



Northeast Water Strategy
2016 Annual Report



Contents

Executive Summary	03
Introduction	06
Measuring Progress.....	09
Showcase Story - Human Health Risk Assessment and the Northeast Water Strategy.....	12
Progress on Action Areas	15
Enhance Information and Tools to Support Water Decisions	15
Water Research	15
Water Stewardship Information Source Database.....	16
Mapping New Water Bodies (Dugouts)	17
Permafrost Ecosystems in Transition	18
Fort Nelson Wetlands Project	19
Evaluation of Irrigation Potential in the Peace Region.....	19
Peace River Regional District Surface Water Quality.....	20
The Dawson Creek Reclaimed Water Project	20
Kiskatinaw Watershed Flow Forecasting Study	21
Natural Gas Atlas Project.....	21
Water Monitoring.....	22
Enhancing Surface Water Quantity Monitoring in Priority Watersheds	23
Enhancing Surface Water Quality Monitoring in Priority Watersheds	25
Building and Coordinating Groundwater Knowledge.....	26
Montney Aquifer Characterization Project.....	27
Showcase Story - Private well monitoring	28
Aquifer Characterization in the Montney Shale Play	30
Peace River Regional District Aquifer Characterization	31
Intrinsic Aquifer Vulnerability Mapping in Northeast B.C. using the DRASTIC Model	31
Provincial Groundwater Observation Well Network.....	31
Strengthen the Regulatory Regime	32
Water Sustainability Act.....	32
The Northeast Drought Communication and Response Plan	34
Dugout Policy.....	34
Oil and Gas Activities Act	35
BC Oil and Gas Commission.....	35
Hydraulic Fracturing Operating Practices – Canadian Association of Petroleum Producers	36
Coordinate Decision-Making Processes Across the Natural Resource Sector	37
Showcase Story - The Murray River Watershed Partnership.....	39
Enhance Reporting, Compliance and Enforcement.....	42
Reporting	42
The Water Portal.....	42
The NorthEast Water Tool	43
Compliance and Enforcement.....	44
Build a Water Stewardship Ethic.....	45
Appendix A: Northeast Water Strategy Implementation Partners	47
Appendix B: Water Definitions.....	51

EXECUTIVE SUMMARY

The *Northeast Water Strategy* was released on March 20, 2015. The Strategy recognizes that water is our most valuable resource, and that all water-related decisions in the region must be built on the values of sustainability, collaboration and transparency. It brings together more than 50 partners with a wide range of interests—all levels of government, First Nations, industry, academia, non-governmental organizations and community representatives—to share information, generate new monitoring and research, and promote a strong stewardship ethic that will ensure the Northeast region can meet water demands today—and into the future.

This first year of Northeast Water Strategy implementation (April 2015 +) has focused on building a foundation, bringing partners

together and launching the long-term process of sharing our resources and our knowledge. We have started by identifying the information gaps and, over the coming years, will continue to deepen our understanding of water use across the region and our commitment to sustaining this invaluable resource for current and future generations.

Ultimately, success will be measured by two factors: achieving the goals as set out in the *Northeast Water Strategy*, and public confidence in the work being accomplished. As a result, transparency is a priority, and this annual report is the first in a series of summary reports of activities.

PROGRESS TO DATE

The *Northeast Water Strategy* focused attention on five action areas. This annual report highlights actions and successes achieved in the first year.

1

Enhanced information and tools to support water decisions

- ✓ **Launched three large collaborative projects for enhanced water monitoring**, including measuring surface water quantity in priority watersheds, characterizing water quality in watersheds across Northeast B.C., and improving groundwater knowledge through communication, aquifer characterization research and regional research initiatives. Key highlights for groundwater work includes characterizing the Montney Shale Play / South Peace River Regional District aquifers, private well sampling, mapping vulnerable aquifers and improving the provincial groundwater observation well network.
- ✓ **Launched research initiatives**, including development of an online inventory of over 430 water-related research projects underway across Northeast B.C., mapping new water bodies (dugouts) in support of future policy development and coordinating a number of studies including —permafrost thaw and ecosystem change, the effect of land development and climate change on wetlands, and irrigation feasibility.

2

Strengthened the regulatory regime

- ✓ Most notably, on Feb 29, 2016, the B.C. government introduced the *Water Sustainability Act*. Other activities included developing a Northeast Drought Communications and Response Plan and the Northeast Dugout Policy.

3

Coordinated water decision-making processes across the natural resource sector

- ✓ Created an inter-agency Northeast Water Steering Committee to guide provincial implementation of the *Northeast Water Strategy* and coordinate water management activities.
- ✓ Implemented bilateral water management agreements between federal, provincial and territorial governments.
- ✓ The Murray River Watershed Partnership is a showcase example of the benefit and value of collaborative partnership. It stands as a model for collaborative development of water quality objectives and monitoring in watersheds across Northeast B.C.

4

Enhanced reporting, compliance and enforcement

- ✓ Reporting, including the Water Portal.
- ✓ Compliance and enforcement—with a focus on building capacity in First Nations communities, specifically through the Natural Resource Aboriginal Liaison Program.

5

Laid the groundwork for building a water stewardship ethic

- ✓ The forward looking piece – relying on all partners to become fully engaged in identifying priorities and delivering on-the-ground projects.

INTRODUCTION

The Northeast Water Strategy was released on March 20, 2015 to measure, manage and map water resources across B.C.'s Northeast region. The Strategy recognizes that water is our most valuable resource, and that all water-related decisions in the region must be built on the values of sustainability, collaboration and transparency. It brings together more than 50 partners with a wide range of interests—all levels of government, First Nations, industry, academia, non-governmental organizations and community representatives—to share information, generate new monitoring and research, and promote a strong stewardship ethic that will ensure the Northeast region can meet water demands today—and into the future.

These are still early days in the *Northeast*

Water Strategy, and this 2015-16 Annual Report highlights the first year of activity. We (the partners¹) have made real progress in key areas, including learning more about water resources in Northeast B.C., identifying gaps in knowledge, reducing duplication in monitoring, and tracking water use and quality. We are also laying the groundwork to meet long-term and complex goals – ultimately, a strong, shared water-stewardship ethic.

Partners in the *Northeast Water Strategy* have identified goals and actions from our own perspectives and taken direction from public questions and concerns. Several *Northeast Water Strategy* projects are in direct response to public priorities, including questions about the quality of drinking water and the

1 See Appendix A for a full list of implementation partners.

abundance and distribution of groundwater resources within the region. This public openness, transparency and responsiveness is emerging as a defining value of the *Northeast Water Strategy*.

Why the *Northeast Water Strategy*? And why now?

While British Columbia is fortunate to have an ample supply of water, effective stewardship is vital to meet increasing demand. This is especially true for Northeast B.C. The region is experiencing change and growth. Expansion in natural gas and oil, forestry, agriculture and mining activities will create new demands for water. The region's population is expected to increase by 30 percent over the next 25 years², thereby increasing the demands of domestic water use for drinking and waste management. In addition to managing changes in water demand, climate change may increasingly challenge our ability to balance water use with available supply and ecological needs. These factors will require government to be increasingly

responsive in managing water, and industry and communities to be more creative and innovative in its use.

Water use in Northeast B.C. can only be managed well with accurate knowledge of water quality and quantity, and coordination among all agencies, organizations and communities involved. The *Northeast Water Strategy* assembles more than 50 partners with a wide range of interests – all levels of government, First Nations, industry,

Climate change in northeast B.C. is occurring much more rapidly than in the rest of the province. For example, over the last hundred years, the rate of warming in Northeast B.C. has been 2.2 degrees Celsius compared with the B.C. overall of 1.2 degrees Celsius.³

academics, non-governmental organizations and community representatives.

A key benefit of bringing all partners together is the chance to share information with each other and, just as important, identify where there are significant gaps in information. In the first year of the *Northeast*

2 <http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationsProjections.aspx>

3 [Northeastern B.C.: Climate Risk Assessment for the Oil and Gas Sector](#). May 2015. Natural Resources Canada.

Water Strategy, we focused on pulling together the wide range of work already underway or planned for the near future. As we continue to identify gaps and begin compiling new, up-to-date and accurate information, we will gain a greater understanding of the state of water in Northeast B.C. and identify new projects and initiatives to be undertaken.

Collaboration across partners brings significant and specific knowledge, experience, perspectives and priorities to the table. This commitment to partnership is vital to the development, implementation and ultimate success of the strategy.

Transparency is a priority of the Northeast Water Strategy. This Annual Report is the first in a series of reporting-out documents. It is an indicator of the range and scope of the work to date – and the foundational groundwork for future projects. Over the coming years, we will continue to collaborate to determine priorities, highlight our accomplishments and mark our progress.

For more information, please visit the [Northeast Water Strategy website](#).



Measuring Progress

Progress in implementing the *Northeast Water Strategy* will be measured by: achieving our goals laid out in the *Northeast Water Strategy*, and public confidence in the way we reach them.

Achieving goals

The *Northeast Water Strategy* focuses on achieving measurable results in five action areas:

1. Enhancing information and tools to support water decisions
2. Strengthening the regulatory regime
3. Coordinating water decision-making processes across the natural resource sector
4. Enhancing reporting, compliance and enforcement
5. Building a water stewardship ethic.

We have made significant progress in this first year of the strategy, including:

- » Compiling a comprehensive, online inventory of water related research projects underway across Northeast B.C.
- » Developing a regional model to prioritize enhanced surface water quality and quantity monitoring based on surface disturbance and socio-geographic sensitivity.
- » Launching three collaborative, enhanced water monitoring projects across the region focused on surface water and groundwater quantity and quality.
- » Initiating implementation of the *Water Sustainability Act* in the Northeast region.
- » Continuing work through the Murray River Watershed Partnership, an innovative and enduring model for effective, collaborative watershed management.

10

We have also laid the foundation to meet priorities identified for the next two years:

- » Enhance a collaborative water monitoring program in Northeast B.C.
- » Substantially improve communication around water research and collaboration opportunities in Northeast B.C.
- » Strengthen compliance and enforcement of water resource activities.
- » Continue to support water policy development and implementation.

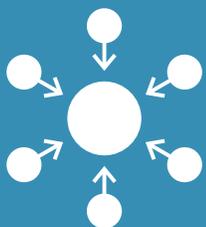
Public confidence

The *Northeast Water Strategy* was developed specifically to build public confidence in both the process and the outcomes. It relies on:

- » Broad participation from all organizations and individuals interested in water-use issues and opportunities in Northeast B.C.
- » Openness and transparency in all the work we do.

Broad participation

Partnerships and transparency are the core operating values in both developing and implementing the *Northeast Water Strategy*. It explores all viewpoints, benefits from the wide range of experience and reflects the values of everyone who depends on water in Northeast B.C. In the broadest sense, this includes anyone living and working in this vast region.



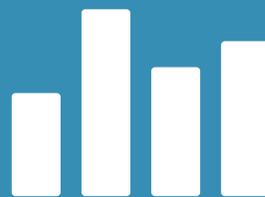
Broad Participation

+



Open and Transparent
Process

+



Measurable Results

=



Public Confidence

Bringing a wide range of water users to the table ensures that we represent many diverse and occasionally conflicting views. As a group, we can consider the pros and cons, the opportunities and challenges, the benefits and disadvantages from many perspectives. This approach captures the values and experience of communities and First Nations across the region, and helps all partners understand each other's values, needs and priorities, as they relate to water use in the region.

Openness and transparency

Along with reporting to and through our partners, the *Northeast Water Strategy* provides public status and progress reports. The *Northeast Water Strategy* 2016 Annual Report is the first in a series of public reports highlighting results that have been achieved, showing where we are making progress, priorities for the future and clearly identifying areas that require more work.

Project updates and completed reports, outcomes and summaries from meetings, workshops and forums, and links to information sources and water tools will be regularly posted to the [Northeast Water Strategy website](#).





Toad River, Northeast B.C.

Human Health Risk Assessment and the Northeast Water Strategy

In 2011, the B.C. Ministry of Health⁴ responded to public concern in Northeast B.C. by launching public engagement on the potential impact of oil and gas development on human health. The Fraser Basin Council heard more than 300 submissions from citizen's groups, health professionals, academics, non-profit organizations, First Nations, all levels of government and the oil and gas industry, and identified concerns around environmental exposure, oil and gas operating issues and monitoring, compliance and transparency.

As a result, the Ministry of Health launched a human health and risk assessment (HHRA) related to the oil and gas industry in the region. In February 2014, the Phase 2 report was released⁵ with 14 recommendations. The B.C. government accepted all recommendations, and turned to the *Northeast Water Strategy* as the tool to meet the four recommendations specifically related to fresh water.

4 https://archive.news.gov.bc.ca/releases/news_releases_2009-2013/2011hlth0109-001661.htm

5 <https://news.gov.bc.ca/stories/phase-two-oil-and-gas-human-health-study-released>

“Many of the activities that are now part of the *Northeast Water Strategy* were already underway, but the commitment to fulfill the recommendations of the HHRA gave them a higher priority and more resources,” said Elizabeth Johnson, a hydrogeologist with the *Northeast Water Strategy*, Ministry of Natural Gas Development. “The B.C. government looked at the health risks related to the oil and gas industry, it looked at recommendations around enhanced monitoring and more accessible databases, and recognized that the goals were very close to what the *Northeast Water Strategy* was doing. So the *Northeast Water Strategy* is intimately linked to the HHRA – they’re tied together at a very high level.”

Key recommendations in the HHRA are the primary commitments of the *Northeast Water Strategy*. For example, the Private Well Sampling program (see Page 30) was already happening in some areas, but it has been expanded to cover the Northeast region. That initiative received resources from the Ministry of Health specifically to gather more information to feed into the knowledge base.

“Key recommendations in the HHRA are the primary commitments of the *Northeast Water Strategy*.”

“There was also more money invested in paleovalley surveys,” said Johnson. “Sometimes there’s no indication on the surface of the land, but deep underground, there are valleys that have been filled in with rock and sediment. They are buried deep underground as a result of glacier activity millions of years ago. They may still have groundwater flow systems in these ancient river beds, or they may be dry. Either way, we don’t know very much about what goes on in these aquifers. Some of these systems found in other parts of North America have tremendous amounts of water – enough to support big cities. The HHRA identified the need for more geological assessment, and that’s been captured in the Groundwater Knowledge project of the *Northeast Water Strategy* (see Page 29).

“Then there’s the issue of coordinating the water-based information we do have. One big issue identified in the HHRA was that it was very difficult to move across databases. It was impossible to work across collection systems. If you managed to get into one database, you couldn’t compare the data with information in another database. Information was incomplete, and there was no overall way to capture all the information”.

“What came out of this was the Water Portal (see Page 45), a project championed by the BC Oil and Gas Commission and the Ministry of Forests, Lands and Natural Resource Operations. It’s a map-based system where you can click on a location and the system will tell you all about the quality and quantity of both surface water and groundwater from a diverse array of information sources. It’s amazing to have it all together in one location”.

“The HHRA has focused attention on the need to change the way we collect and track information, and the *Northeast Water Strategy* is becoming the vehicle to coordinate it all. The overarching vision for the *Northeast Water Strategy* is to continue to pull this information together, to continue to make it easier to acquire and to use. Then we can evaluate the state of water in the whole, interconnected watershed – and all this information will be shared online with the public. This is an ambitious goal – there are 69 major watersheds in Northeast B.C. alone.”

More information about recommendations implemented from the Human Health Risk Assessment study can be found on the [Northeast Water Strategy website](#).



*Elizabeth Johnson, Ph.D., P Geol.
Senior Hydrogeologist and Groundwater Lead, Northeast Water
Strategy
Ministry of Natural Gas Development*

PROGRESS ON ACTION AREAS

1 ENHANCE INFORMATION AND TOOLS TO SUPPORT WATER DECISIONS

Improving information resources and addressing knowledge gaps based on forecasted development opportunities and water use will support informed and effective decision-making.

While many organizations in Northeast B.C. are involved with water related research and monitoring, we have only recently started coordinating our data with each other. Prior to the *Northeast Water Strategy*, partners were challenged to access each other's work and we could not build a comprehensive overview of the state of water in the region. It was also a challenge to build on each other's efforts, reduce duplication or benefit from improvements.

Water Research

A top priority of the Strategy is to share research and information. This gives partners access to new information and allows us to identify and systematically begin filling any gaps in knowledge and reporting.

The first step is organization. To address this, a database of water research and stewardship activities, currently underway in Northeast B.C., was developed.

Water Stewardship Information Source Database

The Water Stewardship Information Source database is a comprehensive database of more than 430 research and stewardship projects led by some 50 organizations, including federal, provincial and local government agencies, universities, consultants, industry, non-government organizations and First Nations. Information can be searched by topic, area or researcher using key words. Printable search reports provide abstract, the type of project, status and links to publications. The database is available on the [Northeast Water Strategy website](#).



Partners are already using the database to locate research and support water decisions. Looking ahead, we will compile the research results for a more complete picture of water information for Northeast B.C. that is accessible and useable by partners, researchers and the public. We will also become more coordinated and streamlined in how we collect and report information, as well as in how we identify projects to fill specific knowledge gaps.

The project database is continually evolving, and partners are being encouraged to add information as new projects are developed.

Here are a few examples of the diverse water-related research projects underway in Northeast B.C. that will help build the bigger picture of the state of water in the region.

Mapping New Water Bodies (Dugouts)

Water dugouts collect and store water for future use. They are common in the region for agricultural and range activities, and are used in oil and gas exploration and development.

To better understand and quantify the use of dugouts in the South Peace Region, several provincial government agencies⁶ have developed a water classification algorithm to map new water bodies. Using satellite imagery available through the United States Geological Survey, the algorithm has mapped more than 1,000 new bodies of water in the South Peace region from 1985 to 2015. Most of these are dugouts, and their size appears to be increasing: many recently constructed dugouts (last 10 years) are larger than 1.0 hectares, with some up to 3.0 hectares. This work is ongoing. Research will be extended to the entire Northeast region, and the information will be used to develop management strategies for dugouts. This report is available on the [Northeast Water Strategy website](#).



New policy and regulations under the *Water Sustainability Act* provides effective and consistent regulation of water use from dugouts to ensure public safety, reduce pressure on local water supplies, and protect the environment.

Permafrost Ecosystems in Transition

Understanding and Predicting Hydrological and Ecological Change in the Southern Taiga Plains, Northeastern British Columbia and Southwestern Northwest Territories—this three-year (2015–2018) project focuses on peatland permafrost thaw and its impact on hydrologic change in Northeast B.C. The objective is to improve the base of hydrologic knowledge and produce customized science-based tools to support water management decisions.



The Consortium for Permafrost Ecosystems in Transition (CPET)⁷ will develop new knowledge on the melting permafrost in Northeast B.C. and the impact on water resources. The information will be used to build modeling tools to help predict thaw patterns, rates, impacts and feedbacks. More accurate predictions can be used to develop responses to climate change.

CPET has established two new study sites in Northeast B.C. equipped with hydrometric stations, meteorological stations and other monitoring equipment. It has built an archive of aerial photos and satellite imagery, including Light Detection and Ranging Remote Sensing Method (LiDAR) and GIS data (including Ducks Unlimited wetlands mapping). Ten “Super Sites” have been established along a north-south transect from Northeast B.C. to the Northwest Territories for extra remote sensing analysis using data from NASA and RadarSat 2. Additionally, mapping has been completed across parts of the region and a preliminary hydrological model is now functional.

The research paper is available on the [Northeast Water Strategy website](#).

⁷ CPET has drawn funding and/or support from the oil and gas industry, provincial and federal governments, Geoscience BC and Fort Nelson First Nation. It has drawn researchers from several academic institutions across Canada including Wilfrid Laurier, University of Waterloo, University of Montreal, University of Calgary and University of Alberta.

Fort Nelson Wetlands Project

The Fort Nelson wetlands project⁸ addresses concerns about land-use development and climate change effects on wetland hydrology and ecology. The first year of the project demonstrated that high resolution digital images and LiDAR were powerful tools to identify permafrost, vegetation height and water routing, as well as mark watershed boundaries and identify extent and composition of wetland plant communities in the Coles, Trail Lakes, and Tsea Lakes watersheds north of Fort Nelson. A hydrometric and meteorological field monitoring program was initiated in 2013 and current activities focus on using field data to calibrate a water balance model for the Coles and Tsea Lakes watershed, including identification of surface and groundwater interactions.

Evaluation of Irrigation Potential in the Peace Region

Most agriculture in Northeast region relies solely on natural precipitation to irrigate crops. With climate change forecasted to affect precipitation patterns, the Peace River Agriculture Community⁹ initiated an Irrigation Feasibility study in early 2016. The study examined options to irrigate crops, and whether irrigation might result in higher profitability. The study concluded that there is limited opportunity in today's markets, and further research is required around use of higher-value crops and water availability.

The region is looking at hosting workshops and producing fact sheets to share information with farmers. More information about this project including summary reports are available on the [Northeast Water Strategy website](#).

8 The work is being completed by the University of Northern British Columbia, in collaboration with the Bulkley Valley Research Center with funding by Ministry of Forests, Lands and Natural Resources.

9 Agriculture and Agri-Food Canada, B.C. Ministry of Agriculture, BC Grain Producers' Association, Peace Forage Seed Association, Peace River Regional Cattlemen's Association, Peace River Regional District, Peace River Forage Association, BC Seed Growers' Association, and BC Agriculture and Food Climate Action Initiative.

Peace River Regional District Surface Water Quality

Peace River Regional District¹⁰ is completing a project involving compiling, sorting, formatting, and organizing publicly available provincial water well and water analysis data to support development of a conceptual hydrogeological model and an assessment of water chemistry throughout the Peace River Regional District. Results of the project will provide an enhanced understanding of hydrogeological conditions in focus areas, and provide information on water chemistry and trends throughout the District. The report is available on the [Northeast Water Strategy website](#).

The Dawson Creek Reclaimed Water Project

Concerned about the increasing industrial use of potable water and the ability to meet future regulations for the treatment of wastewater, the City of Dawson Creek entered into partnership with Shell Canada to develop a reclaimed water facility. Since 2010, the plant has been able to draw 4,000m³ of wastewater from the City's existing aerated lagoon wastewater treatment system and treat it to a non-potable standard for industry or municipal use. Shell owns and operates a pumping station and pipeline that can transport 75% of the daily maximum to their Groundbirch operations, nearly 50 kilometres away, for industrial use. Through the use of a pipeline for transport, we can expect to eliminate three million kilometres a year in truck trips over the course of full gas field development. This will reduce traffic, emissions, noise and dust for local landowners.

In 2014, the City was granted permission to use the reclaimed water for street cleaning, storm flushing, flower watering and dust control. Currently, 85% of the water Shell uses in its Groundbirch operations is recycled water. Their aim is to eliminate the need to draw on fresh water sources, once fully operational, and minimize the need for water disposal by reusing water and sharing excess water with other operators for further use.

The full story is available on the [Northeast Water Strategy website](#).

¹⁰ This work was done in partnership between the Peace River Regional District, GW Solutions, and the Treaty 8 Tribal Association, with funding support from the BC Real Estate Foundation.

Kiskatinaw Watershed Flow Forecasting Study

In August of 2014, the City of Dawson Creek and Ministry of Forests, Lands and Natural Resource Operations committed to supporting a University of Northern British Columbia Masters student focused on studying the snowpack and changing weather patterns in the Kiskatinaw Watershed. The co-operative research will support the City's operational programs by:

- » Enabling annual water withdrawal management when turbidity levels are relatively low.
- » Improving prediction of both peak and low flow periods during spring snowmelt.
- » Supporting statutory decision makers regarding water withdrawals from the watershed.
- » Improving medium term water supply management based on climate forecasts.
- » Building long term watershed viability for the City of Dawson Creek.

As of December 2015, this partnership has resulted in telemetry upgrades for two Provincial climate stations, installation of an additional climate station at the City's intake and the installation of turbidity probes in the headwaters of the Kiskatinaw.

Natural Gas Atlas Project to Trace Original Source of Fugitive Gas Emissions from Wellbores in Northeast B.C.

Geoscience BC and its partners¹¹ are using carbon isotopes from natural gas fields to help type them. We now have the ability to get the "postal code" of a natural gas molecule, and are able to pin-point its original source. From this data, we will be able to determine if a trace of natural gas in groundwater is from natural sources or industrial activity. We will also be able to tell what gas pool or field the natural gas originates from in order to expedite curtailment efforts.

This research supports efforts by the BC Oil and Gas Commission to build a comprehensive database of natural gas isotopes. Last year, the BC Oil and Gas Commission announced amendments to the Drilling and Production Regulation requiring all isotopic gas analyses, if

11 University of Victoria and BC Oil and Gas Commission.

performed, to be submitted - as well as mandatory collection, analysis and submission of stable isotope data from exploratory wildcat wells and exploratory outpost wells.

Link to the Natural Gas Atlas is available on the [Northeast Water Strategy website](#).

Water Monitoring

The ability to accurately monitor the quality and quantity of water resources may become the most significant legacy of the *Northeast Water Strategy*. Many of the Strategy partners conduct their own measurements, testing water sources as they relate to specific interests – providing safe drinking water, water for irrigation and crop production, or water for use in resource development. However until 2015, these results were not always shared. It was difficult for partners to build on each other’s work, and there were important gaps in our understanding of the state of water across Northeast B.C.

In 2015, *Northeast Water Strategy* partners¹² conducted a disturbance-sensitivity assessment for watersheds and groundwater units across the region. The goal was to identify what surface and groundwater monitoring was underway, identify both duplication and gaps and set priority areas for enhanced monitoring for both water quantity and quality. The link to the assessment is available on the [Northeast Water Strategy website](#).

This work is grouped into three categories:

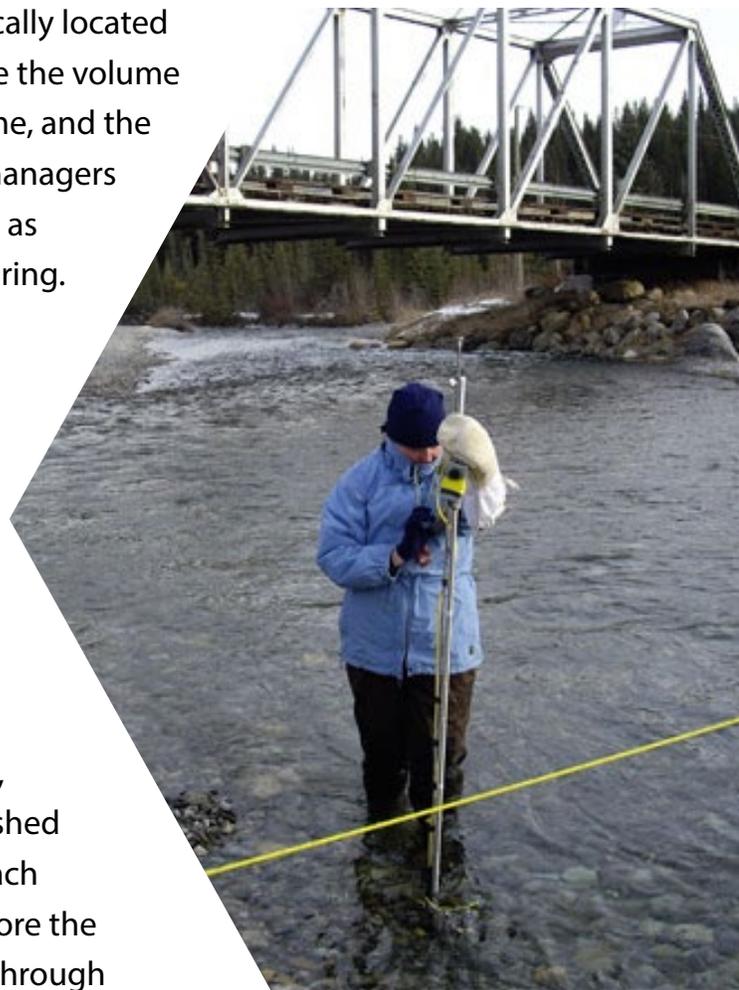
- » surface water quantity monitoring
- » surface water quality monitoring
- » groundwater quality and quantity characterization and monitoring.

12 BC Grain Producers Association, BC Oil and Gas Commission, Blueberry River First Nations, Canadian Association of Petroleum Producers, City of Dawson Creek, B.C. Wildlife Federation, Encana, Fort Nelson First Nation, Geoscience BC, Halfway River First Nation, Hudson’s Hope, McLeod Lake Indian Band, Mining Association of B.C., Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, Northern Health Authority, Northern Rockies Regional Municipality, Peace River Regional District, Shell, Simon Fraser University, Treaty 8 Tribal Association, Walter Energy, West Fraser, and West Moberly First Nations.

Enhancing Surface Water Quantity Monitoring in Priority Watersheds

Surface water quantity is monitored through strategically located hydrometric monitoring equipment. Stations measure the volume of water flowing through a river at a given point in time, and the information they produce is used by regional water managers to make water allocation and management decisions, as well as water purveyors for flood and drought monitoring. There are currently 35 active hydrometric stations in Northeast B.C. with data that is publicly accessible through the Water Portal available through the [Northeast Water Strategy website](#).

Through 2015, *Northeast Water Strategy* partners used the disturbance – sensitivity approach as a base and then reviewed assessments already underway to determine which watersheds required additional hydrometric monitoring. We¹³ set priorities, acquired hydrometric monitoring equipment, established funding partnerships and used a collaborative approach to manage the project. We also determined how to store the data, and how it will be made available to the public through the Northeast Water Tool and Water Portal both available through the [Northeast Water Strategy website](#). New partners are encouraged to become involved with this project to help set and implement priority monitoring sites.

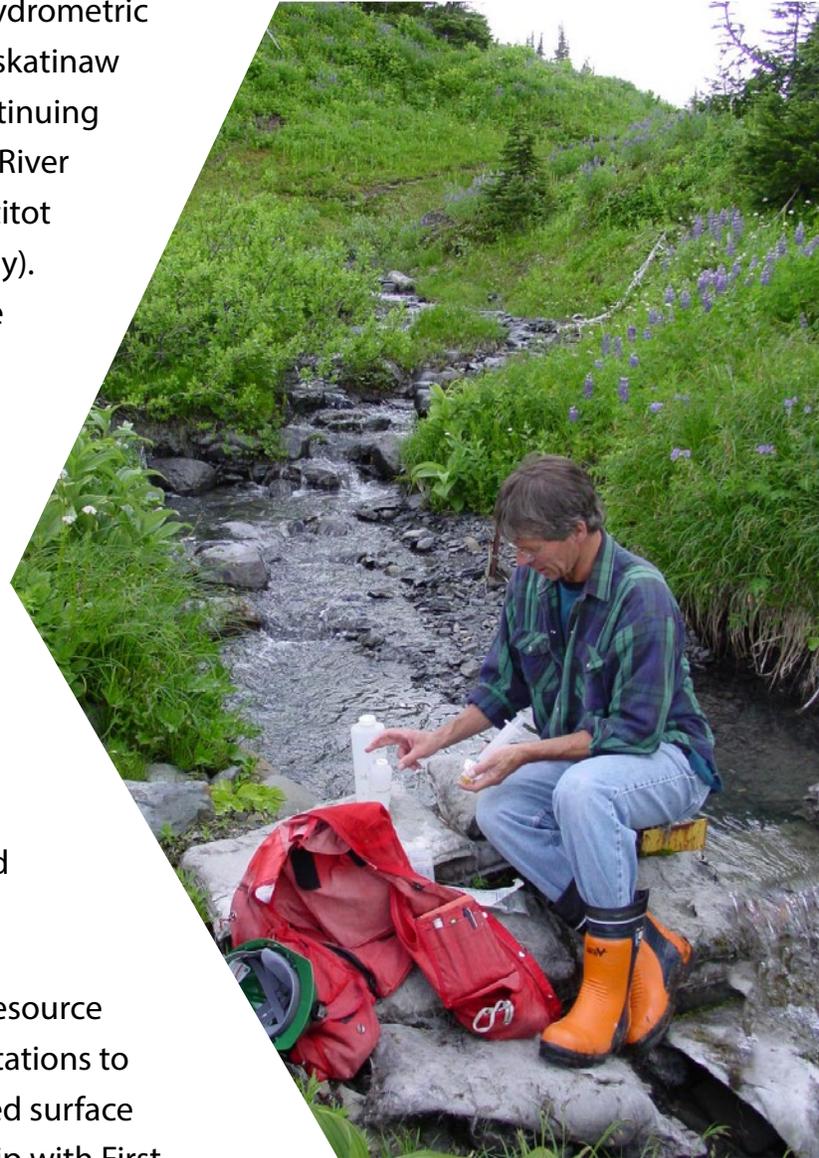


13 Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, GeoScience BC, City of Dawson Creek, BC Oil and Gas Commission, and Progress Energy.

Work has started on implementing three new hydrometric stations in the South Peace (Lynx Creek, West Kiskatinaw River, and East Kiskatinaw River) and we are continuing to collect data at four locations within the Horn River Basin (Kiwigana River, Santaneh River, Lower Petitot River at D'easum, and Middle Petitot River at Dilly). These stations will provide new data and a more comprehensive assessment of surface water quantity across the region.

Between March 2015 and March 2016, eleven existing federal-provincial hydrometric network real-time stations in Northeast B.C. were modernized with new real-time data acquisition equipment. Costs for these station operations and upgrades are variously covered and shared by the Ministry of Environment, BC Hydro, and Environment and Climate Change Canada.

In addition, the Ministry of Forests, Lands and Resource Operations has acquired ten new hydrometric stations to support the Northeast Water Strategy's enhanced surface water quantity monitoring project. In partnership with First Nations, communities and industry, the Province will install these hydrometric stations in priority watersheds through 2016-17.



Enhancing Surface Water Quality Monitoring in Priority Watersheds

While water quality data exists for many streams in Northeast B.C., there has been no coordinated effort to assess the character, condition or trends in water quality for the 69 major watersheds in the region. Establishing a water quality monitoring program is key to generating representative water quality data to assess overall water quality, and identifying priority watersheds for improved water stewardship and management.

The goal of this project is to establish a monitoring program for the region to characterize and identify trends in water quality. The project will see a network of sites monitored over time, guiding future management and stewardship decisions. The first step in achieving this goal is to compile and assess the existing water quality data for each of the 69 watersheds. This work is currently being completed¹⁴ and will include recommendations for monitoring site locations for enhanced water quality monitoring. The disturbance sensitivity approach is used as a base for identifying priority watersheds.



14 Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, and Environment and Climate Change Canada.

Several methods will be used to measure water quality, including benthic invertebrate monitoring in partnership with the Canadian Aquatic Biomonitoring Network (CABIN). This approach uses the insect communities living on the bottom of streams to measure water health. Like the canary in the coal mine, aquatic insects indicate how safe and healthy the water is – without time-consuming and expensive lab tests. One of the most significant benefits of using aquatic insects as water quality indicators is that the presence – or absence – of certain aquatic insects is an immediate indicator of whether a stream requires further, more detailed testing.

New partners are encouraged to become involved with this project to help set and implement priority monitoring sites.

Building and Coordinating Groundwater Knowledge

Groundwater is a key resource in Northeast B.C., supplying communities, First Nations, agriculture, and industry. Forecasted growth in industrial development and population in the region are expected to increase the demand for water, including groundwater. To steward this valuable resource effectively, groundwater management and regulatory decisions must be based on adequate knowledge of aquifers and their water quantity and quality. However, groundwater flow systems in Northeast B.C. are largely unmapped, and there is sparse knowledge or understanding of where aquifers are located outside populated areas.

A top priority for partners¹⁵ involved in this project is to coordinate existing groundwater information, and identify collaborative opportunities to develop new research. This includes:

- » Increasing understanding of the location, size and capacity of groundwater flow systems.
- » Increasing understanding of aquifer characteristics and monitoring, including groundwater chemistry testing.

15 BC Groundwater Association, BC Oil and Gas Commission, Blueberry River First Nations, Canadian Association of Petroleum Producers, Doig River First Nation, Fort Nelson First Nation, Foundry Spatial, Geoscience BC, Halfway River First Nation, Ministry of Environment, City of Dawson Creek, GW Solutions, Hudson's Hope, Ministry of Forests, Lands and Natural Resource Operations, Ministry of Health, Peace River Regional District, Shell Canada, Simon Fraser University, University of British Columbia, and University of Victoria.

- » Coordinating and integrating groundwater information across all water users and partners, including a comprehensive inventory of all groundwater-related activities and identifying information gaps and research needs.
- » Improving communication around groundwater research and initiatives, and collecting and disseminating groundwater knowledge, ensuring that partners and users have the information they need to make informed decisions.

Collecting information is only part of this project. Results-to-date have been shared across governments and with First Nations, academics, industry and interested members of the public at events such as the first annual Groundwater Knowledge Forum meeting in June 2016.

Priority groundwater projects in Northeast B.C. include:

Montney Aquifer Characterization Project

A university-government consortium¹⁶ is characterizing aquifers in the Dawson Creek-Grousebirch area within the Peace River watershed in Northeast region. The project includes aquifer mapping, drilling and testing observation wells, and water chemistry and isotope analysis from private well sampling in the area.

There has also been substantial research to large ancient valleys that are now buried under layers of sediment within the region. Although there may be no indication on the surface of their underground existence, they may host large aquifer systems. For example, the City of Duluth Minnesota is supported almost exclusively by water from an ancient valley or “paleovalley”.

In the Montney region, airborne and ground-based geophysical surveying has been used to map paleovalleys and the geology has been verified by drilling core holes. Project reports are located on the [Northeast Water Strategy website](#).

16 Simon Fraser University, Ministry of Forests Land and Natural Resource Operations, Ministry of Energy and Mines, Ministry of Environment, Ministry of Natural Gas Development, Geological Survey of Canada, and BC Oil and Gas Commission.



Private well monitoring

The private-well monitoring program is an example of a true collaboration between the Provincial government and landowners, industry, local government, and First Nations – as well as anyone who has a well, or is using a spring. The focus on the program is to learn about groundwater quality and water levels across Northeast region.

When we started, we had some aquifer mapping based on limited information. Beyond that, we had very little definitive knowledge, so our goal was to learn everything we could. We wanted to start to understand the groundwater resource, and what sustainable use of it could be.

We're learning that there's a really wide array of groundwater quality in Northeast B.C. A lot of the variability is explained by the geology, and we're starting to put together the subsurface architecture, seeing how things were laid down after the last Ice Age. We're also getting an idea of how long it's been since this water fell on the ground – some has been underground for fewer than 50 years, and some has been there for more than 10,000 years.

What's really interesting is that as soon as someone volunteered their well for monitoring, they become a partner in the project. They have something we need – access to groundwater – and we can do the analysis for them. This project is something we can do together, and at the end, we had a couple of hundred partners across the Northeast.

After we tested the water samples, we contacted owners to explain what we found, which helped them understand a little more about their water. For example, we found that one-third of the wells had high levels of natural arsenic, so we went back to the owners to let them know and find out how they used the water – are you drinking it? Are you treating it? Do you understand the risks? We learned that most people had things

managed, and that they don't drink the water. To be safe, we worked with Northern Health, the First Nations Health Authority, and Ministry of Health to release a public advisory regarding naturally high occurring levels of Arsenic within some of the region's aquifers.

Some water has been underground for fewer than 50 years, and some has been there for more than 10,000 years

But what was really interesting was that we are building relationships with people in the communities, and the agencies really

began working together – the Northern Health Authority, the First Nations Health Authority, the Ministry of Health and the Ministry of Forests, Lands and Natural Resource Operations. Working together on projects like this really strengthens our relationships.”

More information about this project, visit the [Northeast Water Strategy website](#).



*Chelton van Geloven, R.P.F.
Source Water Protection Hydrologist, Dam Safety Officer
Resource Management, Northern Area
Ministry of Forests, Lands and Natural Resource Operations*

Aquifer Characterization in the Montney Shale Play

In August 2015, a partnership¹⁷ led by Geoscience BC completed the largest airborne mapping project in B.C. – an electromagnetic survey of an 8,000 square kilometre area in the Peace region between Hudson’s Hope, Fort St. John and Pink Mountain. Blueberry River, Doig River and West Moberly First Nations participated and under their guidance, additional lands were included for study.

The goal was to create a 3D picture of fresh water aquifers and bedrock topography. This leading edge technology, which operates much like a CAT scan, shows the potential location of water—bearing materials to a depth of 350 meters below the surface.



Aquifers mapped through Aquifer Mapping Project in Montney Shale Play

Geoscience BC also commissioned a study of near-surface geology in the Peace Project area. Building on existing geological mapping and hydrogeological reports, the study mapped depth to bedrock (and hence thickness of Quaternary cover), and the distribution of aquifer sands.

The information will guide the placement of new groundwater monitoring wells, providing transparent and effective water management for all user in Northeast region, and a more accurate and complete picture of the region’s groundwater resources. Project reports are located on the [Northeast Water Strategy website](#).

17 Province of B.C., Progress Energy, ConocoPhillips, Devon, Encana, Shell, Talisman Energy, Arc Resources Ltd., and BC Oil & Gas Research and Innovation Society.

Peace River Regional District Aquifer Characterization

The Peace River Regional District has compiled, sorted, formatted, organized and interpreted lithological and groundwater elevation data to map aquifers in 3D, and to characterize the groundwater regime (flow directions and hydraulic gradients)¹⁸. Reports are forthcoming.

Intrinsic Aquifer Vulnerability Mapping in Northeast B.C. using the DRASTIC Model

The Aquifer Intrinsic Vulnerability Map of Northeast B.C.¹⁹ characterizes the vulnerability of near surface geological materials to contamination originating on the surface. The assessment was conducted in response to concerns regarding the increase in industrial activity, primarily shale gas development, in Northeast B.C. The map supports agencies in the understanding of where groundwater quality is most vulnerable to surface development when considering policy and permitting. The report is available on the [Northeast Water Strategy website](#).

Provincial Groundwater Observation Well Network

First Nations and communities in the Montney Play area expressed concerns about groundwater quality related to oil and gas activities. Six groundwater observation wells were drilled in the area to address these concerns and to improve the knowledge of aquifers in the area - as part of the expansion of the Provincial Groundwater Observation Well Network²⁰. The network measures both groundwater quantity and chemistry. Water levels are recorded hourly and water chemistry samples are taken on a schedule. In 2015, benzene, toluene, ethylbenzene, xylene, oil and grease were added to the water-chemistry sampling parameters for wells in the Montney Play area.

Water level information is publicly available and can be downloaded from the Provincial Groundwater Observation Well Interactive Map available on the [Northeast Water Strategy website](#).

18 This work was done in partnership between the Peace River Regional District, GW Solutions, and the Treaty 8 Tribal Association, with funding support from the BC Real Estate Foundation.

19 Simon Fraser University, with financial support from the BC Ministry of Forests, Lands and Natural Resource Operations and the Pacific Institute for Climate Solutions.

20 Ministry of Environment and Ministry of Forests, Lands and Natural Resource Operations.

2 STRENGTHEN THE REGULATORY REGIME

Creating new regulations and effectively implementing existing legislation will strengthen the current regulatory regime.

Water Sustainability Act

On February 29, 2016, the new *Water Sustainability Act (WSA)* came into force in B.C. The *WSA*'s regulatory framework sets regulations, accountabilities and responsibilities around water use in Northeast region – and across B.C. Implementation of the new Act and regulations prioritizes protecting stream health and aquatic ecosystems, regulating and protecting groundwater, improving water security efficiency and conservation and expanding opportunities for a broader range of entities to participate in decision-making processes.

Key changes now in effect under the *WSA* and new regulations include:

- » New authorizing and permitting requirements for non-domestic groundwater users (e.g., industrial, agricultural).
- » Stronger protection for aquatic ecosystems.
- » New fees and rentals for water use, including application of fees and rentals to non-domestic groundwater use.
- » Expanded protection of groundwater including new requirements for well construction and maintenance.
- » Enhanced dam safety and awareness, and compliance and enforcement.

Under the *WSA*, all non-domestic groundwater users, including existing users, must apply for an authorization and pay an application fee (exempted for the first year until March 1, 2017) and annual water rentals. These users must also provide information on their well which will be entered in the Province's [WELLS database](#). The database will provide a wealth of new data, eventually allowing more accurate mapping of wells in Northeast B.C. and helping to assess water use. While homeowners with a domestic well are exempt from fees and licensing, they are strongly encouraged to register their wells in the provincial WELLS database, adding to the valuable store of information.

Other key changes under the *WSA* include:

- » A requirement to consider environmental flow needs in new authorizations.
- » Expanded prohibitions on dumping debris into streams and introducing foreign matter into wells or near well heads.
- » New tools to manage water during shortages, including temporarily restricting surface water and groundwater use to protect essential household needs and critical environmental flows.
- » An updated and expanded Groundwater Protection Regulation requires that water wells are properly constructed, maintained and, at the end of service, properly deactivated and decommissioned.
- » An updated Dam Safety Regulation introduces new requirements for dam owners related to emergency planning, contact information and placement of signage.

The next phase of policy and regulation development to support the *WSA* implementation will focus on:

- » Establishing monitoring and reporting requirements for large-volume water users.
- » Using water for livestock on crown and private range.
- » Provisions concerning water and land-use decisions (e.g., water objectives and planning).
- » Exploring approaches and opportunities for local involvement in stewardship and decision-making processes.

A summary of the *WSA* and new regulations are found on the [Northeast Water Strategy website](#).

There are strong linkages between the *WSA* and ongoing water projects in the Northeast B.C. including:

The Northeast Drought Communication and Response Plan

The Northeast Drought Communication and Response Plan supports effective and timely responses during periods of low streamflow levels. The plan's objective is to advance the Province's understanding of drought awareness and drought preparation.

Ministry of Forests, Lands and Natural Resource Operations' Northeast Water Stewardship team is responsible for monitoring watersheds across the region to determine the severity of drought conditions, measured against a wide range of hydrometrics and statistical analysis. In times of drought, communication bulletins will be issued with information about the current drought conditions and how it will affect water resource rights and water use allocations.

A copy of the Northeast Drought Communication and Response Plan is found on the [Northeast Water Strategy website](#).

Dugout Policy

Under the *WSA*, the Province is updating its policy on dugouts to help clarify the authorizations required – whether for use in agricultural, livestock or oil and gas industries. This includes identifying if the supply of the water is from surface runoff/snowmelt versus water from a stream or aquifer, and how authorization of water use from dugouts will be treated administered when the water originates from a mixture of different sources. The policy will also provide government decision makers with guidance on terms and conditions of water licences and other authorizations that use water from dugouts.

Oil and Gas Activities Act

BC Oil and Gas Commission

Key actions focused on water use in hydraulic fracturing include:

- » In February 2015, the Commission implemented new requirements for water source well permitting and operation, and has recently developed enhanced processes for reviewing of water source well applications.
- » The Commission has worked with industry, experts and academia in the past relating to advances in technology, that have the potential to support re-use and recycling of produced water, and remains open to do so.
- » The Commission has provided substantial in-kind technical support and data toward a University of British Columbia Okanagan study quantifying the “water footprint” associated with hydraulic fracturing.
- » The Commission continues to regulate oil and gas activities under statutory responsibilities that include the protection of surface water and groundwater resources.
- » The Commission continues to work with researchers to develop knowledge that is useful to inform the regulatory process and possible regulatory enhancements for the protection and management of water resources.
- » The WSA provides incentives for the use of “deep groundwater” over shallow potentially potable groundwater resources for oil and gas purposes.

Hydraulic Fracturing Operating Practices – Canadian Association of Petroleum Producers

The Canadian Association of Petroleum Producers (CAPP) has developed guiding principles for hydraulic fracturing to safeguard the quality and quantity of regional surface and groundwater resources, measure and report on water use, support the disclosure and greening of fracturing fluid additives, and advance and collaborate on technologies and best practices. Almost 85 percent of the oil and gas industry in B.C. are CAPP members.

CAPP subsequently released seven operating practices to inform and complement regulatory requirements. The Baseline Groundwater Testing practice includes commitments to:

- » Develop domestic water well sampling programs.
- » Participate in regional groundwater monitoring programs.
- » Establish a process to address stakeholder concerns regarding water well performance.
- » Continue to collaborate with government and other industry operators to understand regional groundwater quality and quantity through monitoring programs and research.

CAPP members will continue to work with *Northeast Water Strategy* partners on implementation of these practices in Northeast B.C.

A copy of CAPP's Hydraulic Fracturing Operating Practices is found on the [Northeast Water Strategy website](#).

3 COORDINATE DECISION-MAKING PROCESSES ACROSS THE NATURAL RESOURCE SECTOR

There are more than 20 decision-making processes involved in managing water across Northeast B.C. The *Northeast Water Strategy* seeks to coordinate and streamline these water management decision-making processes to improve the efficiency and durability of water decisions including informing the Province's approach to consulting and accommodating First Nations where a proposed decision or activity by the Province may affect claimed or proven aboriginal rights or Treaty rights.

The large number of partners involved in the *Northeast Water Strategy* is both a strength and a challenge. Bringing more than 50 organizations to the same table to discuss and share information creates an unprecedented opportunity to develop strong and cohesive policies that meet the overarching goal of the *Northeast Water Strategy*: "the responsible use and care of water resources through conservation and sustainable practices to ensure human and ecosystem needs are met now and into the future."

The challenge is that each of these organizations operates independently and with very specific mandates, timelines, and accountabilities. The *Northeast Water Strategy* recognizes the need to effectively coordinate all partners to ensure that activities and decisions around water use, research and on-the-ground actions acknowledge the diverse priorities across Northeast region. Activities to date include:

- » Creation of an **inter-agency Northeast water steering committee** to guide provincial government implementation of the strategy and to ensure coordination of diverse and overlapping water management activities in the region.

- » Initial implementation of a **Regional Strategic Environmental Assessment**, a project between B.C. and six Treaty 8 First Nations on how to optimize the meaningful practice of Treaty 8 rights with resource development on the land base. The project will be undertaking a cumulative effects assessment of valued components associated with the practice of Treaty 8 rights including valued components associated with water.
- » Implementation of **bilateral water management agreements** (BWMA) between the governments of Canada, British Columbia, Alberta, Saskatchewan, the Northwest Territories and the Yukon. BWMA are agreements made in support of achieving the terms of the Mackenzie River Basin Transboundary Waters Master Agreement. They define how provincial and territorial governments will work together to manage transboundary waters in the region. BWMA include broad management principles to maintain ecological integrity of the aquatic ecosystem for all shared groundwater and surface water crossings between jurisdictions within the Mackenzie River Basin. The agreement sets clear ground rules for how jurisdictions will manage shared waters through commitments to water quality, quantity and aquatic ecosystem health at the transboundary crossings, and how they will make future water management decisions. A summary of the agreements are found on the [Northeast Water Strategy website](#).

Looking ahead, and with the leadership of the Treaty 8 Tribal Association and its First Nation members, a Terms of Reference will be developed for a high-level working group to coordinate activities of the *Northeast Water Strategy*. This working group will help ensure that all activities meet the objectives outlined in the *Northeast Water Strategy*:

- » unified water stewardship
- » healthy aquatic ecosystems
- » clean water
- » sustainable use of water.



The Murray River Watershed Partnership

There's a lot of activity in the Murray River watershed. There are numerous mines in the area, as well as expansion and permit applications that are in process. There is also oil and gas development, which involves clearing trees and laying pipe, wind combines being built, as well as forest harvesting. All this is within the upper part of the watershed, and all compacted around a couple of tributaries draining into the Murray River. The lower watershed also has rural residential and agricultural activities. There was a real concern among local communities and First Nations, and the question was how much activity could the watershed handle before it 'breaks'.

We saw an opportunity: There was a Northeast Cumulative Effects Program under development that looked at land activities and water quantity issues in the Northeast corner of B.C., but had yet to include the water quality piece. Furthermore, the province was initiating work on a *Northeast Water Strategy* interested in surface and groundwater, both quality and quantity. Ministry of Environment decided to take the lead on the surface water quality portion, specifically for the Murray River. Ministry of Environment felt we could collaborate with local communities and First Nations to address concerns about the capacity of the watershed to handle these permitted discharges, and fill the water quality gap in the Northeast Cumulative Effects Program.

In 2014, we had an initial scoping meeting hosted by Teck Coal, inviting anybody with any interest in the watershed. There was so much interest that we filled the room – and then some. When we went around the table and everybody said who they were, who they represented, and why they were here, it became really apparent that we were all concerned about the future of the Murray River watershed and in protecting its aquatic ecosystem.

It was also clear that we wanted to work together. There was a very strong sense that we were not on different sides of the table, but that we have one goal: we all want to protect the aquatic ecosystem – whether it was to continue to operate our business, to fish or recreate on the water.

When asked who wanted to be on the steering committee, I think everybody wanted to be on it!²¹ There are currently about 12 members – four First Nations in the area, all the mining

companies, local governments, the Province, and oil and gas companies.

We needed to start the work somewhere and we needed to all be on the same page, so we developed the Terms of Reference (TOR) for our project. One of the main outcomes of this work was to develop a cumulative effects assessment framework for water quality that

could be moved from watershed to watershed, focusing in on local issues. I expected we would have drafted the TOR in four-to-six months, but it took a full year. I learned that we had to slow the bus down, and take the time to really listen to each other. We had to not only take the time to listen but also acknowledge each

other: to First Nations and their concerns, to industry and their concerns, and to local governments and communities. If we didn't get it right at the beginning, we would lose people's interest. If people felt their interests weren't valued, they wouldn't participate.

Once we had the TOR, we had the green light and we were ready to move ahead. The partners agreed to share their data – we're

There was a very strong sense that we were not on different sides of the table, but that we have one goal: we all want to protect the aquatic ecosystem

21 Current members of the Murray River Watershed Partnership include Canadian Water Network, District of Tumbler Ridge, HD Mining, McLeod Lake Indian Band, Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, Peace River Coal, Peace River Regional District, Saúlteau First Nations, Shell Canada, Spectra Energy, Teck Coal, Treaty 8 Tribal Association, Walter Energy, and West Moberly First Nations.

sampling here and you're sampling there (basically the same site), so why not share data? That's a first, and without this process, I don't think that would ever have happened. Everyone was willing to identify what data they have, and they were willing to share it. With all that information, we will have what we need to set goals to protect the water quality of the Murray River. If anyone has a discharge or land use activity that effects water quality, they must meet these targets in the watershed.

Although it's only been two and a half years since our first meeting, it feels like it's taken a long time to get here. That's because everybody wants to see action right away. Together, we have a lot of data, and putting it all together was very time consuming. But now, we're getting the analysis – and it's powerful. In June 2016, we had a presentation where we could see everybody's data pulled together on a map, and with the click of a button, we could see the dots showing where selenium (a by-product in refining ore), for example, is being monitored, compare it to the B.C. water quality guideline values and see where it's exceeding them. In the future, it would be compared to the site-specific water quality objectives that the group is establishing.

This is a great process, and it could work to protect other watersheds across the Northeast and the rest of the province. The important thing is to remember that every watershed is unique – and the individuals who live, work or play there are different. There will be different participants in other watersheds, but whoever it is, everyone needs to listen to each other, acknowledge each other, and then you can move forward as a team.

More information about this project can be found on the [Northeast Water Strategy website](#).



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4 ENHANCE REPORTING, COMPLIANCE AND ENFORCEMENT

Effective water monitoring and reporting are the cornerstones of adaptive management of Northeast B.C.'s water resources. They require coordination across all natural resource activities, and commitment from multiple partners to ensure long-term delivery.

Reporting

Access to water-related monitoring and data, and the ability to store and retrieve a wide range of water-related information, is critical to planning water use in Northeast B.C. Two key reporting tools have been developed and upgraded, making it easier to compile, access and use water resource information across Northeast region from an array of partners.

The Water Portal

The Water Portal²² houses information required by statutory decision-makers, resource development operators, and the general public. It is an open, modern, easy-to-use web-based program providing free access to water-related data collected by government agencies and partners. The system provides access to more than 18 government and third party data sets on surface and groundwater quantity and quality making the Portal a one-stop shop for a huge amount of water-related information, including:

- » Water Survey of Canada archive data
- » Water Survey of Canada "real-time" data
- » Water quality data from Ministry of Environment's Environmental Monitoring System

22 The Water Portal is the result of a joint research by the BC Oil and Gas Commission and Ministry of Forests, Lands and Natural Resource Operations.

- » Geoscience BC / Horn River Basin Producer's Group data
- » Data reported to BC Oil and Gas Commission as condition of permit through industry-operated station data
- » Data reported to Ministry of Forests, Lands and Natural Resource Operations as the condition of a water licence
- » Industry-operated station data
- » Environment and Climate Change Canada current and archive weather and climate data.

Until the launch of the Water Portal in 2014, water-related data and information found in different provincial or federal government databases were difficult to find and use. The portal allows access through one location, allowing users to view data more easily by providing an interface with various charts and summaries of available information. The access to a combination of real-time and historic data provides important context for adaptive water management.

The Water Portal is accessible through the [Northeast Water Strategy website](#).

The NorthEast Water Tool

The NorthEast Water Tool (NEWT)²³ provides custom watershed reports on water availability including monthly flows, environmental flow needs, current allocations and available water for allocation for every location on a water body in Northeast B.C. It is used by local governments, individuals and industries applying for water rights, and Ministry of Forests, Lands and Natural Resource Operations and BC Oil and Gas Commission in allocating approvals and licenses. NEWT provides current and historic data on natural water supply and water availability across Northeast region, providing important context for regulators when making water allocation decisions.

23 NEWT was developed in partnership with Geoscience BC, the BC Oil and Gas Commission and Ministry of Forests, Lands and Natural Resource Operations. It has been in operation since 2012.

NEWT was introduced in 2012, and has been upgraded several times.

NEWT is available through the [Northeast Water Strategy website](#).

Compliance and Enforcement

Ensuring that development complies with regulations and permit conditions is key to protecting water and natural resources in Northeast B.C. The Natural Resource Sector Aboriginal Liaison Program²⁴ is helping build such capacity within First Nations. First Nations communities participating in the program have the opportunity to become involved in the oversight, compliance, and reporting of both water use and the impact on water resources.

The opportunity for Aboriginal liaisons to share their knowledge and information with the Province and the natural resource sector is a critical element in this partnership. It is key to working together towards a common understanding of the important values in managing the land base and how to improve oversight, management, and stewardship.

The program was initiated in 2014 and is being piloted in Northeast region working with Doig River First Nation. Sauteau First Nations and Prophet River First Nation have recently joined the program in Northeast region. Further information about the program can be found on the [Northeast Water Strategy website](#).

24 The Province and all interested First Nations.

5 BUILD A WATER STEWARDSHIP ETHIC

Water stewardship is everyone's responsibility. The success of this strategy will be measured years into the future, based on the knowledge, awareness and informed actions of the B.C. government and its partners.

Building a strong water stewardship ethic is a long-term goal, and progress will always be ongoing.

The strength of the *Northeast Water Strategy* is that it relies on all partners for its successful implementation – from identifying priorities to developing research projects to delivering on-the-ground initiatives. And in doing that, the partners are actively building a water stewardship ethic as we go. The *Northeast Water Strategy* asks independent organizations to share information and data, to agree on next steps that may be broader than the interests of their particular organization, and to take on responsibilities and activities that are within scope of their mandate and contribute to the big picture. We are all balancing those priorities with our capacity and our resources. The collaborative process we have all signed onto and our early implementation successes are stewardship-in-action, and will continue to be the key as we move into our second year.

The strategy is becoming a key part of the B.C. government's core business, a program to be delivered year over year by the full partnership. We will continue to identify and build the foundation - such as enhanced, collaborative water monitoring and coordinated watershed management. Progress will be measured in both months (another research project completed, usable data posted on the Water Portal) and years (developing a robust compliance and



Yedhe River

enforcement program). Taken together, both the projects being introduced and the partners implementing them, are building a transparent and accountable approach to managing the most valuable resource in Northeast B.C.

The Murray River Watershed Partnership is a great example of collaboration around stewardship. This group is developing new protocols in collaborative watershed management, and their example may be applied and implemented in other priority watersheds in Northeast B.C.



This first year of the Northeast Water Strategy has been about getting together and getting organized. We have reached key milestones already - numerous key partners are at the table, we are compiling data and sharing our resources. We are transparent in our operation, publically posting the resources, information and results of our work. Most importantly, we are identifying the gaps, and getting a clear sense of the scope of the work that lies ahead, all to support strong decision-making around the use and protection of the valuable water resource.

These first-year projects lay the foundation for work to come, and we will continue to build on the strength of this strategy - the partnership among a diverse group of water users in Northeast B.C.

APPENDIX A: NORTHEAST WATER STRATEGY IMPLEMENTATION PARTNERS

- ▶ B.C. government
 - Ministry of Agriculture
 - Ministry of Forests, Lands and Natural Resource Operations
 - Ministry of Environment
 - Ministry of Energy and Mines
 - Ministry of Health
 - Ministry of Natural Gas Development

- ▶ BC Oil and Gas Commission

- ▶ Northern Health Authority

- ▶ First Nations
 - Blueberry River First Nations
 - Doig River First Nation
 - Fort Nelson First Nations
 - Halfway River First Nation
 - McLeod Lake Indian Band
 - Prophet River First Nation
 - Saulteau First Nations
 - West Moberly First Nations
 - Treaty 8 Tribal Association

- ▶ Local and regional governments
 - City of Dawson Creek
 - District of Tumbler Ridge
 - Hudson's Hope
 - Peace River Regional District
 - Northern Rockies Regional Municipality

- ▶ Federal government
 - Agriculture and Agri-Food Canada
 - Environment and Climate Change Canada
 - Geological Survey of Canada

- ▶ Academia
 - Simon Fraser University
 - University of Alberta
 - University of British Columbia
 - University of Calgary
 - University of Montreal
 - University of Northern British Columbia
 - University of Victoria
 - University of Waterloo
 - Wilfrid Laurier

- ▶ Industry
 - Association of Mineral Exploration BC
 - Arc Resources Ltd.
 - BC Agriculture Council

- BC Grain Producers' Association
 - BC Seed Growers' Association
 - Canadian Association of Petroleum Producers
 - Clean Energy BC
 - ConocoPhillips
 - Council of Forest Industries
 - Devon
 - Encana
 - Grain Producers of BC
 - Mining Association of BC
 - Peace Forage Seed Association
 - Peace River Regional Cattlemen's Association
 - Peace River Coal
 - Peace River Forage Association
 - Progress Energy
 - Shell
 - Spectra Energy
 - Talisman Energy
 - Teck Coal
 - Walter Energy
 - West Fraser
- ▶ Non-governmental organizations
- BC Agriculture and Food Climate Action Initiative
 - BC Groundwater Association

- BC Oil and Gas Research and Innovation Society
- BC Real Estate Foundation
- Bulkley Valley Research Center
- Canadian Water Network
- Foundry Spatial
- Fraser Basin Council
- Geoscience BC
- GW Solutions
- Pacific Institute for Climate Solutions

APPENDIX B: WATER DEFINITIONS

Surface Water is water that runs over or sits on the land. This includes lakes, rivers, streams, creeks and ponds. It is usually freshwater and is not stored in the ground. Surface water supports aquatic ecosystems and may be used by communities, agriculture and other industries.

Watershed is the area of land that drains into a river, stream or lake. Watersheds are divided by heights of land.

Aquifer is an underground deposit of permeable materials (such as sand or gravel or porous bedrock), where groundwater can be readily transmitted and stored. Aquifers can be interconnected to other aquifers and surface water and can occur at various depths.

Groundwater is water found in the soil or rock below the surface where the pores and openings are filled with water.

Shallow Groundwater is freshwater accessed from shallow aquifers up to about 300 metres (m) deep. Usually shallow groundwater is found in unconsolidated sands and gravels along modern river valleys or in buried glacier meltwater channels, although shallow bedrock formations may also contain aquifers. Shallow fresh water aquifers are also used by communities, individual domestic users and agriculture.

Deep Groundwater is water found deeper than 600 metres below the surface and is not connected to surface water. Subsurface water tends to become more saline with depth as it is increasingly isolated from recharge by precipitation. Also, it has resided for a long period of time within the aquifer rock and will have dissolved various salts and minerals within the rock.

Salinity for deep groundwater can range from brackish up to 200,000 mg/l or more (for reference seawater is about 35,000 mg/l). Deep groundwater is not feasible for use by communities or agriculture without significant treatment.

Produced Water is water from an underground formation that is brought to the surface along with oil or natural gas from the well. It may contain salts, organic and inorganic compounds including oil or dissolved gas as well as additives used in drilling and possible naturally occurring radioactive materials dissolved from the rock. Surface discharge of produced water is not allowed in B.C.

Flowback Water is water-based hydraulic fracturing fluid that flows back to the wellbore after a hydraulic fracturing stimulation treatment is completed and before the well is transferred to production. Surface discharge of flowback water is not allowed in B.C.

Water Stewardship is the responsible use and care of water resources through conservation and sustainable practices to ensure human and ecosystem needs are met now, and into the future.

Consumptive Water Use is the extraction and use of water.

Non-consumptive Water Use is the use and return of water to its source.

Water Cycle (also called the hydrologic cycle) is the cycle of processes by which water circulates between the earth's oceans, atmosphere and land, involving precipitation as rain and snow, drainage in streams and rivers to the ocean, and return to the atmosphere by evaporation and transpiration.



Northeast Water Strategy
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