	7.4	270	13	8.0	270
9-Nov	150	8.0	290	6.6	7.6	280
12-Nov	2.3	7.9	270	9.8	8.1	270
16-Nov	4.1	7.8	300	9.7	8.0	300
19-Nov	6.5	8.1	290	7.7	8.2	290
23-Nov	5.8	7.9	280	6.0	8.0	280
26-Nov	2.1	7.8	280	7.4	8.0	280
30-Nov	5.3	7.3	270	8.6	6.8	270
3-Dec	10.0	7.94	270	3.3	8.01	270
7-Dec	6.3	8.13	260	2.6	8.06	260
10-Dec	48.0	7.50	260	2.7	6.87	260
14-Dec	14.0	7.58	260	4.1	7.03	260
17-Dec	20.0	7.58	270	3.5	6.90	260
21-Dec	17	7.32	270	7.5	6.72	260
27-Dec	19	8.02	260	<1.0	8.10	250
29-Dec	41	6.69	250	13	7.29	250

Table A-3: Average Daily Chlorine and Temperature

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
1-Jan	0.01	7.6
2-Jan	0.01	7.8
3-Jan	0.01	8.1
4-Jan	0.01	7.8
5-Jan	0.01	7.2
6-Jan	0.01	7.2
7-Jan	0.01	6.7
8-Jan	0.02	6.9
9-Jan	0.02	6.5
10-Jan	0.02	6.8
11-Jan	0.01	5.8
12-Jan	0.01	6.4
13-Jan	0.01	6.2
14-Jan	0.01	6.7
15-Jan	0.01	8.1
16-Jan	0.01	8.9
17-Jan	0.01	8.4
18-Jan	0.01	7.7
19-Jan	0.01	8.5
20-Jan	0.01	8.4
21-Jan	0.01	8.4
22-Jan	0.01	9.2
23-Jan	0.01	9.3
24-Jan	0.01	9.1
25-Jan	0.01	7.5
26-Jan	0.01	7.9
27-Jan	0.02	7.1
28-Jan	0.02	7.2
29-Jan	0.02	6.7
30-Jan	0.02	7.0
31-Jan	0.02	7.8
1-Feb	0.02	6.3
2-Feb	0.01	7.7
3-Feb	0.01	7.6
4-Feb	0.01	8.2
5-Feb	0	9.0

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
6-Feb	0	9.0
7-Feb	0	8.4
8-Feb	0	8.5
9-Feb	0	9.1
10-Feb	0	8.2
11-Feb	0	7.6
12-Feb	0	7.6
13-Feb	0	3.8
14-Feb	0	5.5
15-Feb	0	5.7
16-Feb	0	5.9
17-Feb	0	6.5
18-Feb	0	7.4
19-Feb	0	8.9
20-Feb	0	9.2
21-Feb	0	9.4
22-Feb	0	10.0
23-Feb	0	9.4
24-Feb	0	8.6
25-Feb	0	7.9
26-Feb	0	7.4
27-Feb	0	6.0
28-Feb	0	6.8
29-Feb	0	6.8
1-Mar	0	7.5
2-Mar	0	6.4
3-Mar	0	6.1
4-Mar	0	5.7
5-Mar	0	6.3
6-Mar	0	6.5
7-Mar	0	7.6
8-Mar	0	8.8
9-Mar	0	9.1
10-Mar	0	6.6
11-Mar	0	6.0
12-Mar	0	7.1
13-Mar	0	8.4

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
14-Mar	0	9.8
15-Mar	0	9.2
16-Mar	0	10.6
17-Mar	0	12.6
18-Mar	0	12.4
19-Mar	0	12.7
20-Mar	0	11.9
21-Mar	0	11.2
22-Mar	0	9.3
23-Mar	0	8.9
24-Mar	0	10.5
25-Mar	0	11.6
26-Mar	0	10.1
27-Mar	0	7.7
28-Mar	0	10.2
29-Mar	0	9.9
30-Mar	0	10.8
31-Mar	0	10.4
1-Apr	0	10.4
2-Apr	0	8.6
3-Apr	0	9.7
4-Apr	0	10.4
5-Apr	0	9.8
6-Apr	0	10.7
7-Apr	0	10.0
8-Apr	0	10.6
9-Apr	0	10.2
10-Apr	0	11.7
11-Apr	0	11.5
12-Apr	0	11.9
13-Apr	0	12.3
14-Apr	0	11.7
15-Apr	0	12.8
16-Apr	0	11.7
17-Apr	0	12.0
18-Apr	0.02	11.8
19-Apr	0.02	11.4

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
20-Apr	0.01	11.2
21-Apr	0.02	10.1
22-Apr	0.03	10.4
23-Apr	0.03	9.2
24-Apr	0	9.4
25-Apr	0.01	10.7
26-Apr	0.02	11.1
27-Apr	0.02	11.7
28-Apr	0.01	12.9
29-Apr	0.02	10.5
30-Apr	0.02	12.0
1-May	0.03	12.4
2-May	0.02	12.0
3-May	0.02	12.4
4-May	0	12.1
5-May	0	13.8
6-May	0.02	13.1
7-May	0.02	12.8
8-May	0.02	12.2
9-May	0.01	12.3
10-May	0.01	13.3
11-May	0.02	13.6
12-May	0.01	12.3
13-May	0.01	10.6
14-May	0	9.2
15-May	0.02	9.0
16-May	0.01	8.8
17-May	0.01	10.1
18-May	0.01	10.6
19-May	0.02	11.1
20-May	0	10.4
21-May	0.02	8.4
22-May	0.01	7.9
23-May	0.02	10.8
24-May	0.02	9.4
25-May	0.02	9.1
26-May	0	8.8

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
27-May	0	9.2
28-May	0	20.5
29-May	0	20.8
30-May	0	21.3
31-May	0	19.6
1-Jun	0.01	20.3
2-Jun	0.02	21.1
3-Jun	0.02	20.4
4-Jun	0.01	20.4
5-Jun	0.01	20.8
6-Jun	0.01	21.3
7-Jun	0	22.2
8-Jun	0	21.7
9-Jun	0	22.0
10-Jun	0	23.0
11-Jun	0	24.7
12-Jun	0	25.3
13-Jun	0	23.6
14-Jun	0	23.7
15-Jun	0	24.5
16-Jun	0	24.3
17-Jun	0	17.0
18-Jun	0	24.7
19-Jun	0	24.4
20-Jun	0	23.1
21-Jun	0	22.0
22-Jun	0	22.4
23-Jun	0	20.9
24-Jun	0	23.1
25-Jun	0	24.7
26-Jun	0	24.8
27-Jun	0	23.8
28-Jun	0	25.6
29-Jun	0	25.0
30-Jun	0	24.9
1-Jul	0	24.3
2-Jul	0	23.6

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
3-Jul	0	25.1
4-Jul	0	24.8
5-Jul	0	22.5
6-Jul	0	22.3
7-Jul	0	24.7
8-Jul	0	24.4
9-Jul	0	24.1
10-Jul	0	21.9
11-Jul	0	23.1
12-Jul	0	23.9
13-Jul	0.10	25.0
14-Jul	0	25.5
15-Jul	0	25.7
16-Jul	0	24.9
17-Jul	0	25.6
18-Jul	0	25.3
19-Jul	0	25.1
20-Jul	0	24.4
21-Jul	0	23.4
22-Jul	0	22.8
23-Jul	0	23.5
24-Jul	0.02	23.7
25-Jul	0	24.9
26-Jul	0.02	24.2
27-Jul	0.01	24.2
28-Jul	0	24.2
29-Jul	0	24.4
30-Jul	0	24.4
31-Jul	0	21.3
1-Aug	0	21
2-Aug	0	19
3-Aug	0	19
4-Aug	0	23
5-Aug	0	18
6-Aug	0	17
7-Aug	0	17
8-Aug	0	17

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
9-Aug	0	16
10-Aug	0	16
11-Aug	0	16
12-Aug	0	16
13-Aug	0	16
14-Aug	0	16
15-Aug	0	15
16-Aug	0	15
17-Aug	0	15
18-Aug	0	15
19-Aug	0	15
20-Aug	0	15
21-Aug	0	18
22-Aug	0	18
23-Aug	0	16
24-Aug	0	16
25-Aug	0	16
26-Aug	0	15
27-Aug	0	15
28-Aug	0	15
29-Aug	0	0
30-Aug	0	15
31-Aug	0	15
1-Sep	0	14
2-Sep	0	-
3-Sep	0	14
4-Sep	0	14
5-Sep	0	14
6-Sep	0	14
7-Sep	0	13
8-Sep	0	13
9-Sep	0	13
10-Sep	0	13
11-Sep	0	13
12-Sep	0	13
13-Sep	0	12
14-Sep	0	12

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
15-Sep	0	12
16-Sep	0	12
17-Sep	0	12
18-Sep	0	0
19-Sep	0	12
20-Sep	0	12
21-Sep	0	11
22-Sep	0	12
23-Sep	0	12
24-Sep	0	11
25-Sep	0	11
26-Sep	0	11
27-Sep	0	11
28-Sep	0	11
29-Sep	0	10
30-Sep	0	11
1-Oct	0	11
2-Oct	0	11
3-Oct	0	11
4-Oct	0	11
5-Oct	0	11
6-Oct	0	11
7-Oct	0.01	15
8-Oct	0.01	15
9-Oct	0.01	15
10-Oct	0.01	16
11-Oct	0.01	15
12-Oct	0.01	16
13-Oct	0	16
14-Oct	0.02	15
15-Oct	0.01	15
16-Oct	0	13
17-Oct	0.05	14
18-Oct	0.02	14
19-Oct	0.04	13
20-Oct	0.04	12
21-Oct	0.04	13

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
22-Oct	0.05	14
23-Oct	0.04	14
24-Oct	0.04	13
25-Oct	0.00	13
26-Oct	0.01	11
27-Oct	0	10
28-Oct	0	10
29-Oct	0	11
30-Oct	0	10
31-Oct	0	8
1-Nov	0	7.9
2-Nov	0	8.2
3-Nov	0.01	7.6
4-Nov	0.01	8.2
5-Nov	0.01	8.8
6-Nov	0.01	10.3
7-Nov	0.01	11.6
8-Nov	0.01	10.0
9-Nov	0.01	7.3
10-Nov	0.01	7.2
11-Nov	0.01	7.3
12-Nov	0.04	7.9
13-Nov	0.04	7.9
14-Nov	0.01	8.9
15-Nov	0.01	9.9
16-Nov	0.02	9.4
17-Nov	0.02	10.5
18-Nov	0.01	9.2
19-Nov	0.01	8.8
20-Nov	0.01	8.6
21-Nov	0.01	8.1
22-Nov	0.01	8.0
23-Nov	0.01	8.7
24-Nov	0.01	8.8
25-Nov	0.02	8.6
26-Nov	0.01	7.6
27-Nov	0	6.9

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
28-Nov	0.01	6.7
29-Nov	0.01	7.0
30-Nov	0.01	7.3
1-Dec	0.01	8.23
2-Dec	0	9.37
3-Dec	0.02	9.58
4-Dec	0.01	9.18
5-Dec	0.01	8.56
6-Dec	0.01	8.05
7-Dec	0.01	7.85
8-Dec	0.01	7.74
9-Dec	0	7.20
10-Dec	0.02	7.64
11-Dec	0.01	6.67
12-Dec	0.01	5.19
13-Dec	0.01	5.70
14-Dec	0	6.06
15-Dec	0.02	5.77
16-Dec	0.03	4.74
17-Dec	0.02	5.03
18-Dec	0.02	5.36
19-Dec	0.02	5.32
20-Dec	0.02	4.89
21-Dec	0.01	5.88
22-Dec	0.01	6.02
23-Dec	0.01	6.85
24-Dec	0.01	8.36
25-Dec	0.01	6.95
26-Dec	0.01	6.89
27-Dec	0.01	7.08
28-Dec	0.01	6.87
29-Dec	0.01	7.11
30-Dec	0.01	6.66
31-Dec	0.01	6.29

Table A-4: Four Week Rolling Average (S13L1-007-02)

	TPH (mg/L)	Phenols (mg/L)	TSS (mg/L)	pH	Specific Conductivity (uS/cm)	Daily Chlorine (mg/L)*	Temperature (C)
Max. Average Limit	3.0 mg/L	0.07 mg/L	n/a	6.0-9.0	n/a	n/a	n/a
Jan 1-31	<2.0	<0.0015	1.5	7.58	244	0.013	7.6
Feb 1-29	<2.0	<0.0015	1.4	7.59	248	0.013	7.7
Mar 1-31	<2.0	<0.0015	1.7	8.0	243	0.0	9.1
Apr 1-30	<2.0	<0.0015	1.7	8.0	245.6	0.02*	11.0
May 1-31	<2.0	0.0023	6.5	7.9	282	0.01	12.2
June 1-30	<2.0	0.0039	35.6	7.7	256	0.01*	22.9
July 1-31	<2.0	0.0015	44.2	8.0	270	0.00	24.1
Aug 1-31	<2.0	<0.0015	8.5	8.0	280	0	19
Sept 1-30	-	-	-	-	-	-	-
Oct 1-31	<0.2	<0.0015	18.5	7.7	283	0.01	13
Nov 1-30	<2.0	<0.0015	9.1	7.8	278	0.01	8.4
Dec 1-31	<2.0	0.0016	4.7	7.37	259	0.01	6.9

Table A-5: Quarterly Acute Lethality Data

CPF Outlet (S13L1-007-2)		
Date	Rainbow Trout (% Survival)	Daphnia Magna (% Survival)
Licence Criteria	>50% survival	>50% survival
Q1	100%	100%
Q2	100%	100%
Q3	100%	100%
Q4	100%	100%

Table A-6: Quarterly Inlet Data

SNP S13L1-007-1 (Inlet)	Q1 (mg/L)	Q2 (mg/L)	Q3 (mg/L)	Q4 (mg/L)	YTD Average (mg/L)
pH	6.86	6.90	6.50	6.50	6.69
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	8.8	6	9.1	7.4	7.7
Total Sodium	8.4	6	8.20	7.5	7.6
Dissolved Potassium	0.88	0.80	1	0.82	0.88
Total Potassium	0.89	1.90	0.99	0.84	1.16
Dissolved Sulphate	31	31	34	32	32
Dissolved Chloride	10	7	9.4	9.7	9.0
Dissolved Calcium	26	30	37	28	30
Total Calcium	26	32	36	29	31
Dissolved Magnesium	9	8	10	9	9.1
Total Magnesium	9	8.4	9.2	9.7	9.2
Total Alkalinity	100	96	130	110	109
Specific Conductivity	250	230	280	250	253
Total Suspended Solids	15.00	6.70	3	25	12.3
Total Dissolved Solids	140	140	140	160	145
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.10	<0.10	<0.10	<0.10	<0.10
Total Hardness	100	110	130	110	113

Table A-7: Quarterly Outlet Data

SNP S13L1-007-2 (Outlet)	Q1 (mg/L)	Q2 (mg/L)	Q3 (mg/L)	Q4 (mg/L)	YTD Average (mg/L)
pH	6.87	6.89	7.21	6.58	6.89
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	8.3	7	9.1	7.9	8.0
Total Sodium	8.4	7	8.4	7.8	8.0
Dissolved Potassium	0.84	0.9	1.1	0.91	0.9
Total Potassium	0.88	1.0	1	0.88	0.9
Dissolved Sulphate	30	36	34	32	33
Dissolved Chloride	10	11	10	9.7	10
Dissolved Calcium	25	35	34	29	31
Total Calcium	26	38	31	29	31
Dissolved Magnesium	9	8	9.7	9.5	9.2
Total Magnesium	9	8.9	9	9.9	9.3
Total Alkalinity	85	95	140	110	108
Specific Conductivity	250	260	270	250	258
Total Suspended Solids	<1.0	7.0	16	1.9	8
Total Dissolved Solids	140	180	160	180	165
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.10	<0.10	<0.10	<0.10	<0.10
Total Hardness	100	120	130	110	115

Appendix B Surface Water Runoff Data

Table B-1: 2020 Surface Water Discharge Analytical Results for Category A Locations

	Date	Total Discharge Volume (m ³)	Chlorides (mg/L)	pH	Sheen Y/N
Water Licence Criteria			<500 mg/L	6.0-9.0	N
Mainland					
D-42X	7-May	372	Y	6.5	N
D-42X	8-May	186	Y	6.5	N
D-42X	13-May	90	Y	6	N
D-42X	14-May	144	Y	6	N
Ditch south of marine shack	6-May	124	Y	6.5	N
Ditch south of marine shack	6-May	124	Y	6.5	N
Ditch south of marine shack	7-May	186	Y	6.5	N
Ditch south of marine shack	7-May	186	Y	6.5	N
Ditch south of marine shack	8-May	310	Y	6.5	N
Ditch south of marine shack	8-May	180	Y	6.5	N
Ditch south of marine shack	8-May	180	Y	6.5	N
East of Lower bosworth bridge	6-May	72	Y	6.5	N
LT 11	13-May	-	Y	6	N
LT 11	17-May	-	Y	6	N
LT 11	18-May	-	Y	6	N
LT 11	19-May	-	Y	6	N
LT 11	20-May	-	Y	6	N
LT 11	21-May	-	Y	6	N
LT 11	22-May	-	Y	6	N
West of Lower bosworth bridge	6-May	72	Y	6.5	N
West of Lower bosworth bridge	7-May	72	Y	6.5	N
West of Lower bosworth bridge	8-May	124	Y	6.5	N
LT 11 category A Area	13-Jul	10	0	6	N
Bear Island					
M-44	26-Jun	3	28	7	N
M-46	26-Jun	3	28	7	N

	Date	Total Discharge Volume (m ³)	Chlorides (mg/L)	pH	Sheen Y/N
Water Licence Criteria			<500 mg/L	6.0-9.0	N
M-48	26-Jun	5	28	6	N
N-13	27-Jun	2	28	7	N
N-15	27-Jun	2	28	7	N
N44	26-Jun	2	28	6.5	N
O-36	26-Jun	3	28	6.5	N
P-13	27-Jun	5	28	7	N
Line 128 Excavation	19-Oct	45	0	7.00	N
Line 128 Excavation	20-Oct	30	0	7.00	N
Line 128 Excavation	21-Oct	50	0	7.00	N
Line 128 Excavation	22-Oct	60	0	7.00	N
Line 128 Excavation	23-Oct	75	0	7.00	N
Goose Island					
M-19	30-Jun	10	28	6.5	N
O-14	28-Jun	10	28	6	N
O-17	28-Jun	3	28	6	N
O-18	28-Jun	10	28	6.5	N
O-20	28-Jun	9	28	6.5	N
Q14	30-Jun	2	28	6.5	N
Q17	29-Jun	3	28	6.5	N
T-16	29-Jun	10	28	6.5	N
T-21	28-Jun	10	28	6.5	N
O16	1-Jul	10	0	6	N
O19	1-Jul	10	0	6	N
Q17	1-Jul	2	0	6	N
T11	2-Jul	10	0	6	N
T13	2-Jul	10	0	6	N
N22	3-Jul	10	0	6	N
S14	5-Jul	10	0	6	N
N13	7-Jul	1	0	6	N
N21	7-Jul	8	0	6	N
P13	7-Jul	4	0	6	N
M19	10-Jul	3	0	6	N
O07	10-Jul	10	0	6	N
P09	10-Jul	2	0	6	N
S05	10-Jul	5	0	6	N
T07	10-Jul	4	0	6	N
N18	11-Jul	9	0	6	N
S08	11-Jul	2	0	6	N

	Date	Total Discharge Volume (m ³)	Chlorides (mg/L)	pH	Sheen Y/N
Water Licence Criteria			<500 mg/L	6.0-9.0	N
P22	12-Jul	9	0	6	N
Q15	12-Jul	3	0	6	N
Q10	13-Jul	4	0	6	N
O07	14-Jul	3	0	6	N
R27	14-Jul	9	0	6	N
S06	14-Jul	3	0	6	N
S26	14-Jul	9	0	6	N
T10	14-Jul	3	0	6	N
T23	14-Jul	9	0	6	N
T25	14-Jul	9	0	6	N
T9	14-Jul	3	0	6	N
P17	15-Jul	6	0	6	N
P21	15-Jul	5	0	6	N
R13	15-Jul	4	0	6	N
R15	15-Jul	9	0	6	N
T12	15-Jul	5	0	6	N
T14	15-Jul	5	0	6	N
T15	15-Jul	5	0	6	N
T19	15-Jul	5	0	6	N
L15	17-Jul	4	0	6	N
N15	17-Jul	4	0	6	N
N25	17-Jul	7	0	6	N
N27	17-Jul	3	0	6	N
N23	18-Jul	9	0	6	N
M13	19-Jul	9	0	6	N
M15	19-Jul	9	0	6	N
N14	20-Jul	9	0	6	N
Q12	20-Jul	8	0	6	N

Table B-2: 2020 Surface Water Discharge Analytical Results for Category B Locations

			Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit						5 mg/L	0.14 mg/L	<500	6.0-9.0			
Mainland Areas - May												
CPF Impound Basin	11-May	Start	10,902	<2.0	0.0032	2.3	7.78	25.0	170	340		
	18-May	Mid 1		<2.0	0.0028	4.2	7.85	33.9	240	430		
	21-May	Mid 2	0	3.2	0.0032	13.0	7.84	7.7	240	370		
	24-May	Mid 3		<2.0	0.0440	12.0	7.71	6.2	260	430		
	25-May	Mid 4		<2.0	0.0023	12.0	7.7	2.2	280	440		
	26-May	Mid 5		<2.0	-	-	-	-	-	-		
	27-May	Mid 6		<2.0	-	-	-	-	-	-		
				<2.0	-	-	-	-	-	-		
Retention Pond Diversion Area - Inlet	24-May	Start	0	<2.0	<0.0015	15.0	7.84	1.5	310	460		
	26-May	Mid 1		<2.0	-	-	-	-	-	-		
	26-May	Mid 2		<2.0	-	-	-	-	-	-		
	27-May	Mid 3		<2.0	-	-	-	-	-	-		
	24-May	Start	0	<2.0	<0.0015	12.0	7.7	4.9	250	380		
	25-May	Mid 1		<2.0	-	-	-	-	-	-		
	26-May	Mid 2		<2.0	-	-	-	-	-	-		
	27-May	Mid 3		<2.0	-	-	-	-	-	-		
LT 11	8-May	Start	2,542	<2.0	0.0220	2.3	7.41	2.9	140	180		
	11-May	Mid		<2.0	0.0054	1.5	7.90	7.4	64	170		
	18-May	Mid 2		<2.0	0.0069	4.9	7.55	1.7	170	230		
	25-May	Mid 3		<2.0	0.0037	4.3	7.45	8.2	300	460		
Refinery Inpound Basin	8-May	Start	22,620	<2.0	<0.0075	3.2	7.56	13.0	250	270		
	11-May	Mid 1		<2.0	0.0075	1.9	7.65	3.7	100	220		
	18-May	Mid 2		<2.0	0.0050	12.0	7.91	7.5	170	380		

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	Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit				5 mg/L	0.14 mg/L	<500	6.0-9.0			
	25-May	Mid 3	0	<2.0	0.0033	5.7	7.58	<1.0	340	460
	11-May	Start		<2.0	0.0024	1.5	7.9	7.4	30	220
	18-May	Mid 1		<2.0	0.0048	9.7	8.23	9.4	210	400
	25-May	Mid 2		<2.0	<0.0015	15.0	7.8	6.5	290	490
Mainland Areas - June										
CPF Impound Basin	1-Jun	Mid 7	4088	<2.0	0.0016	10	7.83	1.3	270	510
	8-Jun	Mid 8	1363	<2.0	0.0033	9.5	7.99	7.3	740	1000
	15-Jun	Mid 9	0	<2.0	<0.0015	11	7.54	7.9	1100	1500
	23-Jun	Mid 9		<2.0	<0.0015	9.9	7.70	5.1	1100	1300
LT-11	1-Jun	Mid 4	0							
	8-Jun	Mid 5		<2.0	0.0044	3.4	8.05	25	740	710
	15-Jun	Mid 6		<2.0	<0.0015	6.8	7.96	12	480	780
	23-Jun	Mid 7		<2.0	0.0074	7.1	7.31	2.3	510	650
Refinery Impound Basin	1-Jun	Mid 4	0	<2.0	<0.0015	7.6	7.98	2.9	330	580
	8-Jun	Mid 5	1312	<2.0	0.0066	10	8.27	2.2	420	630
	15-Jun	Mid 6	397	<2.0	0.0021	13	8.32	2.1	380	630
	23-Jun	Mid 7	0	<2.0	0.0041	17	8.02	3.7	480	680
Refinery Waterflood Basin	1-Jun	Mid 3	0	<2.0	<0.0015	23	8.24	2.3	370	750
	8-Jun	Mid 4		<2.0	<0.0015	28	8.46	1.8	460	860
	23-Jun	Mid 6		<2.0	0.0025	26	8.33	<1.0	440	850
	15-Jun	Mid 5		<2.0	0.0018	26	8.34	3.5	490	880
Misc. Mainland Impound Areas - June										
RTK 109	1-Jun	Start	0	<2.0	0.0058	2.6	7.98	<1.0	190	360

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	Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit				5 mg/L	0.14 mg/L	<500	6.0-9.0			
	8-Jun	Mid 1		<2.0	0.0054	3.3	8.15	3.7	260	390
	15-Jun	End		<2.0	0.0086	3.7	7.95	19	660	900
	23-Jun	Start		<2.0	0.0053	3.3	7.78	2.3	530	710
RTK 112	15-Jun	End	0	<2.0	0.0067	37	8.11	3.7	720	1100
RTK 116	15-Jun	End	0	<2.0	0.0084	7.2	7.73	36	470	790
	23-Jun	Start		<2.0	0.0081	20	7.73	3.5	460	680
RTK 119	15-Jun	End	0	<2.0	0.0044	7.2	7.9	4.0	310	560
	23-Jun	Start		<2.0	0.0023	6.2	7.95	1.6	430	600
Tank 102	25-Jun	Start	0	<2.0	0.0026	1.2	8.37	1.3	180	290
Tank 112	1-Jun	Start	0	<2.0	0.0067	7.1	7.83	4.0	180	400
	8-Jun	Mid 1		<2.0	0.0072	9.7	8.19	1.9	250	450
Tank 113	25-Jun	Start	0	<2.0	0.0037	27	8.28	4.6	630	980
Tank 116	1-Jun	Start	0	<2.0	0.067	8.1	7.75	100	180	380
	8-Jun	Mid 1		<2.0	0.0073	10	8.25	2.3	250	430
Tank 119	1-Jun	Start	0	<2.0	0.0080	5.2	8.03	<1.0	150	290
	8-Jun	Mid 1		<2.0	0.0085	5.7	8.13	3.8	200	330
Mainland Areas - July										
CPF Impound Basin	8-Jul	Start	0	<2.0	0.0042	8.8	7.91	6.5	1200	1500
	14-Jul	Mid 1		<2.0	0.0027	9.0	7.40	130	1300	1600
	21-Jul	Mid 2		<2.0	0.0027	8.0	7.60	38	1200	1500
	28-Jul	Mid 3		<2.0	0.0055	9.6	7.90	10	1300	1600
LT-11	8-Jul	Start	0	<2.0	0.0068	7.3	8.32	1.3	460	720
	14-Jul	Mid 1		<2.0	0.0021	7.9	7.75	1.6	490	760

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	Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit				5 mg/L	0.14 mg/L	<500	6.0-9.0			
	21-Jul	Mid 2		<2.0	0.0082	7.2	7.97	3.9	460	740
	28-Jul	Mid 3		<2.0	<0.0015	8.9	7.94	8.1	560	830
Refinery Impound Basin	8-Jul	Start	0	<2.0	0.0018	44	8.12	5	500	720
	14-Jul	Mid 1	1896	<2.0	0.0048	23	7.91	4.7	470	750
	21-Jul	Mid 2	0	<2.0	0.0047	26	8.17	3.5	500	860
	28-Jul	Mid 3		<2.0	0.0027	27	8.29	1.5	480	760
Refinery Waterflood Basin	8-Jul	Start	0	<2.0	0.0019	26	8.48	1.3	490	830
	14-Jul	Mid 1		<2.0	<0.0015	29	8.39	1.5	480	870
	21-Jul	Mid 2		<2.0	0.0035	28	8.40	2.5	450	870
	28-Jul	Mid 3		<2.0	<0.0015	30	8.62	1.3	500	880
Mainland Areas - August										
CPF Impound Basin	4-Aug	Mid 4	0	<2.0	0.0054	8.7	7.57	37	1200	1500
	11-Aug	Mid 5		<2.0	<0.0015	8.2	7.51	39	1300	1600
	18-Aug	Mid 6		<2.0	0.0039	11	7.54	140	1300	1600
	25-Aug	Mid 7		<2.0	<0.0015	12	7.55	140	1300	1700
	31-Aug	Mid 8		<2.0	0.0063	14	7.31	960*	1300	1700
LT-11	4-Aug	Mid 4	0	<2.0	0.0027	8.3	7.80	4.1	490	810
	11-Aug	Mid 5		<2.0	<0.0015	8.4	7.61	5.1	550	850
Refinery Impound Basin	4-Aug	Mid 4	0	<2.0	0.0016	27	8.43	4.7	450	840
	11-Aug	Mid 5	1349	<2.0	<0.0015	28	8.48	3.2	510	860
	18-Aug	Mid 6	0	<2.0	0.0030	29	8.16	6.4	500	830
	25-Aug	Mid 7		<2.0	0.0035	29	8.07	9.9	560	840
	31-Aug	Mid 8		<2.0	0.0038	30	8.31	29	420	850

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	Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit				5 mg/L	0.14 mg/L	<500	6.0-9.0			
Refinery Waterflood Basin	4-Aug	Mid 4	0	<2.0	<0.0015	28	8.17	1.6	430	760
	11-Aug	Mid 5		<2.0	<0.0015	27	8.27	4.3	500	760
	18-Aug	Mid 6		<2.0	0.0018	29	8.41	34	470	880
	25-Aug	Mid 7		<2.0	0.0019	30	8.16	20	530	920
	31-Aug	Mid 8		<2.0	0.0028	31	8.17	61	230	940
Misc. Mainland Impound Areas - August										
RTK 113	15-Aug	Start	0	<2.0	0.0032	25	8.00	6.9	630	970
RTK 105	15-Aug	Start	0	<2.0	0.0030	7.2	8.04	6.7	380	670
CPF Settling Pond	31-Aug	Start	0	<2.0	0.0019	8.7	8.16	9.2	170	300
Mainland Areas - September										
CPF Impound Basin	15-Sep	Start	0	<2.0	<0.0015	19	7.63	4.4	910	1200
	21-Sep	Mid 1		<2.0	0.0046	16	7.91	14	940	1200
CPF Diversion Area	15-Sep	Start	0	<2.0	0.0015	42	7.9	7.5	1000	1400
	21-Sep	Mid 1		<2.0	<0.0015	15	7.74	16	1100	1400
Refinery Impound Basin	10-Sep	Mid 9	711	<2.0	0.0025	33	8.6	6.1	510	950
Refinery Waterflood Basin	10-Sep	Mid 9	0	<2.0	<0.0015	31	8.4	2.3	520	840
	15-Sep	Mid 10		<2.0	<0.0015	37	8.46	1.7	530	960
	21-Sep	Mid 11		<2.0	<0.0015	41	8.48	5	560	980

Appendix C SNP – Groundwater