

# **CANADA-NEWFOUNDLAND and LABRADOR WATER QUALITY MONITORING AGREEMENT**

## **Progress Report 2019-2020**



Water Resources Management Division  
Department of Municipal Affairs and Environment  
St. John's, Newfoundland and Labrador

Atlantic Water Quality Monitoring - Surveillance de  
la qualité de l'eau de l'Atlantique  
Environment and Climate Change Canada -  
Environnement et Changement climatique Canada  
Dartmouth, Nova Scotia

**Introduction**

The following progress report was prepared by NL MAE staff to document progress made on all activities under the *Canada-Newfoundland and Labrador Water Quality Monitoring Agreement* during 2019-2020. This document is formatted to reflect the same layout as the 2019-2020 Annual Work Schedule. Additionally, a table has been added to include activities completed solely by WRMD staff.

**Work Shared Activities for Fiscal Year 2019-2020**

Activity	Responsible Agency	Remarks
<b>Cost Shared and Work-Shared Ambient Water Quality Monitoring and Data Management Activities</b>	Newfoundland and Labrador Department of Municipal Affairs and Environment  <u>and</u>  Environment and Climate Change Canada	Refer to <b>Table 1</b> for sampling details in Newfoundland  Refer to <b>Table 2</b> for sampling details in Labrador  Refer to <b>Table 3</b> for laboratory analysis details  Refer to <b>Table 4</b> for Shared Activities
<b>Additional Cost-Shared Core Activities</b>	Newfoundland and Labrador Department of Municipal Affairs and Environment  <u>and</u>  Environment and Climate Change Canada	Refer to <b>Table 5</b> for Additional Shared Activities
<b>Work-Shared Special Projects</b>	Newfoundland and Labrador Department of Municipal Affairs and Environment  <u>and</u>  Environment and Climate Change Canada	Refer to <b>Table 4</b> for shared activities related to ambient water quality monitoring and data management  Special Projects Refer to <b>Table 5</b> for cost shared core activities  Refer to <b>Table 6</b> for work-shared special projects
<b>WRMD Activities</b>	Newfoundland and Labrador Department of Municipal Affairs and Environment	Refer to <b>Appendix A</b> for WRMD tasks/projects

### Ambient Water Quality Sampling

During 2019-2020, the ambient water quality grab sampling proceeded as outlined in the corresponding Annual Work Schedule. A comparison of the number of samples scheduled vs. the number of samples collected can be seen in **Table 1** and **Table 2**. In the majority of cases, the number of samples actually collected reflected the number of samples scheduled. In some instances, due to Covid-19 shutdowns, scheduling conflicts, human resource limitations and adverse weather conditions some samples were missed.

In the upcoming fiscal year, NL MAE staff will aim to ensure that the number of samples collected reflect the number of samples scheduled as outlined in the Annual Work Schedule 2020-2021.

**Table 1: Provincial Samples Collected in 2019-2020 Fiscal Year in Newfoundland (Island Portion of the Province)**

Station #	Description	Number of Samples Scheduled in 19-20	Number of Samples Collected in 19-20
<b><u>EASTERN REGION</u></b>			
NF02ZK0005	Northeast River near Placentia	5	5
NF02ZL0029	Goulds Brook near Makinsons	5	4 <sup>1</sup>
NF02ZM0004	Waterford River at Commonwealth Avenue	4	4
NF02ZM0009	Waterford River at Kilbride	4	4
NF02ZM0014	Virginia River at the Boulevard	4	4
NF02ZM0015	Quidi Vidi at Outlet	4	4
NF02ZM0016	Rennie's River at Carnell Drive	4	4
NF02ZM0020	Broad Cove Brook near St. Phillips	4	4
NF02ZM0098	Virginia River at headwaters	4	4
NF02ZM0109	Mundy Pond at Outlet	4	4
NF02ZM0175	Waterford River at Brookfield Rd.	4	4
NF02ZM0176	South Brook at Mouth	4	4
NF02ZM0177	Rennie's River at Portugal Cove Road	4	4
NF02ZM0178	Learys Brook at Prince Phillip Drive	10	9 <sup>1</sup>
NF02ZM0179	Tributary to Virginia River at Guzzwell Drive	4	4

Station #	Description	Number of Samples Scheduled in 19-20	Number of Samples Collected in 19-20
NF02ZM0180	Virginia River at Newfoundland Drive	4	4
NF02ZM0181	Waterford River at Blackhead Road	10	9 <sup>1</sup>
NF02ZM0182	Waterford River at Bremigans Pond Dam	4	4
NF02ZM0183	Kelligrews River at Kelliview Crescent	4	4
NF02ZM0185	South Brook at Headwaters	4	4
NF02ZM0294	Manuels River above Manuels Access Road	4	4
NF02ZM0359	Paddy's Pond at Outlet	4	3 <sup>1</sup>
NF02ZN0004	Salmonier River at St. Catherines	4	4
<b><u>CENTRAL REGION</u></b>			
NF02YO0001	Exploits River at Grand Falls	4	3 <sup>1</sup>
NF02YO0020	Exploits River at Aspen Brook	4	3 <sup>1</sup>
NF02YO0107	Exploits River near Millertown	4	3 <sup>1</sup>
NF02YO0128	Exploits River below Grand Falls	4	3 <sup>1</sup>
NF02YO0142	Corduroy Brook near Centennial Park	4	3 <sup>1</sup>
NF02YO0143	Exploits River at Bond Bridge	4	3 <sup>1</sup>
NF02YQ0030	Gander River at Appleton	4	3 <sup>1</sup>
NF02YQ0072	Careless Brook at Resource Road Steel Bridge	4	3 <sup>1</sup>
NF02YS0001	Terra Nova River at Terra Nova	4	3 <sup>1</sup>
NF02YS0011	Terra Nova River at Spencer Bridge	4	3 <sup>1</sup>
NF02YS0083	Northwest River at Terra Nova National Park	4	3 <sup>1</sup>
<b><u>WESTERN REGION</u></b>			
NF02YE0004	Portland Creek at Route 430	4	4
NF02YE0005	Western Brook at Route 430	5	5
NF02YG0001	Main River at Route 420	5	5

<b>Station #</b>	<b>Description</b>	<b>Number of Samples Scheduled in 19-20</b>	<b>Number of Samples Collected in 19-20</b>
NF02YL0106	South Brook below TCH	4	4
NF02YG0020	Eagle Mountain Brook below Eagle Mountain Pond	4	3
NF02YH0018	Lomond River at Route 431	4	4
NF02YJ0004	Pinchgut Brook at TCH	10	9
NF02YK0022	Humber Canal at Main Dam Road	4	4
NF02YL0011	Humber River at Little Falls Bridge	4	3
NF02YL0012	Humber River at Humber Village Bridge	10	8
NF02YL0013	Corner Brook at Margaret Bowater Park	4	4
NF02YL0029	Wild Cove Brook at Route 440	4	4
NF02YN0001	Lloyds River at Route 480	5	5
NF02YN0043	Peter Stride's Lake at Route 780	4	4
NF02ZA0006	Grand Codroy River below Overfall Brook	4	4
NF02ZC0020	Buck Lake on Route 480	4	4

Notes:

1. One additional sample was collected but was not able to be sent to the Laboratory for analysis due to COVID-19 shutdown of the Laboratory.
2. Total number of samples collected in 2019-20 does include duplicate samples. The total does not include bottle blanks.
3. Total number of samples planned for 2019-20 for Eastern region was 106; 103 were sampled, plus 8 duplicates and 4 trip blanks.
4. Total number of samples planned for 2019-20 for Central region was 44; 37 were sampled, plus 3 duplicates and 3 trip blanks.
5. Total number of samples planned for 2019-20 for Western region was 79; 74 were sampled, plus 8 duplicates and 4 trip blanks.

**Table 2: Northern Samples Collected in 2019-2020 Fiscal Year in Labrador**

Station #	Description	Number of Samples Scheduled in 19-20	Number of Samples Collected in 19-20
NF02XA0001	Little Mecatina River above Lac Fourmont	4	4
NF03NF0013	Ugjoktok River below Harp Lake	4	5
NF03OA0020	Ashuanipi River at Ferguson Bay	4	4
NF03OC0012	Atikonak River above Panchia Lake	4	3
NF03OD0011	East Metchin River at TLH	4	3
NF03OD0012	Wilson River East Branch	4	3
NF03OE0001	Churchill River Above Upper Muskrat Falls	4	2
NF03OE0050	Churchill River 6.15kms below Lower Muskrat Falls	4	4
NF03OE0029	Churchill River above Grizzle Rapids	4	4
NF03OE0030	Minipi River below Minipi Lake	4	3
NF03OE0032	Pinus River above TLH	4	4
NF03OE0033	Big Pond Brook below Big Pond	4	4
NF03OE0035	Dominion Lake Outflow	4	4
NF03OE0037	Cache River at TLH	4	3
NF03PB0025	Naskaupi River below Naskaupi Lake	4	5
NF03PB0028	Cape Caribou River at Grand Lake	4	4
NF03PB0029	Grand Lake Outflow at North West River	4	4
NF03PB0030	Seal Lake at Narrows	4	4
NF03PB0032	Susan River North of Beaver River	4	4
NF03PB0037	Wuchusk Lake at Naskaupi River Inflow	4	4
NF03QA0044	Carter Basin Outflow	4	4
NF03QA0045	Kenamu River near Mouth	4	4
NF03QC0001	Eagle River above Falls	4	3
NF03QC0002	Alexis River near Port Hope Simpson	4	3
NF03XB0018	Tributary to St. Augustin River	4	3

Notes:

1. Total number of samples collected in 2019-20 does include duplicate samples. The total does not include bottle blanks.
2. Total number of samples planned for 2019-20 for Labrador region was 100; 92 were sampled, plus 5 duplicates and 3 trip blanks.

### Ambient Water Quality Analysis

During 2019-2020 analytical service for major ions, physic-chemical, and major ions analyses were conducted at ALET and metals analyses at NLET. All shipping/analysis were carried out as agreed upon in the Annual Work Schedule 2019-2020 as seen in **Table 3**.

**Table 3: Analytical Parameters, Holding Times and Schemas for 2019-2020**

Schema Name	Parameter	Holding Times (recommended by ALET)
<b>MAJOR IONS</b>		
M_Alkalinity	Alkalinity	14 days
M_Anions	Chloride	28 days
	Sulphate	28 days
M_Metals_TR ICO-OES	Calcium	180 days
	Magnesium	180 days
	Sodium	180 days
	Potassium	180 days
<b>PHYSICAL</b>		
M_pH auto	pH	24 hours
M_Conductivity	Conductivity	28 days
M_Colour	Colourv - apparent	48 hours*
M_Turbidity	Turbidity	48 hours
<b>NUTRIENTS</b>		
M-Anions	Nitrate	24 hours*
M_TN	Total Nitrogen	28 days
M_TP	Total Phosphorus	28 days
M_TOC	TOC	28 days
<b>METALS</b>		
TM2004/T27W	Total Metals-27 elements*	6 months (analyzed at NLET)

\*27 Metals include:

aluminum	bismuth	iron	nickel	uranium
antimony	cadmium	lanthanum	rubidium	vanadium
arsenic	cobalt	lead	selenium	zinc
barium	copper	lithium	silver	
beryllium	chromium	manganese	strontium	
boron	gallium	molybdenum	thallium	

### Ambient Water Quality Monitoring and Data Management/Reporting

During 2019-2020, significant effort from both EC and NL ENVC was put into ensuring the Agreement data was accessible in a timely manner to any potential end-users of this water quality information. Numerous products were developed to help make the water quality information more user-friendly. Status of each task can be seen in **Table 4 & 5**.

**Table 4: Ambient Water Quality Monitoring and Data Management Activities (Cost-Shared and Work-Shared)**

	<b>Management Activities</b>	<b>Lead Agency</b>	<b>Progress Evaluation</b>
<b>Water Quality Sampling and Analysis</b>	Collection of water samples under WQMA program	NL MAE	See Table 1 and 2 for list of samples scheduled and collected.
	Entering field data onto field sheets and subsequent submission to laboratory	NL MAE	This has been completed and up to date for 2019-2020.
	Laboratory Analysis and Quality Control Processes	ECCC	All procedures remained the same in 2019-2020.
<b>Data Management</b>	Processing and Loading of WQ analytical data	ECCC	This has been completed and up to date for 2019-2020.
	Accessibility/Availability of NL WQMA Dataset	ECCC	Datasets were provided by ECCC to NL in September 2019 and March 2020. Additionally, monthly updates to the Open Data Portal included data from AT0215.
<b>Data Management Special Projects</b>	Data Verification and Validation of Sample/Masurement Data	ECCC _____ NL MAE	Partially completed. Detailed plan for data verification and validation will be developed by WRMD in 2019-2020.
	Data extraction tools development and updates	ECCC _____ NL MAE	No new data extraction tools were developed due to the on-going process to procure a new Data Management Solution for all WQMS data. That new solution (to be procured in 2020-21) will include data extraction tools.



**Table 5: Additional Core Activities 2019-2020 (Cost-Shared)**

Project	Activity	Responsible Agency	Progress Evaluation
<b>Canadian Aquatic Biomonitoring Network (CABIN)</b>	Monitoring of benthic invertebrates at selected water bodies (reference sites, core CESI sites and annual sites) for maintenance of the long-term reference network in support of the Atlantic Reference Approach Model	NL MAE	Three annual CABIN sites were sampled in 2019.
	Baseline Report on Reference Invertebrate Assemblages in NL	ECCC NL MAE	No progress due to no technical expertise with ECCC to evaluate.
	Share spatial data with EC, for use in the reference model	NL MAE	This task is ongoing as new data becomes available each year.
	Field certification and training (as needed)	NL MAE	No training provided as there was none requested.
	Develop CABIN reference model and associated tools	ECCC	ECCC's Watershed Hydrology and Ecology Research Division. It will be available end of 2021.  Continued calibration and testing of Atlantic Canada model by EC, WRMD and partners.
	Prepare course/presentation on how to look at data in Atlantic	ECCC	Planned for 2021-22.
<b>Canadian Environmental Sustainability Indicators (CESI)</b>	Compile, analyse and interpret water quality data at core CESI stations according to CESI protocols	NL MAE	This has been completed and up to date for 2019-2020.
	Update CANAL metadata website for current year's CESI data	NL MAE	Drivers of WQI scores and rankings updated every year to CANAL WQI Comments section.

	Final report validating/contributing to CESI core stations review for longer term WQI national reporting	NL MAE	This was completed for 2019-2020.
	QA/QC of submitted data/results and report to the public on the web page	ECCC	This has been completed and up to date for 2019-2020.
	CESI WQI Error Fact Sheet	NL MAE	Final version of the fact sheet developed and sent to ECCC.
<b>Modifications/Improvements to CESI WQI Calculator</b>	Troubleshooting support and corresponding update in CESI Calculator coding.	NL MAE	Updates to CESI WQI calculator were documented in the ongoing Excel spreadsheet maintained and updated by WRMD.  Two workshops (one within conference call between ECCC and provincial partners) were hosted between ECCC and WRMD to demonstrate the equation builder.
	Update of CESI Calculator Help Manual as required	NL MAE	A separate “Equation Builder” pdf document was provided demonstrating the usage and functionality of the equation builder.  Updated the CESI Error Fact Sheet a pdf document that helps user fixing commonly generated calculator errors.
	Investigate how Trends Analysis can be incorporated into the CESI calculator.	ECCC	Work underway to change the Trend calculation was paused before it could be completed. It was decided to wait until it was completed before investigating how to incorporate the Trend calculation into the Calculator.
	Inclusion of French version of CESI Help Manual.	ECCC	Due to complexity of the CESI computer code this activity was pushed to 2021-22
<b>Modifications/Improvements to CESI WQI Calculator</b>	Create an additional module to the WQI calculator to allow users to modify equations.	NL MAE	An equation builder module is created using Visual Studio 2017 coding. Front end forms were developed allowing users to enter equations.  The calculator with equation builder was tested by WRMD. Additional modification were made to the guideline for Ammonia. These modifications includes back end coding and front end forms.

<b>Modifications/Improvements to CESI WQI Calculator</b>	Upgrade the calculator to the 2017 Visual Studio.	NL MAE	CESI WQI calculator has been upgraded to Visual Studio 2017.
<b>Chemical Management Plan</b>	Special water sampling at a select station on the Waterford River	NL MAE	CMP water samples were collected quarterly for Nonylphenols and Nonylphenol Ethoxylates (NP-NPE) and Perfluorochemicals (PFC) from Waterford River from April 1, 2019 to March 31, 2020.
<b>Labrador Remote Station Sampling</b>	Labrador water samples are collected by both federal and provincial staff in support of CESI reporting (for more remote core sites).	ECCC _____ NL MAE	Northern sampling and analysis proceeded as outlined in the Annual Work Schedule 2019-2020. See Table 2.

**Table 6: Special Projects (Work Shared)**

<b>Project</b>	<b>Activity</b>	<b>Responsible Agency</b>	<b>Progress Evaluation</b>
<b>Monitoring Network Evaluation and Optimization</b>	This on-going project focuses on evaluating the network on a regular basis to ensure that the partner’s monitoring objectives are being met and that the network will be sustainable in the long-term.	ECCC _____ NL MAE	<p><b>Risk-Based Adaptive Management Approach (station level, basin level, statistical tools):</b></p> <p><u>Environment and Climate Change Canada</u></p> <ul style="list-style-type: none"> <li>- ECCC will continue to provide guidance and advice as required and work with NL MAE to optimize approach for NL waters.</li> <li>- ECCC will work towards providing access to the data and tools for use by external partners.</li> <li>- Power analysis report will be completed and provided to NL.</li> <li>- Sampling frequencies will be evaluated on an on-going basis.</li> <li>- Update NL MAE on Network of Networks design.</li> </ul> <p><u>NL Department of Municipal Affairs and Environment</u></p> <ul style="list-style-type: none"> <li>- NL MAE will add Risk-Based Assessment results to each station profile page on CANAL. Results have been shared on the Departmental main webpage.</li> <li>- NL MAE will continue to investigate statistical approaches to optimize the monitoring network within the province – hierarchal clustering (for classification) and Entropy analysis (for prioritization)</li> </ul>

			<p>being done for quantity sites and then quality sites). A draft report completed for quantity sites using HC and Entropy analysis.</p> <ul style="list-style-type: none"> <li>- NL MAE will publish the Trend Analysis Report for NL stations, comparing results of older data with more recent data. A technical report is completed and reviewed by ECCC. NL MAE currently in the process of incorporating ECCC comments. Additional trend analysis will be carried out and documented for other stations that have the required amount of data available.</li> <li>- ECCC and NL MAE will collaboratively review all results and the possible publications will be explored.</li> <li>- Investigate how the water quantity indicator can be combined with the water quality indicator to provide a more integrated and holistic approach to assessing waterbodies.</li> </ul>
<b>Real-time instrumentation special projects</b>	In-situ water quality/quantity/climate monitoring using a mobile environmental monitoring platform (MEMP) on a need-basis across the province.	<p>ECCC</p> <hr/> <p>NL MAE</p>	MEMP was not deployed in 2019-2020 due to custodian leaving MAE. Custodian will be reassigned for 2020-2021.
	Sharing of instrumentation purchase, deployment and maintenance expenses for monitoring stations of joint interest.	<p>ECCC</p> <hr/> <p>NL MAE</p>	YSI Multisonde loaned to NLMAE in 2017 is scheduled to be replaced in 2023.
<b>Extrapolation of non-measured data at select real-time stations</b>	Development of regression models to extrapolate water quality parameters from real-time measurements of related parameters	<p>ECCC</p> <hr/> <p>NL MAE</p>	<p><u>NL Department of Municipal Affairs and Environment</u></p> <ul style="list-style-type: none"> <li>- Regression models to compare total suspended solids (TSS) concentration vs. real-time turbidity measurements at stations once enough grab samples (at least 30) data is being collected to develop the model and additional three years of samples to validate the models.</li> <li>- Initial technical report of TSS-Turbidity regression models currently developed (Churchill River sites) and currently under review.</li> <li>- Graphs for extrapolated parameters for additional stations will be added to for selected sites to NL MAE data management systems and real time web page reporting (Currently done for Leary's Brook</li> </ul>

			<p>and Waterford River at Kilbride for Ionic Concentration parameters using Conductivity).</p> <ul style="list-style-type: none"><li>- Research on forecasting of real-time water temperature to obtain 7-day daily temperatures. (Initial R script developed to forecast 7-day temperature using ARIMA model).</li></ul> <p><u>Environment and Climate Change Canada</u></p> <ul style="list-style-type: none"><li>- ECCC will continue to provide technical advice and review on the approach considering its national applicability.</li></ul>
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In fiscal year 2019-2020, select WRMD staff attended and presented at many conferences and training initiatives. They are as follow:

- GOES DCS Training – April 2019
- MET Station Maintenance Training – June 2019
- Aquarius Demo – June 2019
- UAV Pilot Training – September 2019
- Ice and Water Monitoring Workshop Presentation – September 2019
- Kister Demo – November 2019
- Hydrolab PTE Training – March 2020
- Standard First Aid

**Table 7: Industry Monthly and Annual Real-Time Water Quality Reports Completed for 2019-2020**

<b>Partners</b>	<b>Monthly Deployment Reports</b>	<b>Annual Deployment Reports</b>
Canada Fluorspar Inc	May 2019 – Jul 2019 Jul 2019 – Aug 2019 Aug 2019 – Oct 2019 Oct 2019 – Dec 2019 *Removed Winter Months	May 2019 – Dec 2019
Duck Pond Operations (TECK)	Nov 2018 – May 2019 May 2019 – Jul 2019 Jul 2019 – Sep 2019 Sep 2019 – Dec 2019 Dec 2019 – May 2020	Jan 2019 – Dec 2019
Nalcor	May 2019 – Jul 2019 Jul 2019 – Sep 2019 Sep 2019 – Oct 2019 Oct 2019 *Removed Winter Months	May 2019 – Oct 2019
Northern Harvest Smolt Ltd	New installation. Installed in July 2019	Annual Report 2019
IOC	Jun 2019 – Jul 2019 Jul 2019 – Aug 2019 Aug 2019 – Oct 2019 *Removed Winter Months	Jun 2019 – Oct 2019
Rambler Metals and Mining Inc	Jul 2019 – Sep 2019 Sep 2019 – Nov 2019 *Removed Winter Months	Jul 2019 – Nov 2019
Tacora Resources (formally Wabush Mines)	Jun 2019 – Jul 2019 Jul 2019 – Aug 2019 Aug 2019 – Oct 2019 *Removed Winter Months	Jun 2019 – Oct 2019
Tata Steel Minerals Canada Limited (TSMC)	Jun 2019 – Jul 2019 Jul 2019 – Aug 2019 Aug 2019 – Oct 2019 *Removed Winter Months	Jun 2019 – Oct 2019
Vale (Long Harbor)	Mar 2019 – Apr 2019 Apr 2019 – May 2019 May 2019 – Jul 2019 Jul 2019 – Sep 2019 Sep 2019 – Nov 2019 Nov 2019 – Jan 2020 Jan 2020 – Mar 2020 Mar 2020 – Apr 2020	Jan 2019 – Dec 2019
Vale (Voisey's Bay)	Jun 2019 – Jul 2019 Jul 2019 – Aug 2019 Aug 2019 – Sep 2019 Sep 2019 – Oct 2019 *Removed Winter Months	Jun 2019 – Oct 2019

**Table 8: WRMD Monthly Real-Time Water Quality Reports Completed for 2019-2020**

WRMD Network	Monthly Deployment Reports
Leary's Brook at Prince Philip Drive	Feb 2019 – Apr 2019 Apr 2019 Apr 2019 – Jun 2019 Jun 2019 – Jul 2019 Jul 2019 – Sep 2019 Set 2019 – Oct 2019 Nov 2019 – Jan 2020 Jan 2020 – Mar 2020 Mar 2020 – Apr 2020
Humber River at Humber Village Bridge	Not deployed 2019-2020
Paddys Pond	Nov 2018 – Apr 2019 Apr 2019 – Jun 2019 Jun 2019 – Aug 2019 *Instrument reassigned
Waterford River at Kilbride	Dec 2018 – Apr 2019 May 2019 - Jun 2019 Jun 2019 - Aug 2019 Aug 2019 - May 2020



## **Conclusion**

A significant amount of work took place under the *Canada-Newfoundland and Labrador Water Quality Monitoring Agreement* for fiscal year 2019-2020. The number of available products from this program continues to grow annually.

NL ENVC would like to take this opportunity to thank our federal counterparts (EC Atlantic Region) for their on-going support and commitment in ensuring the delivery of the outcomes/products under the *Canada-Newfoundland and Labrador Water Quality Monitoring Agreement*.



Appendix A  
Additional WRMD Activities 2019-2020

<b>Project</b>	<b>Activity</b>	<b>Responsible Agency</b>	<b>Progress Evaluation</b>
<b>CANAL/Site Documentation Database/Bacteriological Database</b>	Updating of the Site Documentation Database	Newfoundland and Labrador Department of Municipal Affairs and Environment	Updates to the Site Documentation Database are completed as needed. New GIS layers for Labrador was completed.
	Calculation of the Water Quality Index scores	Newfoundland and Labrador Department of Municipal Affairs and Environment	In 2019-2020, CESI reporting was completed on 2016-2018 data.
<b>Ambient Monitoring Activities</b>	Blue-Green Algae Monitoring	Newfoundland and Labrador Department of Municipal Affairs and Environment	Data is collected each summer on a “needs basis”, basically in response to public requests. Monitoring was conducted at Millers Pond (PCSP) in 2019. WRMD partnered with National Research Council (NRC) Canada to take additional samples during the same time period which were analyzed at NRC. A BGA report was prepared for 2019. The report is on the NL MAE webpage.
<b>Technical Documents (WQMA)</b>	Updating of Water Quality Monitoring Sampling Manual	Newfoundland and Labrador Department of Municipal Affairs and Environment	Manual was updated in December 2019 and posted to the NL MAE webpage. This manual will be updated as required.
	Field Sampling Tablet Application	Newfoundland and Labrador Department of Municipal Affairs and Environment	An application for digital field sheets using a tablet was developed.

	Updating of Contour Maps	Newfoundland and Labrador Department of Municipal Affairs and Environment	Version 3 of the 43 water quality contour maps underwent quality review. These will be finalized in 2020-2021.
	Water Quality Calculator	Newfoundland and Labrador Department of Municipal Affairs and Environment	Provided feedback and troubleshoot with numerous users (within Canada and international) to run the calculator.
	Water Quality Trends Report	Newfoundland and Labrador Department of Municipal Affairs and Environment	Addressed the reviews put forward by federal partners and modified the trend report. Report will be finalized in 2020-21.
	Water Index (Quality/Quantity) Calculator	Newfoundland and Labrador Department of Municipal Affairs and Environment	Added the code behind the front end forms and which enabled the WQI and confidence interval functionalities.
	Network Evaluation	Newfoundland and Labrador Department of Municipal Affairs and Environment	Developed the R code to perform the network evaluation which includes classification based on cluster evaluation and prioritization based on entropy analysis.
<b>Real-Time Related Projects</b>	Negotiating/renewals of Memorandum of Agreements with industry – New MOAs and Renewals	Newfoundland and Labrador Department of Municipal Affairs and Environment	<p>Grieg NL Nurseries Ltd signed a new MoA in February 2020.</p> <p>Northern Harvest Smolt Ltd signed a new MoA in June 2019.</p> <p>Vale Voisey’s Bay renewed MoA to March 31, 2025.</p> <p>Teck Duck Pond Mines renewed MoA to March 31, 2025.</p>

			TSMC renewed MoA under March 31, 2025.
	Development of ADRS Console	Newfoundland and Labrador Department of Municipal Affairs and Environment	A new feature was added to enable alternate elevation datums to be viewed such as CGVD2013.
	Piloting of Drone Technology	Newfoundland and Labrador Department of Municipal Affairs and Environment	Three flights completed for dam inspection on Paradise River Arch Dam and related structures. One new pilot trained in 2019-2020.
	Redeployment of Buoy System in Lake Melville	Newfoundland and Labrador Department of Municipal Affairs and Environment	Issues with the modem and solar panels prevented the buoy from being deployed in 2019-2020. New equipment was ordered in winter 2020.
	Development of ADRS Console	Newfoundland and Labrador Department of Municipal Affairs and Environment	This is a multi-year project. This was completed in 2019-2020.
	Real-time Instrumentation in-house Testing and Servicing	Newfoundland and Labrador Department of Municipal Affairs and Environment	This is an on-going task. Testing and evaluation generally takes place from Jan to April/May and involves a complete review of every water quality instruments in the network. There were 59 repairs conducted in 2019. An additional 11 were repaired by an outside vendor due to WRMD staff vacancies.
	Report on the Comparison of TSS Concentration vs Real-time Turbidity Readings	Newfoundland and Labrador Department of Municipal Affairs and Environment	Continue collecting turbidity and TSS data for all real time stations across the province to identify which stations consists the required number of samples for model development.

	Training of Industry Partners	Newfoundland and Labrador Department of Municipal Affairs and Environment	No industry training was requested in 2019-2020.
<b>Wetlands Inventory Partnership</b>	Inventory and classification project with multiple partners to aid in wetlands inventory and classification systems	Newfoundland and Labrador Department of Municipal Affairs and Environment	Wetland inventory datasets were produced and shared by two research groups associated with this project: (i) an wetland inventory map of Newfoundland (Mahdianpari <i>et al.</i> 2018), and (ii) an wetland inventory map of Newfoundland and Labrador (Amani <i>et al.</i> 2019)
<b>Education/Outreach</b>	Outreach	Newfoundland and Labrador Department of Municipal Affairs and Environment	Participated in Take Kids to Work Day events at the Rooms.