



***Capacity of Taku River Tlingit First Nation to practice
Integrated Water Resource Management***

**Independent Research Project
McGill University, Bioresource Engineering, Montreal, Quebec**



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1.0 Introduction:

In First Nation culture, water is vital, it is considered the life-blood, where rivers and streams are viewed as the veins running through the “Great Mother”, all mighty, yet also soft and flexible (Assembly of First Nations, n.d.). Indigenous people depend on water for transportation, drinking, cleaning, for the use of purification and medicines and for the good health for plants and animals (Anderson, 2013). Ironically though, in Canada, while most of the population enjoy high quality and readily available drinking water, often taken for granted, many individuals on First Nations reserves do not have the same access. The reasons for such disparity are complex and highly contextualized and not the focus of this paper. However, the realities of low population size, remoteness, low economic factors and low capacity, for many First Nation communities, has contributed to immense economies of scale, and large challenges in providing basic municipal services with efficient operations.

To contribute meaningful information on the First Nation water issue, the author asked, can the process and practice of IWRM be an advantage for Indigenous communities, struggling with operations in drinking water and water resource management within their traditional territories? Broadly, the theory of the IWRM process aims to improve access to potable water and management of water resources, through broad participation by all stakeholders, whom all seek equity and a balance between water users (Global Water Partnership, 2009).

The original purpose of this project was to assess the capacity of two First Nation to practice IWRM, by using an established analytical framework. This framework was focused around six key indicators of capacity: actor network, information management, financial, institutional, technical and human resources (Rizvi and Adamowski, 2013). Of additional interest to the author, was the role of Indigenous values and what that brings to capacity and IWRM. Because this project involved interviews with Indigenous people, it first required an application and approval from the McGill Research Ethics Board. To support the application, the written consent of the First Nation Chief was also required. This consent was eventually given to the author from two First Nations, one in BC - Taku River Tlingit First Nation (TRTFN) and the other in Yukon - Kluane First Nation. In addition, an application was required by the Yukon Government’s Heritage Branch, for a ‘Scientist and Explorers Licence’. Unfortunately, obtaining interviews with key informants from the Kluane First Nation, in Yukon, was not possible for this project.

2.0 Methods:

For this research project, initial consent from TRTFN leadership was sought and obtained. Key participants were then contacted and recruited. An anonymous on-line survey was development with 67 standard questions and sent to the four agreeing participants. The responses

were stored electronically and then analysed using an analytical framework. Subsequent follow-up questions were attempted with partial success.

3.0 Analytical framework

Lebel and Reed (2010), established an early analytical framework for assessing the capacity of an aboriginal community in Saskatchewan, to provide potable water to its customers. Their case study was completed in the relatively remote aboriginal reserve of Montreal Lake, Saskatchewan. The Lebel framework investigated five primary dimensions of capacity building (financial, human resources, institutional, socio-politico and technical) and used 38 element indicators to assess the variation of capacity associated with management of the water systems. Qualitative data was obtained through standardized question interviews and workshops in the community and document analysis, over one year (Reed, 2010). A rating table was created that listed the indicators and then rated the capacity 'ability' and 'presence' as either positive or negative or partially. The authors gave a caveat that the scope of the study had been narrowed, by leaving out aboriginal traditional belief systems, attitudes, knowledge and issues of aboriginal rights and title.

Rizvi & Adamowski (2013) also developed and carried out a similar study using an analytical framework, to assess the capacity of two First Nations, but this time with a IWRM focus. The two Quebec First Nation communities were Kitigan Zibi, 130 km of North of Gatineau, and Kahnawa:ke, 10 km south of Montreal. The framework assessed similar key dimensions of capacity building, found in the 2010 Label and Reed study, but added two new indicators, namely, 'actor network' and 'information management'. Their assessment used 79 elements around the six dimension of capacity, that were taken from normative literature associated with for drinking water management. (Rizvi and Adamowski, 2013). The methods used for qualitative data collection were through structured interviews and workshops from the selected stakeholders, who's responses were recorded as either 'yes' or 'no'. The results of this framework assessment revealed that overall, both aboriginal communities had only 'moderate' capacity to deliver potable water, with Kahnawa:ke (48%) and Kitigan Zibi (43%) capacity respectively. The results pointed to a lack of financial funding, both in terms of receiving from the federal government and in the ability to generate income. In addition, actor network scored very low, indicating a lack of social linkages with community, institutions and partnerships (Rizvi and Adamowski, 2013).

4.0 Six indicators of capacity to practice IWRM

For this research project, the author applied the analytical framework and indicators of capacity by Zehra Rizvi and Jan Adamowski (2013). However, for this project the questions were changed and reworded to be clear, and to include elements of natural resource management. Non- the less, the six key indicators were the same:

1. *Human Resources* - required the appropriate number of people with relevant skills and knowledge to perform duties and be efficient enough to allow for creativity. Also includes opportunities for personnel to improve their skills and knowledge for the benefit of the organization and the individuals.

2. *Actor Networks* - required cooperation, communication and exchange of information. Capacity is stronger through social linkages of partnerships and collaborations.
3. *Institutional* - required legislation, regulations, policies, plans and protocols surrounding natural resource management and drinking water operations. This indicator required good governance.
4. *Financial* - required an ability to acquire, generate, manage and save money to fund programming and projects.
5. *Technical* – relating to watershed and potable water. Technical indicators required their infrastructure to store water, safely treat it, distribute it and manage the wastewater. By default, also requires skilled personnel to operate and maintain those important assets.
6. *Information management* – required that information be collaboratively produced and shared. Information mgmt. requires competent personnel to manage. This builds trust and fosters integrity. Information must be securely stored, analyzed, integrated and be accessible to be effective for decision-making.

5.0 Results:

For this project, the analytical framework was applied to the responses from four key informants, who were actively engaged in some of form of water management. The results are shown in Table 1.

Table 1: Summary ranking of participant’s responses of six indicators of capacity for TRTFN

Capacity type	Total indices	Capacity ratio (present/total)	Partially
Human Resources:	4	0:4	2:4
Actor Networks:	14	1:14	7:14
Institutional:	9	0:9	8:9
Financial:	9	1:9	4:9
Technical:	15	6:15	8:15
Information Mgmt	14	1:14	10:14
Total	65	9 (14.5%)	38 (58%)

From this narrow analysis, the summary results revealed TRTFN had low overall capacity (15%), to practice integrated water resource management (Table 1). The strongest indicator of capacity for the TRTFN was technical, having the fortune of a newly built infrastructure, with competent operators and access to professional backup services. Capacity challenges were evident, primarily with limited finances and the inability to hire appropriate personnel and undertake broader programming. The results also suggested that the First Nation were relatively isolated under the actor-networks indicator and reliant on the federal government for funding and what was given is limited. There were moderate capacity indicators of information management and institution frameworks. There was no stand-alone management strategy, document or policy statement that is focused on water resources. Instead, TRTFN’s

emphasis was focused on lands management, forestry and fisheries habitat stewardship and hydroelectric power generation. Interestingly, none of the participants had heard of the IWRM.

5.1 Human Resources Analysis

In terms of human resources, TRTFN was challenged by not having the availability of appropriate staff, nor having enough employees to adequately support their resource management activity (Table 2). As one participant responded, “I am doing two jobs here”. However, TRTFN did have partial capacity for training and education of personnel in training and education in water. Training was dependant of ones’ position and experience. Water operators must be trained and certified and in addition, TRTFN have received mentorship services from a regional Circuit Rider Trainer on numerous issues. A lack of financial resources can cause limits on all programing, and the flexibility and creativity of the First Nation.

Table 2. Summary response for human resources capacity with TRTFN

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
<i>Human Resources:</i>				
<i>Availability of suitable employees?</i>				
Does TRTFN have access to internal individuals with the appropriate levels of education and expertise to adequately support the various resource management areas, environmental protection and Rights?	X			
Does TRTFN have sufficient number of employees dedicated to water management, including policy, operations, protection or rights holder participation?	X			
<i>Capacity development though training and education</i>				
Do staff actively and regularly participate in the available training and education programming opportunities that help contribute to improved natural resource management, protection and Rights assertion?		X		
Do personnel of TRTFN have opportunities for training and education in water management, environmental protection or other related programs?		X		

5.2 Information management analysis

TRTFN scored low for capacity regarding information management (Table 3). Regarding the indicators of broad communication, TRTFN was only partially active in distributing information and data on water and lands to its members and only partial availability of that information when requested. There was no real exchange information and data with other levels government and non-governmental organizations. There was only partial production of

joint/participative information around the management of natural resources. This was the same, internally, for the joint/participative information production between departments. TRTFN had only a partial inventory and understanding of the natural resources, within its traditional territory. The inventory that did exist was around lands, forest and fisheries habitat. With a shortage of appropriate personnel, there was moderate to low capacity to monitor and collect information on natural resources, which also carried over to partial capacity to produce quality reports on that same data and information. There was unanimous agreement that Traditional Ecological Knowledge (TEK), from Nation's membership, about their traditional territory was documented and was used in planning by the Nation.

TRTFN did not have a stand-alone water management strategy or guiding document on water protection. Nor did TRTFN have any legal provisions developed around access to information, consultation requirements and in participation in decision-making. There was no stand-alone climate change adaptation plan, but TRTFN did participate in a broader community exercise for the development of the Atlin Climate Change Adaptation Plan (Northern Climate Exchange, 2015). There is only partial involvement of different disciplines (technical, engineering, environmental, health and social) when policies are defined or developed. There was also only partial encouragement around the use of innovation and ingenuity in problem solving.

From the interviews, it was learned that management did meet weekly, but rarely was said was shared. Water quality test results were not shared internally. A new wastewater treatment facility was being built by outside engineers with no engagement by the community or departments. TRTFN focused more actively in giving out information about land use, wildlife and fisheries, to its members, through various ways of internet, literature, brochures, gatherings, media and, as community newsletters. Once a year, a TRTFN person went out and monitored and collected data and information on water and natural resources and were able to produce quality reporting on that data and information relating to land, fish and wildlife. Once a year, a TRTFN fisheries biologist did an annual inspection of the watershed and made a report for sharing. (TRTFN personal communication, March 2, 2017).

Table 3. Summary of responses for information management capacity from TRTFN.

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
<i>Information management:</i>				
<i>Broad communication</i>				
Does the TRTFN actively distribute information and data on water and lands to its members, through various ways? (internet, literature, brochures, gatherings, media)		X		
If requested, is water and natural resource management information available to public and members?		X		
Does TRTFN exchange information and data with other levels				

government and non-governmental organizations?	X			
<i>Joint or participative information production</i>				
Internally, does TRTFN use a participative information exchange model for managing natural resources? (Do other depts know what other departments are doing)		X		
Is the Nation involved in any joint decision-making processes with the federal government?		X		
<i>Use/collection of information</i>				
Does the TRTFN monitor and collect data and information on water and natural resources and able to produce quality reporting on that data and information?		X		
At the watershed scale, does TRTFN have an inventory and a good understanding of the natural resources within it's traditional territory?		X		
Does the TRTFN have available and current data and information (plans) associated with management of water resources (supply, treatment, source protection, aquifers)		X		
Is Traditional Ecological Knowledge (TEK) of the Nation's membership of their traditional territory documented and used in planning by the Nation?			X	
Does the Nation have a stand-alone water management strategy or guiding document?	X			
<i>Interdisciplinary</i>				
Internally, are different disciplines involved in defining and developing various TRTFN policies? (technical, engineering, environmental, health and social)		X		
Does the TRTFN encourage and use innovation and ingenuity in problem solving?		X		
Has the TRTFN developed a policy or plan towards adaptation to the impacts of a changing climate?		X		
Within the TRTFN, are there legal provisions around access to information, consultation requirements and participation in decision-making?	X			

5.3 Technical analysis

Regarding the indicator for technical, this was TRTFN's strongest capacity hitting 6 of 15 elements (Table 4). Their source water is Atlin Lake, of which the quality is excellent and the quantity enormous. Monitoring of drinking water quality is performed both daily, monthly and yearly, depending on the water quality parameters being tested. Not all parameters are required to be sampled and tested daily. The water treatment infrastructure and distribution system are more than adequate to produce safe drinking water for the Nation's residences. For the most part, all sampling locations met established BC drinking water guidelines, except during Spring/Fall lake turnover when turbidity levels can be increased. The communities drinking water quality was monitored by qualified TRTFN staff and water operators were institutionally trained. TRTFN had recently retained an engineering firm to develop a multi-barrier assessment (source-to-tap water) of their drinking water systems, which is close to a water safety plan (personal communication, February 20, 2017). There was limited identification of source water

protection areas, primarily because of the immense size of Atlin Lake. As such, groundwater recharge areas within the watershed have not been identified and there is little need. TRTFN had no authority over land use activity within the source water area, but they did receive land use permit applications for activity in the area and the government sought their comments and concerns. Within the village area, TRTFN had partially identified local potential and actual point-source(s) of contamination to Atlin Lake, i.e., fuel storage, sewage disposal, domestic waste.

From the survey, the identified contaminants of concern for the source water supply were: sedimentation (Total Suspended Solids) from active mined creeks to the East of Atlin. Several of these historic place mined creeks also produced heavy metals, including Pine Creek, Birch Creek, Boulder Creek, Ruby Creek, Spruce Creek, Otter Creek, among others. Other potential contaminants were from pet waste, oils and hydrocarbons, especially during spring run-off. In addition, it's believed there were residential septic field installations not up to code. Interesting to note that arsenic, which occurs naturally, was reported to be in a local spring that many residents use daily for water collection

Table 4. Summary of responses for technical capacity from TRTFN

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
<i>Technical:</i>				
<i>Watershed Health inventory:</i>				
Has TRTFN identified source water protection areas?		X		
Public land use activity within the source water area is managed and controlled?		X		
Have the Nation's source water protection areas been designated as protected by a regulatory instrument or other governance tool?		X		
Have groundwater recharge areas within the watershed have been identified?	X			
Have TRTFN identified potential and actual point-source(s) of contamination to Nation water supply identified?		X		
<i>Monitoring Drinking Water Quality:</i>				
Is the raw water quality of source water adequate for the community?			X	
Is the source water adequate in terms of long term quantity (supply) for the community?			X	
At all locations, does the Nation's drinking water quality regularly meet established guidelines?		X		
Is the Nation's community drinking water quality monitored daily by qualified Nation staff?		X		
Is the Nation's community drinking water quality monitored weekly by qualified Nation staff?			X	
Is the Nation's community drinking water quality monitored monthly by qualified Nation staff?			X	
<i>Operations and Maintenance:</i>				

Is the water treatment infrastructure adequate to produce safe drinking water for the Nation's residences?			X	
Is the water treatment infrastructure adequate to distribute safe drinking water for the Nation residences?			X	
Are water operators trained and institutionally certified to the level of the water treatment or distribution facilities?		X		
Does the Nation have a documented Drinking Water Safety Plan as risk management tool?		X		

5.4 Financial

Regarding TRTFN financial capacity, it scored low for financial capacity (Table 5). All funding for TRTFN, approximately \$4 million annually, was provided by the Government of Canada (TRTFN personal communication, March 2, 2017). Within TRTFN, central decision-making and financial control are under the same administrative leadership. Their annual financial resources were partially adequate for funding of water protection or water initiatives. And, their financial resources were only partially sufficient for water and wastewater treatment systems. TRTFN did not have a cost recovery system from water users and nor did they have a funding surplus saved for future water projects. To protect the First Nations' water infrastructure, the assets were annually inspected by a qualified individual for asset condition and safety and an Asset Maintenance Management System is in the development. From the interviews, salary compensation was an issue. The TRTFN Development Corp's hydro-electric facility does generate revenue and this does go back into the community and for TRTFN – details of which are unclear.

Table 5. Summary of responses financial capacity from TRTFN

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
Financial:				
<i>Appropriate Financial System</i>				
Does the Nation use cost recovery from water users?		X		
Do water rates reflect the cost of protecting and providing drinking water: treatment, distribution, source water protection, capacity building?	X			
Within the Nation, is senior decision-making and financial control under the same leadership?			X	
Does the Nation have a funding surplus saved for future water projects?	X			
Is the Nation able to obtain funding from inside the community for water management projects?	X			
Does the Nation have adequate financial resources for source water protection or water policy initiatives?		X		
Does the Nation receive sufficient annual financial resources for water and wastewater treatment systems?		X		

<i>Asset risk management</i>				
Are the Nations water infrastructure assets annually inspected by a qualified individual for condition and safety?			X	
Does the Nation use an Asset Maintenance Management System, for its water infrastructure?		X		

5.5 Institutional analysis

Regarding TRTFN’s capacity under institutional, it also scored low (Table 6). TRTFN had no completed legal framework for water management Yet, there were bits and pieces of capacity for the remaining indicators. There was partial existence of clear leadership for water protection at a watershed scale, and partial management plans that consider the long-term. Within the Nation, internal communication between departments were only partially effective. Natural resources policies were only partially adaptable and flexible to new insights, information and unforeseen circumstances. Occasionally natural resources policies are reviewed and periodically changed. Community planning initiatives around protecting source drinking water supplies and natural resource management were few, and likely centered around lands and fisheries habitat stewardships. There has been partial success with implementation of natural resources policy and plans. Scientific information and traditional knowledge were occasionally used to influence federal policy.

From the interviews, it was learned that the First Nation have monitors that travel about within their traditional territories to ensure there is no activity that they are not aware of. Also, TRTFN have participated in a recent large scale, government of BC, land-use planning exercise for their traditional areas.

Table 6. Summary of responses for institutional capacity from TRTFN

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
<i>Institutional:</i>				
<i>Appropriate Legal Framework:</i>				
Within the Nation is there a complete and clear legal framework for water management?	X			
<i>Long-Term Horizon:</i>				
Does the Nation have documented natural resources management plans that consider the long-term?		X		
<i>Adaptability:</i>				
Are the Nation’s natural resources policies flexible to new insights, information and unforeseen circumstances?		X		
Are local natural resources policies reviewed and changed periodically		X		
<i>Policy & Planning:</i>				

Are there Nation driven community planning initiatives that are involved in protecting source drinking water supplies?		X		
Has the Nation been successful with implementation of their natural resources policy and plans?		X		
Within the Nation, are there effective internal communication between departments?		X		
Does TRTFN use new scientific information and traditional knowledge to influence federal policy		X		
Within the Nation, is there existence of clear leadership for water protection at a watershed scale?		X		

5.6 Actor networks analysis

Regarding actor network TRTFN scored low (Table 7). The one yes response, under social linkage, was for their cooperative arrangements outside of its territory, which focused on issues of lands and fisheries stewardship and a First Nation water operator mentoring network. Regarding cooperation across external administrative boundaries, there was only partial active collaboration with other First Nation governments on water and land issues. Respondents felt that there was only a partial positive working relationship between, both the federal and provincial governments. The issue of co-governance of water with the federal and provincial authority has been raised within the TRTFN, but not advanced. There was only a moderate amount of broad stakeholder participation in partnerships and with non-governmental organizations around natural resources management. Occasionally, members of the TRTFN (the community) have participated and contributed to analysis of natural resource problems. Respondents felt that both the federal and provincial government don not take TRTFN input seriously. There were few social linkages and there were no partnerships with academic institutions. According to the respondents the greater community did not have broad awareness about water resources or watershed protection, nor did they generally participate in any decision-making processes, as it pertains to issues of drinking water, wastewater and environmental management.

From the interview, it was learned that TRTFN have done some work with other FN, including Yukon Inter-Tribal Watershed Alliance in the past, and some information exchange with BC government. There was a comment that the youth of the community should be more inspired to be water operators or resource protectors. There was also comments about the need for re public awareness, and more use of elders to share their knowledge (TRTFN personal communication, March 2, 2017)

Incorporating First Nation values within drinking water management have slowly occurred for TRTFN, primarily because of a new network. As early as 2006, a lead water operator for Lytton First Nation, BC, in addition to other concerned First Nation certified water operators across Canada, began to voice their serious concerns to the federal government about a lack of support, education and a fair wage for First Nation water operators, despite their important work. (Jim Brown, personal communication, March 7, 2017). That concern spread to other Indigenous water operators and managers and it would eventually get the attention of

INAC. In October 2015, with the funding support from INAC, the first chapter of the ‘First Nation Operator Waters Net for British Columbia & Yukon Territories’ (FNOWN) was created. This First Nation driven organization represented approximately 400 First Nation members. “The operators now have a voice, they are sharing their problems and receiving feedback”, said Brown. In 2016, members of the FNOWN were brought together for their first conference, which was well attended and inspiring (Personal Communication, March 7, 2017). Because the FNOWN is First Nation’s lead, an Indigenous values approach to communication can flourish, with an example of the “Community Circle” approach. The Circle can improve open communication amongst all participants within it. Key objectives for mobilizing a Circle are when there is a new or ongoing problem. Within the Circle, and through open communications of oral sharing and critical listening, with the intent of resolving the problem, a solution can usually be found. Open communication can change the awareness and knowledge of all within the Circle and lead to collaborative and innovative solutions (Cairns, 2016). When asked, what is the biggest challenge for FNOWN?, Jim Brown replied, “firstly, it's to secure long term funding and secondly. the challenges of developing stronger partnerships and relationships between others in academia, INAC, First Nation Health Authority, RES'EAU, and engineering firms”. When asked, is the new federal govt is listening to First Nation for new solutions in solving the water crisis? Mr. Brown, stated, “Time will tell if they can walk the talk” (Jim Brown, personal communication, March 7, 2017)

RES'EAU-WaterNET is a five-year, \$7 million program, 30% funded from partnership with public and private organizations matched by 70% funding from the Natural Sciences and Engineering Research Council (NSERC). In addition, the program leverages over \$5 million in human and technological capital from partner organizations to support the implementation of the internationally recognized Community Circle approach. The focus is on achieving understanding between engineering, chemistry, genomics and the social sciences that can be applied to water health monitoring and treatment technology development, as well as new approaches to treating water for various forms of contamination (RES'EAU-WaterNET , 2016).

Table 7. Summary of responses for actor network capacity from TRTFN

Capacity met				
Elements of capacity:	No	Partial	Yes	Unknown
<i>Actor Networks:</i>				
<i>Cross-Sectoral Cooperation:</i>				
Are conflicts with other parties usually dealt with constructively resulting in inclusive understandings and agreements among the parties?		X		
<i>Cooperation Across Administrative Boundaries:</i>				
Does the TRTFN actively collaborate with other First Nation governments on water and land issues?		X		
Is there a positive working relationship between the TRTFN and the federal government?		X		

Is there a positive working relationship between the TRTFN and the provincial government?		X		
Has the issue of co-governance in water management been raised within the TRTFN?		X		
Broad Stakeholder Participation:				
Does the Nation have partnerships with non-governmental organizations around natural resources management, protection?		X		
Do members of the TRTFN (the community) participate and contribute to analysing natural resource problems, developing solutions, making decisions having influence over decisions?		X		
Regarding water management issues, does the federal government seriously take the Nations input their decision making?	X			
Regarding water management issues, does the Nation feel that the provincial government, seriously takes the input of the Nation into account, in their decision making?	X			
Social Linkages:				
Does the Nation have partnerships with outside academic institutions?	X			
Is the Nation part of a cooperative structure outside of its territory; watershed organization/natural resource association?			X	
Do members of the community have broad awareness about water resources, watershed protection?	X			
Do community members participate in any decision-making processes, as it pertains to issues of drinking water, wastewater and environmental management?	X			

6.0 Discussion

Based on this study, the TRTFN revealed low capacity to practice IWRM, scoring 9 out of 65 elements (~15% capacity). However, based on the interviews responses from the participants, it is believed TRTFN possesses greater capacity than this ranking outcome, perhaps even in the 30-40% range. It is speculated that participants might have responded conservatively to the survey questions. The data scored stronger in the 'partial' response category at 58% capacity, to practice IWRM. Indeed, there are currently challenges for TRTFN to operate and maintain their existing water systems and natural resource management programs. Fortunately, they have a relatively new treatment facility and with support from the Circuit Rider Trainer, there has not been a single shut down of the facility, nor has there been a water advisory in the community. TRTFN are obviously concerned about the quality and quantity of water. It was encouraging to learn that there is now a study underway to evaluate their drinking water risks, through a Source-to-Tap evaluation. For TRTFN, water protection elements are captured through their investment in forestry, land-use, hydro-electric power and fisheries habitat stewardship.

7.0 Conclusion:

Although the process of IWRM has clear advantageous and benefits for water managers and decision-makers, the practice of IWRM requires agencies to have enhanced levels of capacity, a willingness by all the stakeholders to be engaged and the ability to share knowledge. The process of IWRM requires stakeholders to adopt a new way of thinking and acting from more conventional approaches of top down, with a narrow focus and limited involvement by others. For TRTFN, based on the responses, the capacity to practice of IWRM was limited. As

none of the participants had heard of IWRM, it would require significant adjustments (and reinforcement) within the First Nation administration, over time.

Incorporating First Nations values and culture within the realm of water management may be increasing as TRTFN have tapped into this new Indigenous network. This network represents approximately 400 First Nation members, who now have a place to share their problems and receive feedback, in addition to having a voice to try influence change. This is timely, because new approaches to change the conversation and actions about water management between Indigenous communities and governments are urgently required. Indigenous water issues are not simply technological in nature, requiring more engineering infrastructure, but they are intertwined with historic wrongs, legalities, financial short falls, environmental settings, public health and a myriad of other types of challenges that may be unique to each community. As such, there is no single individual response to resolve these problems.

From this project, TRTFN now has a foundational quantifiable baseline measurement of capacity. From here, its now possible to plan and begin to build various elements of capacity, should this be desirable.

Thank you to leadership and the participants from TRTFN, for this opportunity to complete this research project towards the completion of my Master of Science Degree.

Sincerely,

A handwritten signature in blue ink that reads "K. Rumsey". The signature is written in a cursive, flowing style.

Kevin D. Rumsey

References

- Anderson, e. a. (2013). Carriers of water: Aboriginal women's experiences, relationships, and reflections. (K. C.-B. Anderson, Ed.) *Journal of Cleaner Production* , 60(3), 11-17.
- Assembly of First Nations. (n.d.). Retrieved from Honoring water: <http://www.afn.ca/en/honoring-water>
- Global Water Partnership. (2009). *Handbook for integrated water resource management in basins*. Stockholm, Sweden: Global Water Partnership and International Network of Basin Organizations.
- Reed, P. L. (2010). The Capacity of Montreal Lake, Saskatchewan to Provide Safe Drinking Water. *Canadian Water Resources Journal*, 35(3), 317-338.
- Rizvi and Adamowski. (2013, January). First Nation capacity in Quebec to practice integrated water resource management. *International Journal of Water*, 7(3), 161-190.