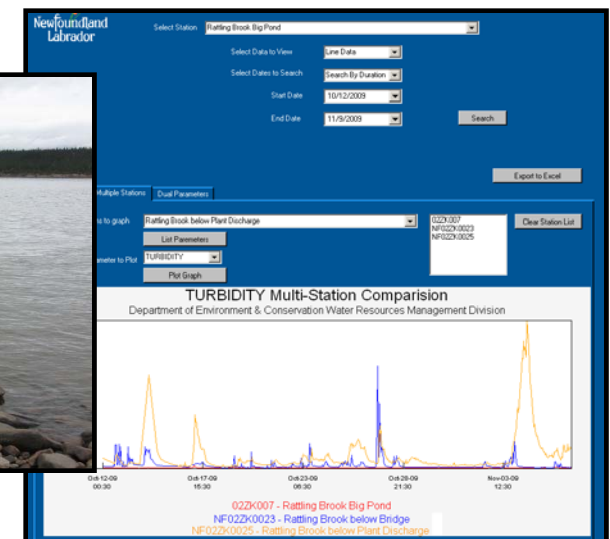
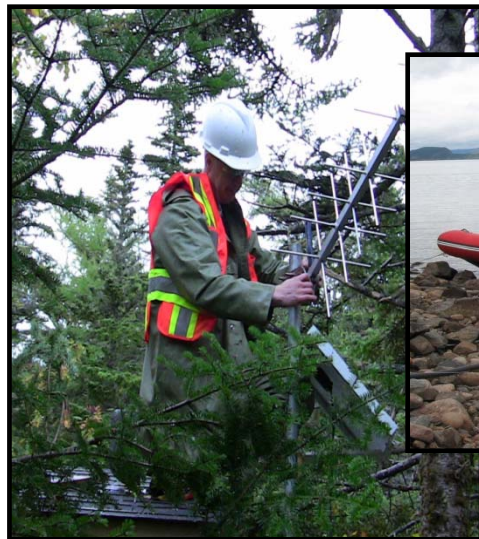




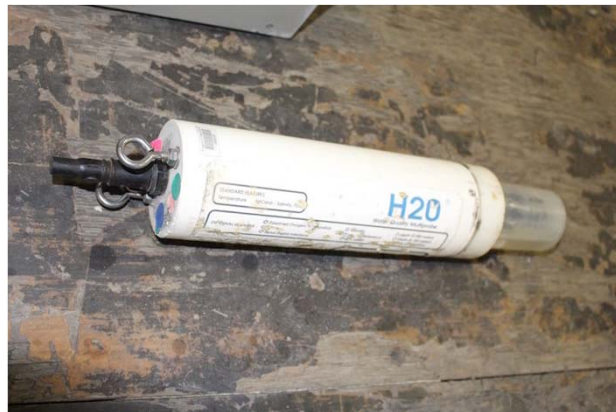
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Real-Time Water Quality Monitoring Network

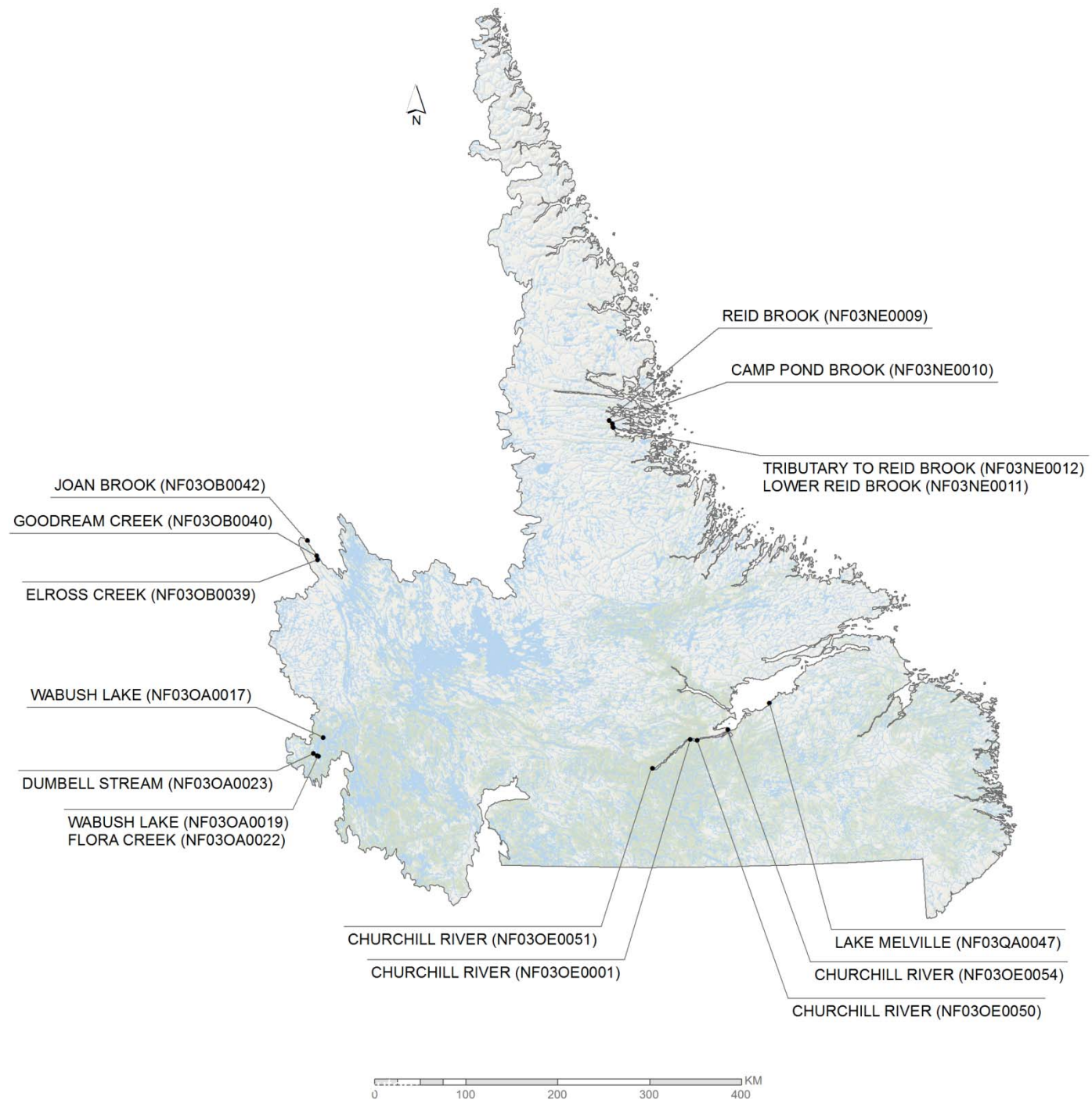


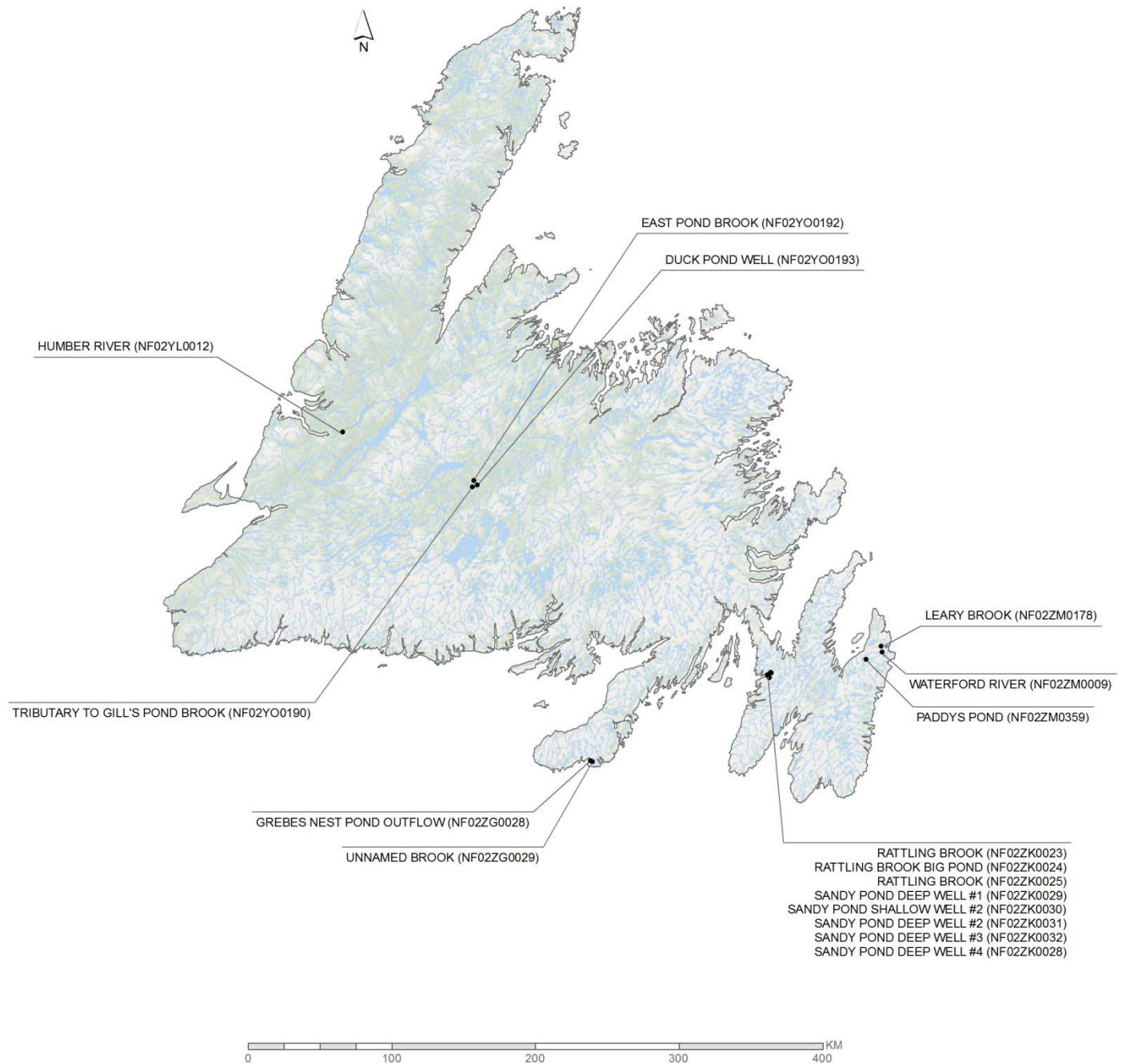
Our History to Now



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Real-Time in NL



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Expansion

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Expansion



Expansion

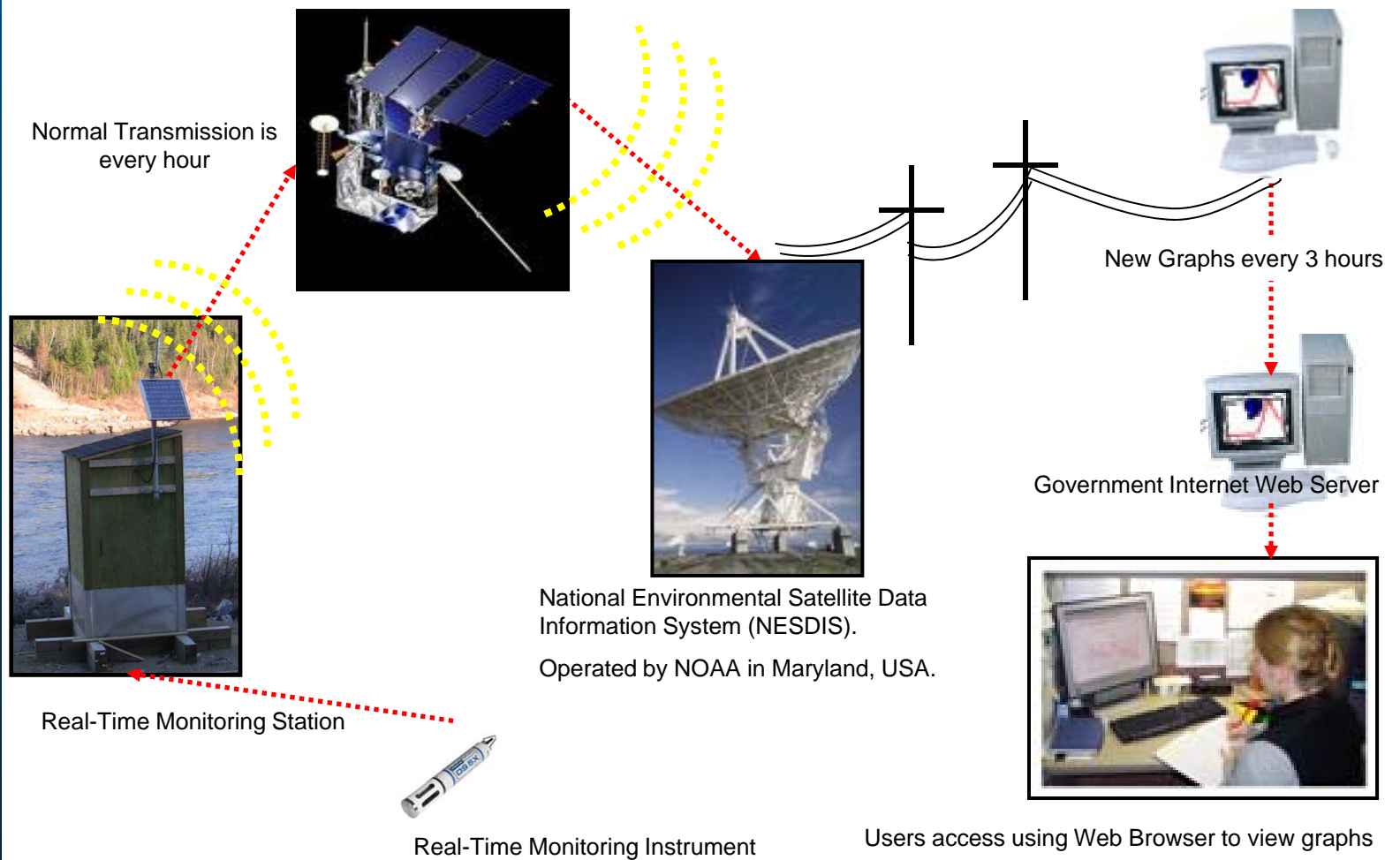
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Components: Telemetry

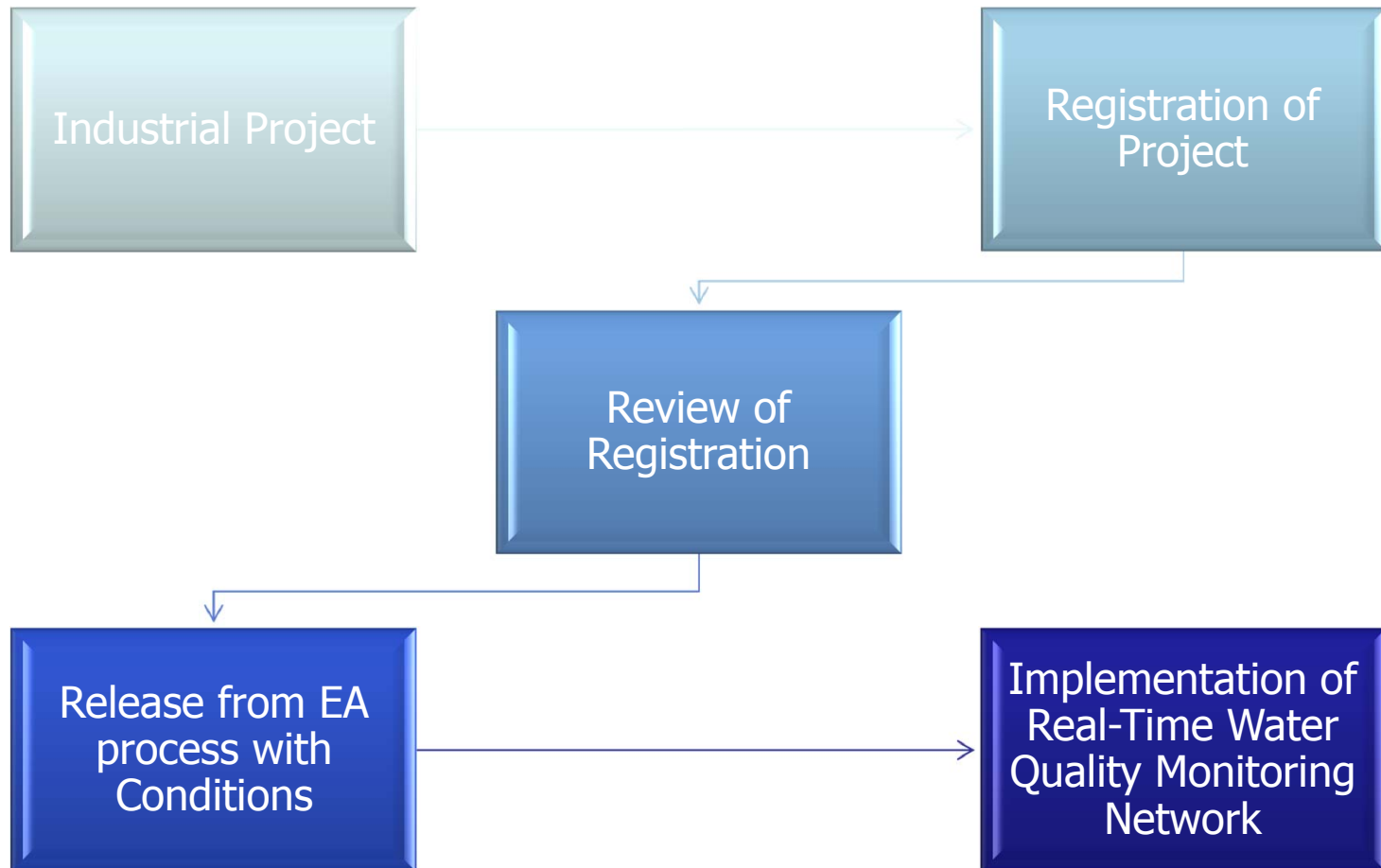
- Datalogging and Communication



Partner Approach

- Industrial
- Environmental Assessment process
 - Input sought from WRMD
 - WRMD gives recommendations regarding monitoring of at-risk water bodies
- Release may be contingent on installation of monitoring station/network

Partner Approach



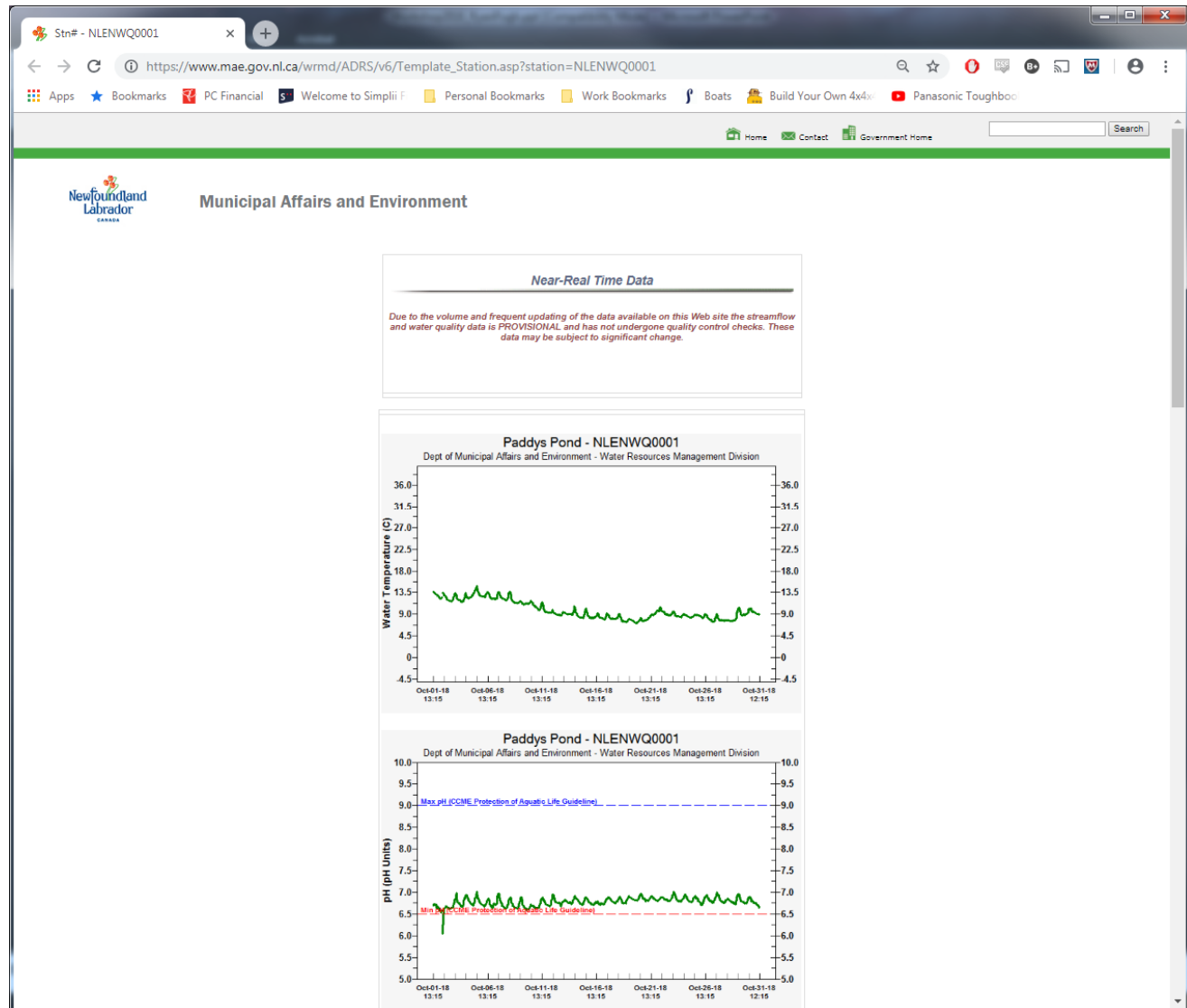
Partner Approach

- Memorandum of Agreement
 - Outlines responsibilities of each party
 - Proponent purchases equipment and capital costs
 - WRMD executes the installation of equipment, commissions the station, and is responsible for operation and maintenance

Partner Approach

- Network is beneficial to WRMD and industry partner:
 - WRMD is assured of environmental monitoring
 - Partner receives data and reports
 - Partner is not on the hook for additional workload
 - Public can access graphs and reports for accountability

Partner Approach



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Problems Abound

- Despite our best intentions and efforts, things will go awry.



Problems Abound

- Vandalism



■ Hu



Problems Aboard

- Floods



Problems Aboard

- Wind



Problems Abound

- Wildlife



Problems Abound

- Really, really bad drivers



Problems Abound

- Human Error
 - Strangely, no pics to be found...
- Manufacturer defects
- Equipment Failure

Avoiding Problems

- Training
- Fail Forward – learn from your mistakes
 - Standard Operating Procedures
 - Thorough documentation
- Re-training

Avoiding Problems

- Some examples of our Processes
- Maintenance and Calibration of Instrumentation
 - Instruments must be calibrated in a controlled space
 - Quality Control
 - log all maintenance/calibration info in database
 - Quality Assurance
 - Simultaneous grab samples upon redeployment of newly calibrated equipment and checking with duplicate equipment



Our Path Forward

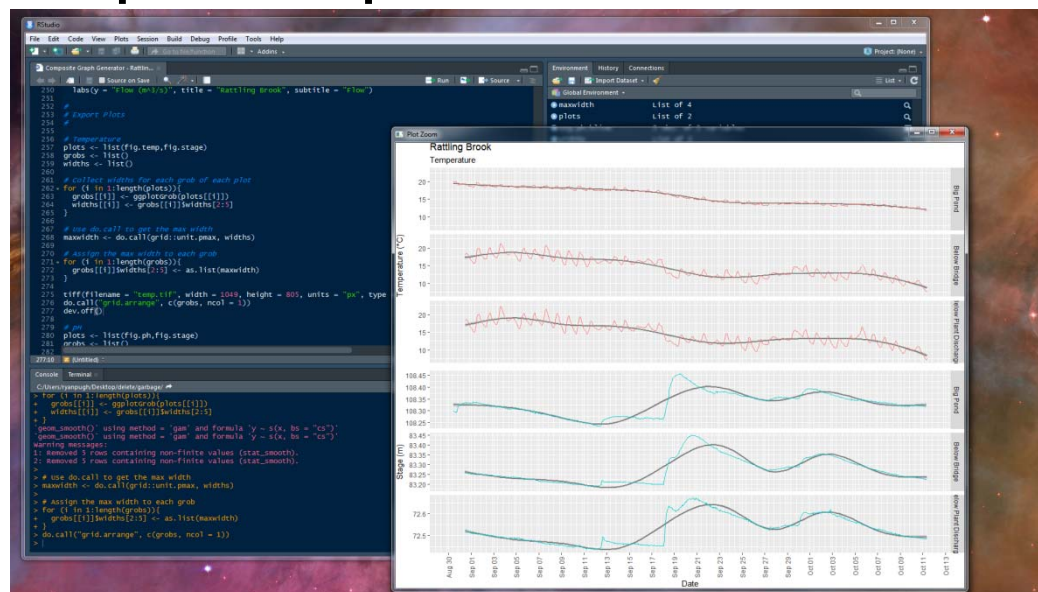
- Expanding software-based tech
 - Data Science quickly emerging as a distinct field of expertise
 - Buzzwords:
 - Big Data, Machine Learning, R, Python, algorithms
 - New modelling techniques for:
 - Forecasts
 - Predicted parameters
 - Trend analysis

Our Path Forward

- R and Shiny framework
 - App- and web-based tools can be distributed quickly
 - Tools save time over cumbersome and flaw-prone spreadsheet work.

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Our Path Forward

- New hardware is examined on a case-by-case basis
 - Currently investigating UAVs with application towards flood investigation and recovery



Conclusion

- From humble beginnings, we have grown in size and capability
 - Identify key skillsets/people
 - Train
 - Create good SOPs and Documents
 - Cultivate good partnerships
 - Don't stagnate

