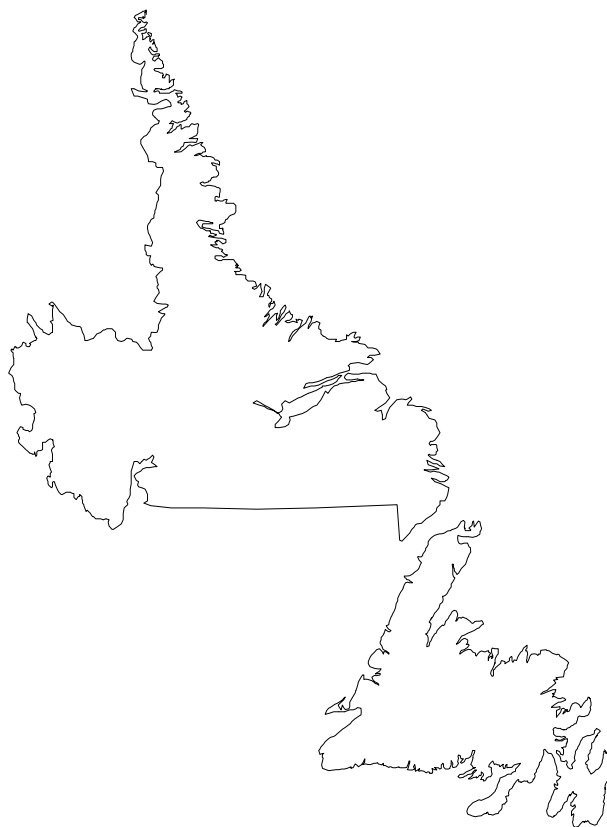


CANADA-NEWFOUNDLAND and LABRADOR WATER QUALITY MONITORING AGREEMENT

Progress Report 2015-2016



Water Resources Management Division
Department of Environment & Conservation
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

Introduction

The following progress report was prepared by NL ENVC staff to document progress made on all activities under the *Canada-Newfoundland and Labrador Water Quality Monitoring Agreement* during 2015-2016. This document is formatted to reflect the same layout as the 2015-2016 Annual Work Schedule. Additionally, a table has been added to include activities completed solely by NL ENVC staff.

Work Shared Activities for Fiscal Year 2015-2016

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

Ambient Water Quality Sampling

During 2015-2016, 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 scheduling conflicts, human resource limitations and adverse weather conditions some samples were missed.

In the upcoming fiscal year, NL ENVC staff will aim to ensure that the number of samples collected reflect the number of samples scheduled as outlined in the Annual Work Schedule 2016-2017.

Table 1: Provincial Samples Collected in 2015-2016 Fiscal Year in Newfoundland (Island Portion of the Province)

| Station # | Description | Number of Samples Scheduled in 15-16 | Number of Samples Collected in 15-16 |
|------------------------------|----------------------------------------------|--------------------------------------|--------------------------------------|
| <u>EASTERN REGION</u> | | | |
| NF02ZK0005 | Northeast River near Placentia | 8 | 8 |
| NF02ZL0029 | Goulds Brook near Makinsons | 5 | 5 |
| 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 | 5 | 5 |
| NF02ZM0179 | Tributary to Virginia River at Guzwell Drive | 4 | 4 |

| Station # | Description | Number of Samples Scheduled in 15-16 | Number of Samples Collected in 15-16 |
|------------------------------|----------------------------------------------|--------------------------------------|--------------------------------------|
| NF02ZM0180 | Virginia River at Newfoundland Drive | 4 | 4 |
| NF02ZM0181 | Waterford River at Blackhead Road | 5 | 5 |
| 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 | 4 |
| NF02ZN0004 | Salmonier River at St. Catherines | 4 | 4 |
| <u>CENTRAL REGION</u> | | | |
| NF02YM0003 | Indian Brook at Route 390 | 4 | 4 |
| NF02YM0004 | South West Brook at Baie Verte | 4 | 4 |
| NF02YO0001 | Exploits River at Grand Falls | 4 | 4 |
| NF02YO0020 | Exploits River at Aspen Brook | 4 | 4 |
| NF02YO0107 | Exploits River at Millertown | 5 | 5 |
| NF02YO0121 | Peter's River near Botwood | 4 | 4 |
| NF02YO0128 | Exploits River below Grand Falls | 4 | 4 |
| NF02YO0142 | Corduroy Brook near Centennial Park | 4 | 4 |
| NF02YO0143 | Exploits River at Bond Bridge | 4 | 4 |
| NF02YO0189 | Joe's Lake at Outlet | 4 | 4 |
| NF02YQ0006 | Northwest Gander River at Highway Bridge | 4 | 4 |
| NF02YQ0030 | Gander River at Appleton | 8 | 8 |
| NF02YQ0072 | Careless Brook at Resource Road Steel Bridge | 4 | 4 |
| NF02YR0001 | Pound Cove Brook at Route 330 | 4 | 4 |
| NF02YS0001 | Terra Nova River at Terra Nova | 4 | 4 |

| Station # | Description | Number of Samples Scheduled in 15-16 | Number of Samples Collected in 15-16 |
|------------------------------|------------------------------------------------|--------------------------------------|--------------------------------------|
| NF02YS0011 | Terra Nova River at Spencer Bridge | 5 | 5 |
| NF02YS0083 | Northwest River at Terra Nova National Park | 4 | 4 |
| <u>WESTERN REGION</u> | | | |
| NF02YE0004 | Portland Creek at Route 430 | 4 | 4 |
| NF02YE0005 | Western Brook at Route 430 | 5 | 5 |
| NF02YG0001 | Main River at Route 420 | 5 | 5 |
| NF02YG0009 | Main River at Paradise Pool | 4 | 1 |
| NF02YG0020 | Eagle Mountain Brook below Eagle Mountain Pond | 4 | 2 |
| NF02YH0018 | Lomond River at Route 431 | 4 | 4 |
| NF02YJ0004 | Pinchgut Brook at TCH | 8 | 6 |
| NF02YK0022 | Humber Canal at Main Dam Road | 4 | 4 |
| NF02YL0011 | Humber River at Little Falls Bridge | 4 | 4 |
| NF02YL0012 | Humber River at Humber Village Bridge | 5 | 5 |
| 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 870 | 4 | 4 |
| NF02ZA0006 | Grand Codroy River below Overfall Brook | 4 | 3 |
| NF02ZC0020 | Buck Lake on Route 480 | 4 | 4 |

Notes:

1. Total number of samples collected in 2015-16 does include duplicates samples. The total does not include bottle blanks.
2. Total number of samples planned for 2015-16 for Eastern region was 99; 99 were sampled plus 8 duplicates and 6 trip blanks.
3. Total number of samples planned for 2015-16 for Central region was 74; 74 were sampled plus 4 duplicates and 5 trip blanks.
4. Total number of samples planned for 2015-16 for Western region was 72; 64 were sampled plus 2 duplicates and 5 trip blanks.

Table 2: Northern Samples Collected in 2015-2016 Fiscal Year in Labrador

| Station # | Description | Number of Samples Scheduled in 15-16 | Number of Samples Collected in 15-16 |
|-------------------------------|-------------------------------------------|--------------------------------------|--------------------------------------|
| <u>LABRADOR REGION</u> | | | |
| NF02XA0001 | Little Mecatina River above Lac Fourmont | 4 | 4 |
| NF03NF0013 | Ugjoktok River below Harp Lake | 5 | 3 |
| NF03OC0012 | Atikonak River above Panchia Lake | 5 | 4 |
| NF03OD0011 | East Metchin River at TLH | 4 | 4 |
| NF03OE0001 | Churchill River Above Upper Muskrat Falls | 4 | 5 |
| NF03OE0030 | Minipi River below Minipi Lake | 5 | 5 |
| NF03OE0032 | Pinus River above TLH | 4 | 4 |
| NF03OE0033 | Big Pond Brook below Big Pond | 4 | 3 |
| NF03PB0025 | Naskaupi River below Naskaupi Lake | 5 | 2 |
| NF03QC0001 | Eagle River above Falls | 5 | 4 |
| NF03QC0002 | Alexis River near Port Hope Simpson | 4 | 4 |
| NF03OD0012 | Wilson River East Branch | 4 | 4 |
| NF03OE0035 | Dominion Lake Outflow | 4 | 4 |
| NF03OE0037 | Cache River at TLH | 4 | 4 |
| NF03PB0028 | Cape Caribou River at Grand Lake | 4 | 2 |
| NF03PB0029 | Grand Lake Outflow at North West River | 4 | 4 |
| NF03PB0030 | Seal Lake at Narrows | 4 | 1 |
| NF03PB0032 | Susan River North of Beaver River | 4 | 3 |
| NF03PB0037 | Wuchusk Lake at Naskaupi River Inflow | 4 | 1 |
| NF03QA0044 | Carter Basin Outflow | 4 | 4 |
| NF03QA0045 | Kenamu River near Mouth | 4 | 4 |
| NF03OA0020 | Ashuanipi River at Ferguson Bay | 4 | 4 |

Notes:

1. Total number of samples collected in 2015-16 does include duplicates samples. The total does not include bottle blanks.
2. Total number of samples planned for 2015-16 for Labrador region was 93; 77 were sampled plus 7 duplicates and 3 trip blanks.

Ambient Water Quality Analysis

During 2015-2016 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 2015-2016 as seen in **Table 3**.

Table 3: Analytical Parameters, Holding Times and Schemas for 2015-2016

| Schema Name | Parameter | Holding Times (recommended by ALET) |
|---------------------|---------------------------|-------------------------------------|
| MAJOR IONS | | |
| 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 |
| PHYSICAL | | |
| M_pH auto | pH | 24 hours |
| M_Conductivity | Conductivity | 28 days |
| M_Colour | Colourv - apparent | 48 hours* |
| M_Turbidity | Turbidity | 48 hours |
| NUTRIENTS | | |
| M-Anions | Nitrate | 24 hours* |
| M_TN | Total Nitrogen | 28 days |
| M_TP | Total Phosphorus | 28 days |
| M_DOC | DOC | 28 days |
| METALS | | |
| 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 2015-2016, significant effort from both ECCC 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)

| Management Activities | | Lead Agency | Progress Evaluation |
|--------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water Quality Sampling and Analysis | Collection of water samples under WQMA program and field data submission to laboratory | Newfoundland and Labrador Department of Environment and Conservation | See Table 1 and 2 for list of samples scheduled and collected. |
| | Laboratory Analysis and Quality Control Processes | Environment and Climate Change Canada | 314 discrete + 21 QA/QC samples were analysed for 52/53 separate analytes. All data were verified at the time of sample reception and upon insertion to NAQUA. |
| Data Management | Processing and Loading of WQ analytical data | Environment and Climate Change Canada | This has been completed and up to date for 2015-2016. |
| | Accessibility/Availability of NL WQMA Dataset | Environment and Climate Change Canada | Data from NAQUA was provided to NL in September 2015 and March 2016. |
| Data Management Special Projects | Data Verification and Validation of Sample/Masurement Data | Environment and Climate Change Canada Newfoundland and Labrador Department of Environment and Conservation | NL ENVC developed QAQC checklist for Verification process. Based on assessment of the ECCC's Eval tool, the following tools were integrated into Envirotrend: Graphical display of station parameter data; Using 5 th and 95 th Percentile to identify percentage of the total data falls into this list; Compare parameter data with flow data from the nearest hydrometric station. |

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| | Data extraction tools development and updates | <p>Environment and Climate Change Canada</p> <hr/> <p>Newfoundland and Labrador Department of Environment and Conservation</p> | The GENIE was tested during 2015-2016 fiscal year and no improvement was noted in terms of user friendliness, limitation in data display and longer time taken to download data in some cases generating error messages. |
| | Automated Water Quality Monitoring Shared Activities | <p>Environment and Climate Change Canada</p> <hr/> <p>Newfoundland and Labrador Department of Environment and Conservation</p> | <p>After vandalism destroyed the MEMP in 2014, ECCC loaned a new MEMP unit to NL ENVC. Unit was transferred November 2015 and retrofitting of the unit continued into 2016.</p> <p>ECCC continue to loan NL ENVC a Webcam for Leary's Brook station.</p> |

Table 5: Additional Core Activities 2015-2016 (Cost-Shared)

| Project | Activity | Responsible Agency | Progress Evaluation |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Canadian Aquatic Biomonitoring Network (CABIN) | 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 | Newfoundland and Labrador Department of Environment and Conservation | Three CABIN sites were sampled in 2015: Northeast River, Careless Cove Brook and Pinchgut Brook. Information on CABIN was added to the NL ENVC website for easy public access. WRMD sampled one site on the Waterford River in partnership with Northeast Avalon ACAP (NAACAP) – Year 1. |
| | Baseline Report on Reference Invertebrate Assemblages in NL | Environment and Climate Change Canada Newfoundland and Labrador Department of Environment and Conservation | This has been deferred until fiscal year 2016-2017. |
| | Share spatial data with ECCC, for use in the reference model | Newfoundland and Labrador Department of Environment and Conservation | This task is ongoing as new data becomes available each year. |
| | Develop CABIN reference model and associated tools | Environment and Climate Change Canada | Continued calibration and testing of Atlantic Canada model by ECCC, NL ENVC and partners. |
| | Field Training | Newfoundland and Labrador Department of Environment and Conservation | NL ENVC provides CABIN field training in NL as required. In 2015-2016, the following CABIN Training Sessions were held: <ul style="list-style-type: none"> • Labrador: September 9-10, HVGB - 3 participants |

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| | | | <ul style="list-style-type: none"> • Western: September 23, CB – 2 participants • Eastern: September 17, STJ – 1 participant |
| Canadian Environmental Sustainability Indicators (CESI) | Compile, analyse and interpret water quality data at core CESI stations according to CESI protocols | Newfoundland and Labrador Department of Environment and Conservation | This has been completed and up to date for 2015-2016. |
| | Produce an overview document indicating issues driving the ratings and spatial trends. | Newfoundland and Labrador Department of Environment and Conservation | 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 | Newfoundland and Labrador Department of Environment and Conservation | This was completed for 2015-2016. |
| | QA/QC of submitted data/results and report to the public on the web page | Environment and Climate Change Canada | This has been completed and up to date for 2015-2016. |
| Modifications/Improvements to CESI WQI Calculator | Evaluate CESI Calculator and document solutions to issues encountered | Newfoundland and Labrador Department of Environment and Conservation | Updates to CESI WQI calculator were documented in the ongoing Excel spreadsheet maintained and updated by NL ENVC. ECCC is updated and made aware of the changes. Follow-up to improvements in the new CESI (CCME look alike) calculator. Upgrade the current calculator to Microsoft Visual Studio 2013 (upgraded from Microsoft Visual Studio 2008). |
| | Publication on the development and application of the CESI WQI Calculator | <p>Environment and Climate Change Canada</p> <hr/> <p>Newfoundland and Labrador Department of Environment and Conservation</p> | A technical paper was developed by NL ENVC and was reviewed by ECCC. All reviews was incorporated in the paper by NL ENVC. |

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| | Investigate how Trend Analysis can be incorporated into the CESI Calculator | Environment and Climate Change Canada Newfoundland and Labrador Department of Environment and Conservation | A proposal was made by NL ENVC to incorporate the Envirotrend trend method into the CESI Calculator. ECCC was looking into development of their own trend method. Updates have been completed on Parameter Influence that identify how each parameter influence the WQI score. |
| | Make appropriate improvements to the help manual | Newfoundland and Labrador Department of Environment and Conservation | All design and functionality changes have been reflected in the updated Help Manual for the CESI Calculator. The Help Manual has been added as a part of the new installation package for the CESI Calculator and forwarded to ECCC along with the setup components for the 2015-2016 fiscal year. Additionally, a fact sheet document developed by NL ENVC to identify and resolve commonly encountered CESI bugs were updated. |
| | Host webinar relating to CESI Calculator if required | Environment and Climate Change Canada | Webinar was not required in 2015-2016. |
| Chemical Management Plan | Special water sampling at a select station on the Waterford River | Newfoundland and Labrador Department of Environment and Conservation | CMP water samples were collected quarterly for Triclosan, Bisphenyl-A (BPA), Dysprosium (DY3), Nonylphenols and Nonylphenol Ethoxylates (NP-NPE) and Perfluorochemicals (PFC) from Waterford River from April 1, 2015 to March 31, 2016. |
| Labrador Remote Station Sampling | Labrador water samples are collected by both federal and provincial staff in support of CESI reporting (for more remote core sites). | Environment and Climate Change Canada Newfoundland and Labrador Department of Environment and Conservation | Northern sampling and analysis proceeded as outlined in the Annual Work Schedule 2015-2016. See Table 2. |

Table 6: Special Projects (Work Shared)

| Project | Activity | Responsible Agency | Progress Evaluation |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Monitoring Network Evaluation and Optimization</p> | <p>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.</p> | <p>Environment and Climate Change Canada</p> <hr/> <p>Newfoundland and Labrador Department of Environment and Conservation</p> | <p>Risk-Based Assessment (station level): Additional stations were ranked and forwarded to ECCC as RBA database. All RBA ranked station were used to create a map where individual station RBA ranking were displayed as pie chart. The maps were also converted to kmz file to be displayed in the web as Google Map files.</p> <p>Risk-Based Assessment (basin level): Four individual maps were created to display RBA station rankings for the four NL regions (Eastern, Central Western and Labrador). A webpage template were developed to display all station’s RBA ranking along with the Google Map files. Another template (in adobe) were developed for individual stations RBA score to be incorporated into the CANAL website.</p> <p>Power Analysis: Work by ECCC is complete. The R code for Power Analysis was obtained from ECCC and looked for the possibility of Power Analysis in the Envirotrend Application.</p> <p>Trend Analysis: Updated graphing functionalities of Envirotrend and keep incorporating updated Enviodat data into the application. The application was installed into several ENVC staffs computer for testing. Based on testing results additional improvement in design and data accessibility was added into the application.</p> <p>Trend Analysis Report: A comprehensive trend analysis report were partially completed using Envirotrend tool. Comparison were made to identify changes in trend results with additional data.</p> <p>In 2015-2016, work on adding RBA to the NL ENVC website began and drafts were completed for incorporation.</p> |
| <p>Real-time Instrumentation Special Projects</p> | <p>In-site water quality/quantity/climate monitoring using a mobile environmental monitoring</p> | <p>Environment and Climate Change Canada</p> <hr/> | <p>After vandalism destroyed the MEMP in 2014, ECCC loaned a new MEMP unit to NL ENVC. Unit was transferred November 2015 and retrofitting of the unit continued into 2016.</p> |

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| | platform (MEMP) on a need-basis across the province | Newfoundland and Labrador Department of Environment and Conservation | |
| | Sharing of instrumentation purchases and maintenance expenses for real-time monitoring stations of joint interest | Environment and Climate Change Canada <hr/> Newfoundland and Labrador Department of Environment and Conservation | Equipment is in use by NL ENVC and ECCC advised should the hut or instrumentation require any maintenance or repairs. NL ENVC shared test results of UAV & Buoy projects with ECCC as requested. |
| Extrapolation of non-measured data at select real-time stations | Development of regression models to extrapolate water quality parameters from real-time measurements of related parameters. | Environment and Climate Change Canada <hr/> Newfoundland and Labrador Department of Environment and Conservation | Utilized model equation for predicting ionic concentrations (sodium, calcium, chloride and sulphate) based on real time conductivity the parameters were graphed and displayed under the Real-time Water Quality Monitoring Program website for three station. The predicted parameters graphed alongside the actual parameters to identify the model accuracy. |
| Development of Real-time Water Quality Monitoring QA/QC products | Development and auditing of technical reports for real-time and automated water quality monitoring activities. | Environment and Climate Change Canada <hr/> Newfoundland and Labrador Department of Environment and Conservation | All monthly and annual real-time reports were reviewed and posted NL ENVC webpage. A document was started to streamline station auditing procedures in 2015-2016. |

In fiscal year 2015-2016, select WRMD staff attended training initiatives and presented at conferences. They are as follow:

- Chainsaw Awareness Training – July 2015
- Chainsaw Safety Training – December 2015
- Water Research Exchange - May 2015
- Snowmobile Safety – February 2016
- Wetland Classification Training (Nature Conservancy of Canada) – August 2015
- WHIMIS 2015
- Standard First Aid

Table 7: Industry Monthly and Annual Real-Time Water Quality Reports Completed for 2015-2016

| Partners | Monthly Deployment Reports | Annual Deployment Reports |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Vale (Voisey's Bay) | Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 *Removed Winter Months | Jun 2015 – Oct 2015 |
| Vale (Long Harbor) | Mar 2015 – Apr 2015 Apr 2015 – May 2015 May 2015 – Jun 2015 Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Oct 2015 Oct 2015 – Nov 2015 Nov 2015 – Dec 2015 Dec 2015 – Jan 2016 Jan 2016 – Feb 2016 Feb 2016 – Mar 2016 Mar 2016 – Apr 2016 | Jan 2015 – Dec 2015 |
| Duck Pond Operations (TECK) | Jan 2015 – May 2015 May 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 Oct 2015 – Nov 2015 Nov 2015 – Dec 2015 Jan 2016 – May 2016 | Jan 2015 – Dec 2015 |
| Tacora Resources (formally Wabush Mines) | Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 *Removed Winter Months | Jun 2015 – Oct 2015 |
| Tata Steel Minerals Canada Limited (TSMC) | Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 *Removed Winter Months | Jun 2015 – Oct 2015 |
| Labrador Iron Mines | Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 Aug 2015 – Oct 2015 *Removed and discontinued | Jun 2015 – Oct 2014 |
| Nalcor | May 2015 – Jun 2015 Jun 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 | May 2015 – Nov 2015 |

| | | |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| | Oct 2015 – Nov 2015 *Removed Winter Months | |
| City of St. John's | Mar 2015 – Apr 2015 Apr 2015 – Jun 2015 Jun 2015 – Jul 2015 Jul 2015 – Sep 2015 Sep 2015 – Oct 2015 Oct 2015 – Nov 2015 *Removed and discontinued | Jan 2015 – Nov 2015 |

Table 8: NL ENVC Monthly Real-Time Water Quality Reports Completed for 2015-2016

| NL ENVC Network | Monthly Deployment Reports |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leary's Brook at Prince Philip Drive | Mar 2015 – Apr 2015 Apr 2015 – Jun 2015 Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Sep 2015 Sep 2015 – Oct 2015 Oct 2015 – Nov 2015 Nov 2015 – Dec 2015 Dec 2015 – Jan 2016 Jan 2016 – Feb 2016 Feb 2016 – Mar 2016 |
| Humber River at Humber Village Bridge | Mar 2015 – Jun 2015 Jun 2015 – Sep 2015 Sep 2015 – Dec 2015 Dec 2015 – Apr 2016 |
| Paddys Pond | Dec 2014 – Jun 2015 Jun 2015 – Jul 2015 Jul 2015 – Aug 2015 Aug 2015 – Oct 2015 Oct 2015 - Nov 2015 Nov 2015 – Dec 2015 *Removed Winter Months |
| Waterford River at Kilbride | Apr 2015 – Jun 2015 Jun 2015 – Aug 2015 Aug 2015 – Oct 2015 Oct 2015 – Nov 2015 Nov 2015 – Dec 2015 Jan 2016 – Feb 2016 Feb 2016 – Mar 2016 |

Conclusion

A significant amount of work took place under the *Canada-Newfoundland and Labrador Water Quality Monitoring Agreement* for fiscal year 2015-2016. The number of available products from this program continues to grow annually. Activities for 2016-2017 will be clearly outlined in the upcoming Annual Work Schedule and Divisional Work Plan.

NL ENVC would like to thank our federal counterparts (ECCC 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 NL ENVC Activities 2015-2016

| Project | Activity | Responsible Agency | Progress Evaluation |
|-------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CANAL/Site Documentation Database/Bacteriological Database | Updating of the Site Documentation Database | Newfoundland and Labrador Department of Environment and Conservation | <p>Updates to the Site Documentation Database are completed as needed. An upload of the updates to the database will be done yearly.</p> <p>In 2015-2016, NL ENVC's CANAL website was redesigned to include CABIN sites and metadata collected by NL ENVC.</p> <p>Station names were updated on CANAL as part of the Nomenclature Standardization project.</p> |
| | Calculation of the Water Quality Index scores | Newfoundland and Labrador Department of Environment and Conservation | In 2015-2016, CESI reporting was completed on 2011-2013 data, with updated scores added to CANAL along with relevant interpretive comments. |
| Ambient Monitoring Activities | Blue-Green Algae Monitoring | Newfoundland and Labrador Department of Environment and Conservation | Data is collected each summer on a "needs basis", in response to public requests. Monitoring was conducted at Millers Pond (PCSP) and Great Pond (Torbay) in 2015. A BGA report was prepared which includes all years of data from 2007-2015. The report is on the NL ENVC webpage. Subsequent years will have an annual report. |
| Technical Documents (WQMA) | Updating of Water Quality Monitoring Agreement Web Site | Newfoundland and Labrador Department of Environment and Conservation | This web site has been updated. It will continue to be updated as needed. In 2015-2016, improvements were made to include CABIN stations. |
| | Updating of WQMA Sampling Manual | Newfoundland and Labrador Department of Environment and Conservation | Development of a WQMA Sampling Manual continued in 2015-2016 with work progressing on Data Verification. |

| | | | |
|-----------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Updating of Contour Maps | Newfoundland and Labrador Department of Environment and Conservation | In 2015-2016, work progressed on contour maps with research into methods. In October, data from a draft trends report was provided for the generation of draft contour maps. Refinement of the data, mapping process and review are ongoing. |
| | Delineation of Watersheds | Newfoundland and Labrador Department of Environment and Conservation | The final version of the report, <i>An Approach to Watershed Delineation, Implemented by the Water Resources Division</i> , was completed on March 3, 2016. |
| Real-Time Related Projects | Audit real-time stations visits/meet with clients | Newfoundland and Labrador Department of Environment and Conservation | Numerous meetings were held between NL ENVC and select industry clients as follows: - Nalcor Energy (May 2015; Sept 2015; Dec 2015); Iron Ore Company of Canada (May 2015; Oct 2015; Jan 2016); Labrador Iron Mines (April 2015); Vale-Long Harbour Project (June 2015; quarterly Community Liaison Committee meetings). Additional conference calls and email correspondence aided in open communication between NL ENVC and industry clients throughout 2015-2016. |
| | Negotiating/renewals of Memorandum of Agreements with industry – New MOAs and Renewals | Newfoundland and Labrador Department of Environment and Conservation | <ul style="list-style-type: none"> - City of St. John’s MoA was not renewed and stations were decommissioned November 2015. - Canada Fluorspar Ltd MoA was drafted March 2016 but not finalized. - Iron Ore Company of Canada signed an amendment/extension expiring March 31, 2021. - Churchill Falls (Labrador) Corporation Limited (CFLCo) signed an extension of the MOA in September 2015. |

| | | | |
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| | | | <ul style="list-style-type: none"> - Labrador Iron Mines continued operation of one station in 2015, but this station will be decommissioned in Spring 2016 as project on hold indefinitely. - Nalcor Energy/NL ENVC began negotiations for changes to the RT network. - Vale Voiseys Bay signed and amendment/extension expiring March 31, 2020. - Vale Long Harbour signed an MoA extension expiry March 31, 2021. - Wabush Mines signed an MoA extension to March 31, 2017. - Tata Steel Minerals Canada signed an extension of the MOA to March 31, 2018. |
| | Research and Development of New Technologies | Newfoundland and Labrador Department of Environment and Conservation | <p>Year 2 of data collection for comparison study of three multiparameter instruments was conducted at Paddy’s Pond station: YSI 6600V2, YSI Exo2 & Hydrolab HL4. Report to be completed in 2016-2017.</p> <p>Completed two UAV missions for proof of concept in digital elevation models.</p> <p>The Lake Melville buoy was installed in Summer 2015. The buoy sustained hull damage. Will be repaired and redeployed in 2016.</p> |
| | LCD Screen Display | Newfoundland and Labrador Department of Environment and Conservation | Programming was completed in 2015-2016, but the project was terminated due to fiscal restraints. |
| | Quarterly Update of Temperature Probes | Newfoundland and Labrador Department | Quarterly updates of temperature probes were conducted and information relayed to WSC for replacement. |

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| | | of Environment and Conservation | |
| | Real-time Instrumentation in-house Testing and Servicing | Newfoundland and Labrador Department of Environment and Conservation | 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 instrument in the network. There were 74 repairs conducted in 2015. |
| | Updating/Populating of Inventory, Calibration and Evaluation Database (ICED) | Newfoundland and Labrador Department of Environment and Conservation | To improve PTE workflow, it was agreed in February 2015 that going forward, staff were to use ICED in an effort to go paperless and ensure consistency. In 2015-2016, the 'Submit PTE Feature' was added to improve tracking of instrument issues and failures. |
| | Incorporation of QA/QCed data into ADRS | Newfoundland and Labrador Department of Environment and Conservation | Application beta tested in 2015-16. |
| | Investigation of the use of control charts as a QA/QC measure on real-time data | Newfoundland and Labrador Department of Environment and Conservation | Initial investigation and research into the use of control charts was conducted in 2015-2016. |
| | Review of QA/QC Ranking Categories | Newfoundland and Labrador Department of Environment and Conservation | Graphical and uncertainty analysis was performed to identify whether limiting the number of blanks, duplicates and triplicates would affect the QA/QC of data. |
| | Training of Industry Partners | Newfoundland and Labrador Department of Environment and Conservation | Refresher training with Voisey's Bay Environmental Coordinator occurred on June 14, 2016. |
| | Implementing predicted parameters into real-time graphs | Newfoundland and Labrador Department of Environment and Conservation | Site specific predicted parameters were implemented. |

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| | Development of Shiny Application | Newfoundland and Labrador Department of Environment and Conservation | Application for dealing with data gaps in real-time data was completed in 2015-2106. A training video was also developed. |
| Technical Documents (RTWQ) | Report on International Status of Real-time Monitoring Programs | Newfoundland and Labrador Department of Environment and Conservation | This report has not been completed. Will continue in fiscal year 2015-2016. |
| | Updating of RTWQ Sampling Manual | Newfoundland and Labrador Department of Environment and Conservation | This is updated annually as required. In 2015-2016, the ICED database was added to the manual as part of the workflow to ensure consistency. |
| | 10 year RTWQ report for Vale, Newfoundland and Labrador – Voisey’s Bay | Newfoundland and Labrador Department of Environment and Conservation | Final report completed and provided to Vale on March 31, 2016. |
| | Performance test and evaluation (PTE) protocols manual | Newfoundland and Labrador Department of Environment and Conservation | Manual completed but will be a living document. Updates will be made to procedures/protocols of the PTE process as improvement are made with lab space and additional training. |
| Application of Earth Observation for Water Quality Monitoring | Monitor Changes in Turbidity and TSS along the Churchill River | Newfoundland and Labrador Department of Environment and Conservation | A GIS shape file of the Churchill River outline was created in July 2015. |
| Wetlands Inventory Partnership | Inventory and classification project with multiple partners to aid in wetlands inventory and classification system, | Newfoundland and Labrador Department of Environment and Conservation | Worked in cooperation with the Eastern Habitat Joint Venture wetlands committee regarding the mapping and development of a provincial-wide wetlands inventory. Provided government data (e.g., satellite imagery of the Humber River watershed and GIS wetland layers of CBS and Torbay), with C-CORE inventory developers. |

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| | | | Helped organize and conduct a field campaign to survey 54 wetlands in the Avalon pilot site. |
| Automatic Data Retrieval System (ADRS) | Upgrades/Maintenance to ADRS as needed | Newfoundland and Labrador Department of Environment and Conservation | This task is on-going. |
| | Improvements/Upgrades to ADRS Desktop Search Engine | Newfoundland and Labrador Department of Environment and Conservation | This task is on-going. |
| Education/Outreach | Educational Displays | Newfoundland and Labrador Department of Environment and Conservation | During fiscal year 2015-2016, an education/outreach page was added to the NL ENVC website including downloadable handouts. Educational presentations or displays included: <ul style="list-style-type: none"> • World Water Day display Corner Brook • PEGNL Bridge Day 2016 (St. John's) • Presentations at Marine Institute on CABIN, WQI/CESI, RT • Field Days with MUN students |
| | Weird Stuff in Water | Newfoundland and Labrador Department of Environment and Conservation | Initial draft completed in 2015-2016 and disseminated for review. Staff continue to gather relevant photos. |