Independent First Nations Alliance

First Nation Report Phase II

1.0 Introduction

1.1 Background

Following the outbreak of E. Coli in the Town of Walkerton, Ontario, in May 2000, and other incidents of Cryptosporidium and Giardia in other communities, the Ontario First Nations Technical Services Corporation (OFNTSC) expressed concerns as to potential health and safety risks facing First Nation communities resulting from water supplies, treatment and storage. It was decided to retain a consultant to carry out a study of existing water facilities in First Nation communities and to assess the ability of these facilities to meet the risk challenges.

In November 2000 the OFNTSC issued a Request for Proposal (RFP) for an Assessment Study of Water Supply/Treatment/Storage at Ontario First Nations Communities. The Ontario Clean Water Agency (OCWA) responded to the RFP and in January 2001 was awarded the assignment by the OFNTSC.

The objective of the study, as outlined in the RFP, was to provide an overall general assessment of the water supply/treatment/storage in First Nation communities to determine the magnitude and scope of existing and potential problems in terms of health and safety risks. Data was to be collected and analyzed on the facilities through observation and discussion and recommendations made on such issues as optimization, maintenance, training and the immediate need for the purchase of equipment. Estimates or details were not required.

Mr. Ross Holden, P.Eng. of Ross Holden Engineering Services was appointed as the Study Coordinator to manage the study on behalf of the OFNTSC.

To monitor the progress of the study and to provide direction, a Technical Steering Committee was formed with representatives from the OFNTSC, Ross Holden Engineering Services, Indian and Northern Affairs Canada (INAC), Public Works and Government Services Canada (PWGSC), Health Canada (HC) and OCWA. Meetings were held at OCWA's offices on January 9, 2001, February 6, 2001 and March 19, 2001. At these meetings it was agreed to expand the Terms of Reference for the study to include sewage facilities. Sewage treatment plants, sewage lagoons and pumping stations, together with water storage tanks, were to be included in the study. Sewage collection systems, other than lift stations, and water distribution systems were not to be included in the study. Individual water and sewage systems were not to be included in the report except where water from communal treatment facilities is provided to individual holding tanks.

The RFP included a questionnaire to be completed for water facilities at each of the First Nation communities included in the study. Through the Technical Steering Committee the questionnaire was revised and expanded to include the new scope of work. In addition, a second questionnaire was developed for sewage facilities. The completed summary for the Independent First Nations Alliance community, is included in the Appendix "A" attached to this report.

Under the Terms of Reference for the study, OCWA representatives would travel to the communities, meet with the First Nation operators, and having enlisted their cooperation, complete the questionnaires by means of questions and discussions. A tour of the treatment facilities would be undertaken at the time

of the visit. Any concerns expressed by the operator would be recorded, together with observations made by the reporter. Reports were then to be prepared on the findings for each of the communities, documenting the potential health and safety risks that were apparent at the time of the visit. Reports for each Tribal Council and/or Large First Nation were then to be prepared to summarize the findings for all of the constituent communities.

Other information provided to OCWA by the Technical Committee included:

- Akwesasne to Wunnumin Lake
  Profiles of Aboriginal Communities in Ontario
  Ontario Native Affairs Secretariat and Ministry of Citizenship
  January 1992
- First Nation Community Profile
  Ontario Region
  OFNTSC
- Capital Asset Inventory System (CAIS)

OCWA met with the Tribal Council Technical Services Advisors (TCTSA) and OFNTSC representatives on January 16, 2001 in Sault Ste. Marie to brief the TCTSA on the study and to ask for their assistance in contacting the various First Nation communities and, if possible, travel to the communities with the OCWA representative. The Tribal Council representatives were very cooperative in assisting with this study and their participation is a major reason for the very high community participation rate in the study.

Visits to the communities by OCWA and the TCTSA were made in February, March, April, May, June, and July 2001.

Draft Tribal Council and/or Large First Nations reports (22 reports in total) were produced in July 2001. These reports were circulated to OFNTSC and Ross Holden Engineering Services for review and comment. Final Tribal Council and/or Large First Nations reports were issued in October 2001 incorporating the comments received by OCWA. In October 2001, a draft Overview Report was also issued, summarizing the 22 Tribal Council and/or Large First Nation reports. The OFNTSC circulated the October 2001 final Tribal Council and/or Large First Nations reports to the various Tribal Councils and/or Large First Nations for comments in December 2001. The Phase I report was finalized in March 2002 based upon the comments received.

1.2 Background - Phase II Reports

Representatives from INAC were members of the Technical Steering Committee and attended the Technical Steering Committee meetings. With INAC's involvement in the initial study in Ontario, INAC have seen the value of undertaking similar studies in the rest of Canada. INAC has taken and used the Terms of Reference prepared by OFNTSC in the initial Ontario study, have modified and expanded the Terms of Reference and the Questionnaire, and in early summer 2001 taken the study Nation wide. The new Terms of Reference developed by INAC are referred to as the "National Site Assessment" study. With the National Site Assessment study expanded Terms of Reference for the rest of Canada, the Ontario study is now less detailed and lacking information is compared with the rest of Canada studies. Therefore INAC at a meeting on August 30th, 2001, through OFNTSC, asked OCWA to submit a proposal expanding the initial Terms of Reference to the National level of detail. By July 2001, OCWA had visited all of the First Nation communities. To properly complete all the requirements of the expanded Terms of Reference, a revisit to the community would be required. INAC stated a revisit was not financially viable and therefore it was agreed some of the requirements of the expanded Terms of Reference could not be met. OCWA submitted their proposal dated September 7th, 2001 based on the use

of information gathered in the initial visits to the First Nation communities from February 2001 to July 2001 and any additional information gathers through Health Canada and discussions with the community.

1.3 Phase II – Terms of Reference, Proposal and Meetings

The Ontario Clean Water Agency ("OCWA") was asked on Thursday, August 30, 2001 to submit a proposal to the Ontario First Nations Technical Services Corporation (OFNTSC) using the Terms of Reference entitled "Assessment Study of Water and Wastewater Systems and Associated Water Management Practices at Ontario First Nation Communities" supplied by Indian and Northern Affairs Canada (INAC). These Terms of Reference are generally referred to as the National Site Assessment study. The intent of this proposal is to expand on the initial study awarded to OCWA by OFNTSC in January 2001 to bring the study information up to the National study information level.

The Terms of Reference given to OCWA on August 30, 2001 were generic Terms of Reference developed by INAC Headquarters, and were meant to be modified for the Region involved. OCWA has taken the liberty with the Terms of Reference to make assumptions where blanks existed in the Terms of Reference. As was noted earlier, INAC instructed OCWA to use existing information and any additional information that could be gathered, without revisiting the community.

Terms of Reference has been included in Appendix "B" of this report.

OCWA submitted the proposal on September 7th, 2001 now referred to as the "Phase II" of the study. Meetings were held on September 12th, 2001, September 17th, 2001, September 24th, 2001, and October 1st, 2001 to clarify the proposal requirements. The negotiated activities for the Phase II study included:

- Preparing estimated costs of (Class D Level) capital works identified in the Phase I reports
- Inputting Phase I and Phase II information data into a computerized database developed by PWGSC
- Gathering Health Canada sampling and boil water advisories data
- Classifying the water and sewage facilities based upon Terms of Reference definitions
- Preparing updated Phase II reports.

The Technical Steering Committee had representation from OFNTSC, INAC, PWGSC, Ross Holden Engineering Services and OCWA. Steering Committee meetings were held on October 18th, 2001, November 9th, 2001, November 27th, 2001, December 17th, 2001 January 17th, 2002, and March 27, 2002. Teleconference calls were also held on January 23rd, 2002 and February 21st, 2002. Ross Holden Engineering Services was not involved in the meetings of February 21 and March 27, 2002.

OCWA has also received Health Canada sampling data on Independent First Nations communal water and sewage facilities in February 2002. This Phase II report includes the Phase I report information, along with the additional information gathered from Health Canada and discussions with Independent First Nations Council representatives.

2.0 Community Water and Sewage Facilities Assessed

2.1 Communities

The IFNA is comprised of four communities of which Kitchenuhmayoosib Inninuwug and Muskrat Dam are approximately 400 km north of Sioux Lookout; Lac Seul is approximately 15 km northwest of Sioux Lookout, and Pikangikum is approximately 85 km northwest of Red Lake.

From information obtained from CAIS and INAC reports, the on-site community population, number of houses, and services are tabulated below:

Table 1(a) - Community Statistics

Community	Pop.	Houses	Water Systems				
			Communal	Wells	Holding Tanks	Other	Totals
Pikangikum	1,762	387	0	0	43	344	387
Kitchenuhmayoosib Inninuwug	856	251	76	3	164	8	251
Muskrat Dam	281	95	40	0	37	18	95
Lac Seul	746	199	171	0	0	28	199
Totals	3,645	932	287	3	244	398	932

Table 1(b) - Community Statistics

Community	Pop.	Houses	Sewage Systems				
			Communal	Septic Tanks	Holding Tanks	Other	Totals
Pikangikum	1,762	387	0	0	43	344	387
Kitchenuhmayoosib Inninuwug	856	251	76	0	130	45	251
Muskrat Dam	281	95	40	0	37	18	95
Lac Seul	746	199	171	0	0	28	199
Totals	3,645	932	287	0	210	435	932

From the above tables the following observations can be made:

- of the 932 houses in the IFNA communities, 287 houses (23%) are serviced by communal water, and 287 houses (31%) are serviced by communal sewage;
- 3 houses are serviced by individual wells;
- 244 houses (26%) are serviced by water trucks delivering communal water to individual holding tanks, and 210 houses (23%) are serviced by trucks hauling sewage from individual sewage holding tanks;
- 398 houses (43%) have other water delivery systems, and 435 houses (46%) have other sewage disposal systems; and
- it is recommended that the CAIS and INAC reports be updated and reconciled.

2.2 Community Visits

Cam McIvor, the OCWA representative, visited the community of Pikangikum in April without the Tribal Council Technical Services Advisor. Cam met with George Vocal and Gordon Peters of the Band and also with the operator, Allen Peters.

Marcel Lavigne, the OCWA representative, visited the community of Kitchenuhmayoosib Inninuwug in March without the Tribal Council Technical Services Advisor. On site, he met with Bill Sainwawap (Public Works) and with the operator, Gord Albani. Marcel also met with Billamie Morris (Community Health).

The communities of Muskrat Dam and Lac Seul were not visited. Mel Barber, the Tribal Council Technical Services Advisor, advised OCWA that the Muskrat Dam community would not participate in this study. In the case of Lac Seul, Mel was unable to schedule an inspection.

The communities visited were as follows:

Table 2 - Community Visits

Community	Facilities Visited
Pikangikum	Water and sewage facilities
Kitchenuhmayoosib Inninuwug	Water and sewage facilities
Muskrat Dam	No visit
Lac Seul	No visit

Information contained within this report is based on discussions with the plant operators (as noted above), a quick walkthrough, and visual inspection of the facilities.

The findings presented by OCWA are based on provincial legislation pertaining to drinking water and sewage treatment requirements. and on practices adopted by OCWA in the operation of facilities. Specifically, the requirements of the Ontario Drinking Water Protection Regulation (O.Reg. 459/00) have been incorporated into the analysis - these requirements being more stringent than the guidelines included under the Guidelines for Canadian Drinking Water Quality - Sixth Edition.

The study only includes the assessment of communal systems. **No detailed review was conducted by OCWA.**

Individual systems, such as septic tanks and individual wells, were not assessed.

2.3 Communal Systems

The communal water systems in the communities are shown below:

Table 3 - Communal Water Systems

Community	Water Supply Systems
Pikangikum	Surface water source - Water Treatment Plant (WTP) with in-ground pressure distribution system
Kitchenuhmayoosib Inninuwug	Surface water source - Pump house with disinfection only – no in-ground distribution system
Muskrat Dam	No visit
Lac Seul	No visit

In Pikangikum, the existing WTP flooded in September 2000. Subsequently, a Zenon plant was installed on a temporary basis for drinking only. Water is supplied to the distribution system, but is only chlorinated and not intended for drinking.

In Kitchenuhmayoosib Inninuwug, surface water is chlorinated only and trucked to individual water holding tanks. There is no in-ground water distribution system.

No visits were made to the Muskrat Dam and Lac Seul communities and, therefore, no details are included herein.

The communal sewage systems in the communities are shown below.

Table 4 - Communal Sewage Systems

Community	Sewage Treatment Systems
Pikangikum	Individual holding tanks with sewage trucked to lagoon
Kitchenuhmayoosib Inninuwug	Collection system and sewage lagoon
Muskrat Dam	No visit
Lac Seul	No visit

In Pikangikum, the houses are serviced by sewage being trucked from individual holding tanks to a lagoon. A communal collection system is in place only for the nursing station, the school, and the 'teacherage'.

In Kitchenuhmayoosib Inninuwug, the houses are serviced by a collection system and pumping station discharging to a lagoon.

No visits were made to the Muskrat Dam and Lac Seul communities and, therefore, no details are included herein.

2.4 Classification of Facilities

The water and sewage facility classifications are based on classification guidelines developed by Public Works and Government Services Canada, Appendix I of the Terms of Reference for this study and with discussions with the Ontario Ministry of the Environment, Human Resources, Certification Section. These guidelines are similar to the Ontario Guidelines as specified in Regulation 435/93. However, the sludge/backwash water disposal criterion was omitted in the Terms of Reference guidelines, but was included for the purpose of this study.

The classifications of water and sewage facilities for the Independent First Nations Alliance communities are summarized below.

Table 5 – Classification of Facilities

Community	Water Treatment Facility	Sewage Treatment Facility
Pikangikum	Class I	Class I
Kitchenuhmayoosib Inninuwug	Class I	Class I
Muskrat Dam	No Visit	No Visit
Lac Seul	No Visit	No Visit

3.0 Potential Health and Safety Risks to Communities

3.1 Definition of Risk

In the area of risk assessment, the concept of the frequency of occurrence, probability, and impact of risk situations are fundamental because they are used to assess the risk itself. When an impact assessment of water and wastewater systems is required, before any corrective measure can be implemented, the type and magnitude of impacts on the residents of a community must be identified.

The risk in relation to public health should be viewed as the product of such factors as: the frequency of occurrence of the event, the probability of the occurrence of negative effects and the seriousness of effects. All these factors were considered while surveying each system. The definition of Risk has been changed from the Phase I report. Risk in the Phase II assessment will focus on drinking water health protection using a simplified method under four categories. For more detailed descriptions of the categories entitled "Risk Assessment Model" are included herein under Appendix "B," Terms of Reference Appendix "E".

Low Risk (Ranking Scale 1-4)

Systems operating without major problems and are able to produce the drinking water that meet the Guidelines for Canadian Drinking Water Quality.

Medium Risk (Ranking Scale 5-7)

Systems with deficiencies that would require repairs and upgrades, should be identified. Some remedial action may be required to: construct a new facility, upgrade existing facilities, improve operation and maintenance practices.

Also, water systems that do not meet the Aesthetic Objectives (AO) parameters, indicated in the Guidelines for Canadian Drinking Water Quality are included in this category as are wastewater systems that do not meet MOE's Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments (GEQWTFE). The operation of water and wastewater facilities should not create a health risk to the public. In the case of water facilities, the quality of produced water may include a minimal excess of iron, manganese and sodium. Similarly, wastewater treatment facilities that may be experiencing operational problems, but will not create immediate health and safety risks.

High Risk (Ranking Scale 8-10)

Systems with potential health and safety concerns such as the repetitive water boiling advisories, not meeting the Maximum Acceptable Concentration (MAC) parameters specified in the Guidelines for Canadian Drinking Water Quality, and other issues of a similar nature. Deficiencies identified under this category may pose an immediate health risk for residents of a surveyed community.

Not Enough Information to Assess (Ranking Scale 0)

To properly assess the various categories for Water Source, Design, Operation, Reporting and Operators, OCWA would have to revisit the facility being evaluated. OCWA was requested to evaluate the facilities based upon the existing information gathered without a revisit to the facility. This category was created by OCWA if there was insignificant information to assess the facility.

3.2 Methodology for Risk Assessment

The methodology for the risk assessment consists of ranking each category, water source, design, operations, reporting, operators, individual wells and overall ranking as low, medium or high risk. This ranking is based on the "Risk Assessment Model" in the Terms of Reference and as discussed in Section 3.1. This methodology was approved at the January 17, 2002 meeting and January 23, 2002 teleconference meeting by the Steering Committee. Except in certain cases where Health Canada data was available, individual wells were not evaluated, as they were not part of the Terms of Reference.

3.3 Risk Assessment

For reference purposes, the Boil Water Advisories issued over the last year that have been brought to OCWA's attention by the operators, are included herein. Health Canada compiled a list of active Boil Water Advisories dated November 2, 2001. It should be noted that there may have been other advisories issued of which OCWA is not aware. Requests to Health Canada, by Ross Holden, have not provided confirmation or any additional information to that included below:

Table 5 - Boil Water Advisories Issued in the Last Year

Community	Number of Boil Water Advisories
Pikangikum	One Boil Water Advisory reported
Kitchenuhmayoosib Inninuwug	One Boil Water Advisories confirmed by Health Canada
Muskrat Dam	N/A – No Visit
Lac Seul	N/A – No Visit but Two Boil Water Advisory confirmed by Health Canada

Community water systems have been assessed high risk if there was a Boil Water Advisory in effect at the time of the OCWA visit, there is a history of repeated Boil Water Advisories, a Boil Water Advisory has been issued in the last 12 months, and, in the absence of any information, the reason and the corrective action taken to address the Boil Water Advisory.

The Pikangikum Boil Water Advisory is the result of the flooding of the water treatment plant basement in October 2000. The existing plant has since been replaced by a temporary Zenon Plant and the Boil Water Advisory was removed on September 30, 2001.

The Kitchenuhmayoosib Inninuwug Boil Water Advisory was issued on July 26, 2001 due to a sewage leak near the water intake.

The Lac Seul Boil Water Advisory, in the Frenchman's Head area, was reported to OCWA by Health Canada during January 2001. Another Boil Water Advisory was reported in 1999 due to the combination of well and lake water with no treatment. Heavy fuel contamination was also found in well supply.

The information collected by OCWA from on-site observations and interviews is summarized in the Community Reports included herein under Appendix "A". These reports include a risk analysis according to a category rating system as developed by Ross Holden and OCWA. Descriptions of the categories entitled "Risk Categories and Risk Factors for Water" and "Risk Categories and Risk Factors for Sewage" are included herein under Appendix "B". One of the three categories (high, medium or low risk) has been assigned to each community system as shown below.

With the available information, OCWA has assessed the water treatment facilities using the above noted definition of risk:

Table 7 – Water Facilities Risk Categories

COMMUNITY	CATEGORY Water	SECTION RANKING Water	RISK Water
Pikangikum	A. Water Source	0	Not Evaluated
	B. Design	8	High Risk
	C. Operations	8	High Risk
	D. Reporting	8	High Risk
	E. Operators	2	Low Risk
	F. Individual Wells	8	High Risk
	G. Overall Ranking	**8**	**High Risk**
Kitchenuhmayoosib Inninuwug	A. Water Source	0	Not Evaluated
	B. Design	8	High Risk
	C. Operations	10	High Risk
	D. Reporting	8	High Risk
	E. Operators	8	High Risk
	F. Individual Wells	0	Not Evaluated
	G. Overall Ranking	**8**	**High Risk**
Muskrat Dam	A. Water Source	0	Not Evaluated
	B. Design	8	High Risk
	C. Operations	0	Not Evaluated
	D. Reporting	8	High Risk
	E. Operators	0	Not Evaluated
	F. Individual Wells	0	Not Evaluated
	G. Overall Ranking	**8**	**High Risk**
Lac Seul	A. Water Source	0	Not Evaluated
	B. Design	6	Medium Risk
	C. Operations	0	Not Evaluated
	D. Reporting	8	High Risk
	E. Operators	0	Not Evaluated
	F. Individual Wells	0	Not Evaluated
	G. Overall Ranking	**8**	**High Risk**

The Pikangikum communal water system is rated as high risk because of the Boil Water Advisory and the water treatment plant not being operational. The community is temporarily being serviced by a Zenon microfiltration treatment plant.

The Kitchenuhmayoosib Inninuwug communal water supply is rated high risk because of equipment malfunctions, infrequent sampling, needed repairs to the chlorine line, and illness is the community. The communal sewage facilities are rated high risk because of pumping station by passes, and illness in the community.

OCWA did not visit the Muskrat Dam or Lac Seul community facilities. Based upon the Health Canada sample results, the water treatment facilities have been assessed as high risk for both communities and the sewage treatment facility in the Lac Seul community as high risk.

With available information, OCWA has assessed the sewage treatment facilities using the above noted categories:

Table 8 – Sewage Facilities Risk Categories

COMMUNITY	CATEGORY Sewage	SECTION RANKING Sewage	RISK Sewage
Pikangikum	A. Effluent Receiver	0	Not Evaluated
	B. Design	0	Not Evaluated
	C. Operations	0	Not Evaluated
	D. Reporting	0	Not Evaluated
	E. Operators	0	Not Evaluated
	F. Individual Septic Tanks	0	Not Evaluated
	G. Overall Ranking	**0**	**Not Evaluated**
Kitchenuhmayoosib Inninuwug	A. Effluent Receiver	0	Not Evaluated
	B. Design	7	Medium Risk
	C. Operations	10	High Risk
	D. Reporting	8	High Risk
	E. Operators	6	Medium Risk
	F. Individual Septic Tanks	0	Not Evaluated
	G. Overall Ranking	**10**	**High Risk**
Lac Seul	A. Effluent Receiver	0	Not Evaluated
	B. Design	8	High Risk
	C. Operations	0	Not Evaluated
	D. Reporting	0	Not Evaluated
	E. Operators	0	Not Evaluated
	F. Individual Septic Tanks	0	Not Evaluated
	G. Overall Ranking	**8**	**High Risk**

4.0 Rationale for Assessment and Recommendations

4.1 Legislation and Guidelines

Following is a list of Provincial and Federal regulations and guidelines that pertain to the design and operation of water and sewage facilities:

- Ontario Water Resources Act;
- Ontario Drinking Water Protection Regulation (O.Reg. 459/00);
- Ontario Occupational Health and Safety Act;
- Guidelines for Canadian Drinking Water Quality - Sixth Edition (GCDWQ);
- Guidelines for Effluent Quality and Wastewater Treatment of Federal Establishments (GEQWTFE);
- Canada Labour Code - Part II; and
- Ontario Regulation 435/93.

The GCDWQ and GEQWTFE guidelines were used as reference when evaluating facilities. Other relevant regulations (Ontario) may also have been referred to in performing assessments and evaluations of facilities.

4.2 Operators

Operator training is paramount to the successful operation of water and sewage systems and the mitigation of health and safety risks.

Consideration should be given to introducing a formal operator training and certification program for this community. The Circuit Rider Training Program is available and can provide valuable assistance in this respect.

Under provincial legislation, in addition to mandatory certification requirements, water and sewage plant operators are required to have a minimum of 40 hours per year of training.

Training should include the fundamentals of water and sewage treatment, collection and distribution system, the design and operating requirements of facilities, sampling and testing procedures, the importance of reporting protocols, emergency responses, and preventive maintenance. Health and safety should continue to be the focal point of training education.

4.3 Sampling and Reporting Procedures

Sampling, testing and reporting is a straightforward method of ensuring that facilities are properly operated and that health risks to the community are minimized. This is carried out by ensuring that the operators have proper monitoring equipment, on-site testing equipment and laboratories. In addition, off-site laboratory testing, feed back reporting and follow up is fundamental to ensuring operational excellence.

Sampling and testing of raw water, treated water and distribution systems should be undertaken on a regular basis, with all results being made available to the operators and other appropriate agencies.

Sampling and test results of sewage effluents should also be tabled with the operators and agencies. Non-compliance issues should be addressed at once.

Boil Water Advisories should be addressed immediately. These Boil Water Advisories indicate a breakdown in operating procedures, including equipment failure, and may have an adverse impact on

community health. A formalized reporting structure should be developed to address adverse sample results and Boil Water Advisories.

4.4 Water Sources

4.4.1 Surface Water

Surface water sources from lakes, or rivers, are susceptible to pollution problems and changing conditions in relation to both quantity and quality.

Changes to the raw water quality can occur at different times of the year, particularly at spring breakup, and after heavy rainfall events. Proper monitoring, including turbidity metering, can prepare the operators for changed conditions and adjustments can then be made at the water treatment plants. Raw water sampling should always be employed in order to optimize the treatment process.

Water intakes, particularly in lakes, with declining water levels can present major problems. These intakes should be inspected, modified and maintained accordingly. Shallow intakes are susceptible to winter ice damage, boat damage and poor water quality (turbidity, temperature, shore line pollution). In addition, intakes should be inspected regularly to ensure that zebra mussel infestation is not occurring.

All drinking water obtained from surface water sources must be treated by filtration or other approved processes, in addition to chlorination.

4.4.2 Groundwater

Groundwater sources, used for drinking water, should be monitored to ensure that no contamination is occurring from such sources as sewage effluent discharges, septic tanks, landfill sites or other sources of activity. In addition, naturally poor quality groundwater should be treated and monitored.

4.5 Sewage Effluent

Discharge of effluent from lagoons or sewage treatment plants, to receiving water, should be monitored to ensure compliance with discharge criteria in accordance with the facility design. Disinfection by chlorine or ultraviolet means should be maintained at all times. Discharges from overflows, by-passes, or other non-treatment situations can cause serious problems to drinking water sources as well as damaging the environment and should be minimized. Sewage effluent discharges should be located downstream from the community water intakes.

While not investigated under terms of this study, it is important to note that sludge disposal, from treatment facilities, should be monitored to ensure that cross contamination to drinking water sources does not occur.

4.6 Equipment Requirements

4.6.1 Safety Equipment

Appropriate safety equipment should be maintained on site at each facility for the safety of the operators. This includes protective clothing, where chemicals are being used, together with shower and eye wash stations in the event of spills occurring. Specialized equipment, together with procedures, should be in place where entry to confined spaces has to be undertaken by the operator.

4.6.2 Amenities

Treatment plants should include laboratory space for in-house testing. In the case of combined water and sewage plants there should be two separate laboratories.

Office facilities should provide for the storage of files and records.

It is recommended that facilities that do not have a self contained breathing apparatus (SCBA) should borrow this equipment from the Fire Department. This is a recommendation because the required maintenance for this equipment is difficult to perform due to the remote location of First Nations communities.

Work areas, for maintenance of equipment, should be clearly defined, organized and not impact on the operation of the facility.

All necessary tools should be made available to the operator to undertake emergency equipment repairs and to conduct routine maintenance. Proper organized storage areas for all tools and equipment should be available to the operator.

Separate chemical storage is required so that the chemicals are in one area and separate from the normal day to day activities of the operators.

Washrooms/showers areas should be provided to allow operators to maintain a high standard of hygiene.

4.6.3 Hazards

Access to all tankage, equipment and infrastructure should be protected to prevent injury to operator staff. Walkways and railings to tankage together with fall arrest systems should be in place.

Emergency lighting should be provided at all plants to prevent accidents occurring during power failures and to allow emergency operation to continue

Chemical storage areas should be constructed to provide containment of any spill and should also be properly ventilated. Fuel tanks should also be enclosed in containment areas. In both cases, the containment areas must prevent any leakage to either drinking water supplies or to the environment.

All plant facilities should maintain a housekeeping program to eliminate tripping hazards and to allow proper plant operation.

4.6.4 Chlorine Analyzers

Continuous chlorine residual analyzers should be installed at all water treatment facilities to monitor chlorine levels in the drinking water entering the distribution system. It is important to monitor disinfection as changing water source conditions can change the effectiveness of the treatment processes. Analyzers should be re-calibrated on a regular basis.

4.6.5 Turbidity Meters

Continuous turbidity meters should be installed at all surface water treatment plants to monitor the turbidity of the treated water. In addition operators should monitor the turbidity of the raw water because turbidity changes will affect the operation of the treatment processes. Turbidity meters should be re-calibrated on a regular basis.

4.6.6 Flow Meters

Flow meters should be installed at water and sewage facilities to monitor constant and changing flow conditions.

At water treatment plants, the recorded flow data provide historical information on community consumption and unusual demands caused by broken watermains or leakage. These data are used to coordinate chemical requirements, plant operation, and long term capacity planning.

Sewage flow meters should be installed at pumping stations and/or at sewage treatment plants. Such data will identify unusual occurrences such as high inflow/infiltration into the collection system. Also, the data can be used to optimize sewage treatment and are necessary for long term planning.

Flow meters should be re-calibrated on a regular basis.

4.6.7 Alarms

Alarm systems should be installed in all water and sewage treatment plants, and all sewage pumping stations. These alarms monitor and report on changing treatment process conditions, equipment failure, power failure and unauthorized intrusion. The alarms can register either at the facility and/or remotely, by dial out, to an emergency number.

Each facility should be reviewed and appropriate alarms installed accordingly, in order to minimize potential risks to the services being provided.

4.6.8 Spare Parts and Tools

Sufficient spare parts should be catalogued and stocked at all treatment facilities to allow for repairs to essential equipment and for the ongoing maintenance of all equipment. A recommended spare parts list should be developed for each plant.

Essential equipment, such as chemical feed systems, should be duplicated to allow switch over when one system fails and thereby allow treatment to continue. The original systems should then be repaired as soon as possible.

The necessary tools should be made available to the operator to make repairs to equipment. Without the appropriate tools, it makes repairs difficult for the operator.

4.6.9 Backup Power

Backup power should be considered for each facility in order to maintain treatment functionality during power outages.

4.6.10 Filtration

All drinking water supplied from surface water sources should be filtered or treated in addition to chlorination or other methods of disinfection. This requirement is to ensure the removal of turbidity, which affects the disinfection process. In addition, parasites such as Giardia and Cryptosporidium are removed.

4.6.11 As-Built Drawings and Maintenance Manuals

All facilities, including treatment plants, pumping stations, storage tanks, and collection and distribution systems, should have as-built drawings made available to the operators.

In the case of plants and pumping stations, Operations and Maintenance Manuals should be available on site.

These documents allow the operators to understand the systems and to respond and react to emergency issues including process failure and equipment failure. These documents also permit scheduled maintenance to be undertaken and future planning to be carried out.

4.7 Maintenance Programs

4.7.1 Preventative Maintenance

All facilities should have a preventative maintenance program prepared and implemented. This ongoing routine management plan ensures that all equipment is kept in a fully functional condition. This practice reduces down time, helps to minimizes non-compliance situations, extends equipment life, and reduces risk. Equipment duplication of critical systems also assists in maintaining compliance. Damaged or broken equipment should be repaired immediately and, in the case of backups or duplicated equipment, not left until both systems are in states of disrepair.

4.7.2 Scheduled Maintenance

Routine maintenance of other system components should be carried out on a scheduled basis. Such items as watermain swabbing and flushing, sewer flushing, hydrant draining prior to winter, and other routine items should be planned and implemented. The benefits of these programs is to monitor excessive water losses from water distribution systems and excessive inflow and infiltration into sewage collection systems. In both cases properly maintained systems are less costly to operate and the capacity, as designed, can be maintained thus delaying future capital expansion.

4.8 Contingency Planning

Each facility, community or group of communities should develop a contingency plan. This document should contain all contacts, names, addresses and telephone numbers in order to allow effective responses to all potential emergency and unusual circumstances. Such a plan could include the procedures to be followed for such occurrences as operator absence, changes to water source quality, flooding or fire events, chemical spills, bypassing of sewage, power failures and major equipment failures. With such plans in place, the response to an unusual event can be handled in a timely and effective manner.

Boil Water Advisories should also be addressed in the plan. When a Boil Water Advisory is issued, a process should be in place to work towards having the Boil Water Advisory lifted at the earliest possible time.

4.9 Record Keeping

A separate log book for each facility should be maintained by the operator(s) to record important operational issues, changes to the operation of the facilities, and the completion of the maintenance.

4.10 Individual Systems

Individual systems, including septic tanks and wells, can be susceptible to major problems that pose health and safety risks to community residents.

Septic tanks that are not properly constructed and maintained can cause serious problems by polluting groundwater supplies and hence drinking water supplies that depend on groundwater. In addition, poorly functioning systems can result in breakthrough of untreated or partially treated sewage to the ground surface.

Wells that are poorly installed or maintained can be serious health risks, should the groundwater become contaminated from septic tanks or other polluting sources. Surface water infiltration into poorly sealed well casings can also introduce pollutants into the water.

Where individual holding tanks are located at residences for the storage of bulk water deliveries from communal treatment facilities, procedures should be established for the monitoring of these tanks, together with the delivery tankers. This process will ensure that risks associated with the delivery of drinking water to community residents is minimized.

Beyond the scope of this study, it is advisable to consider undertaking a review of individual systems where water testing results indicate potential problems.

5.0 Recommended Action Items

Based on the three classifications developed under Section 3.0, the findings, as recorded in the Community Reports included under Appendix "A", are now tabulated below for each communal water and sewage facility in each community.

5.1 Immediate Action Issues

Immediate action issues may include high risk items such as broken or malfunctioning equipment, unfiltered surface water, Boil Water Advisories, and noncompliance issues such as exceedances of health related parameters stipulated in GCDWQ, or sewage discharge to the environment.

5.1.1 Water

Immediate action items that are recommended, in relation to communal water supplies in the communities, are as follows:

Table 9 - Immediate Action - Water

Community	Action Required
Pikangikum	• Repair and start operation of the water treatment plant • Investigate causes of THM, TOC, and aluminum exceedances in existing (permanent) plant. • Ensure all test results are returned to the operator and kept on site • Improve record keeping • Add continuous on-line chlorine analyzer at plant • Add on-line turbidity meter at plant • Add spare chlorinator unit at plant • Provide safety equipment at plant • Provide and maintain spare parts and tools at plant • Add flow meter at plant • Add alarm systems at plant
Kitchenuhmayoosib Inninuwug	• Repair chlorine line • Install filtration for surface water supply. • Investigate fire pump problems • Increase sampling frequency • Ensure all test results are returned to the operator and kept on site • Improve record keeping • Add continuous on-line chlorine analyzer at plant • Add spare chlorinator unit at plant • Add on-line turbidity meter at plant • Provide safety equipment at plant • Provide and maintain spare parts and tools at plant • Add flow meter at plant • Add alarm systems at plant
Muskrat Dam	• N/A - no visit
Lac Seul	• N/A - no visit

The above comments have been extracted from the Community Reports enclosed herein under Appendix "A".

5.1.2 Sewage

Immediate action items that are recommended, in relation to sewage treatment in the communities, are as follows:

Table 10 - Immediate Action - Sewage

Community	Action Required
Pikangikum	• System not inspected • Health Canada recommends commenting the hotels, restaurants, water treatment plant, Band Office and Police Station to the communal sewage system to avoid reoccurring problems of overflowing holding tanks.
Kitchenuhmayoosib Inninuwug	• Repair pump tripping out and sewage bypassing • Address BOT, TSS exceedances in lagoon effluent • Construct new entrance to lift station • Ensure all test results are returned to the operator and kept on site • Provide and maintain spare parts and tools at plant • Add flow meter at lift station • Add alarm system at lift station
Muskrat Dam	• N/A - no visit
Lac Seul	• N/A - no visit

The above comments have been extracted from the Community Reports enclosed herein under Appendix "A".

5.2 Short Term Action Issues

Short term action issues may include medium risk items such as the undertaking of capital works and equipment together with operational review to bring the facilities up to approved standards. This classification also includes an assessment of the operator's knowledge, skill levels and abilities, and the necessity for further and ongoing training.

5.2.1 Water

Items that should be considered for implementation as part of an ongoing plan of action include the following:

Table 11 - Short Term Action - Water

Community	Action to be Undertaken
Pikangikum	• As-built drawings and operations manuals to be kept on site
Kitchenuhmayoosib Inninuwug	• No recommendations
Muskrat Dam	• N/A - no visit
Lac Seul	• N/A - no visit

The above comments have been extracted from the Community Reports enclosed herein under Appendix "A".

5.2.2 Sewage

Items that should be considered for implementation, as part of an ongoing plan of action, include the following:

Table 12 - Short Term Action - Sewage

Community	Action to be Undertaken
Pikangikum	• System not inspected - no recommendation
Kitchenuhmayoosib Inninuwug	• No recommendations
Muskrat Dam	• N/A - no visit
Lac Seul	• N/A - no visit

The above comments have been extracted from the Community Reports enclosed herein under Appendix "A".

5.3 Long Term Action Issues

Long term issues may include low risk items and the strategies needed to be put in place to ensure long term optimal operation of the facilities, which will minimize risk to the communities.

5.3.1 Water and Sewage Communal Systems

It is expected that the action items as described in Sections 5.1 and 5.2 will be undertaken to bring the facilities up to full operating standards. At the same time consideration should be given to planning the long term strategy necessary to maintain that level of operational excellence. This strategy will both minimize the long term health and safety risks to the communities, and at the same time maintain the capital investment value of the facilities.

To achieve this long term objective, a support structure should be developed that will provide assistance to the Tribal Council on such issues as operator training and certification, testing and reporting, responding to non-compliance issues including Boil Water Advisories, contingency planning, preventative maintenance and planning issues.

This study has focused on communal water and sewage facilities. In order to provide a comprehensive evaluation of the entire systems, further assessment of the water distribution systems and sewage collection systems should be undertaken. Problems associated with leaking water systems and infiltrating sewage systems are previously discussed under Section 4.0.

Consideration should also be given to further studies of individual systems including sewage holding tanks, water holding tanks, and other individual water and sewage systems. These facilities were not required to be assessed as part of this report.

Items that should be considered for implementation, as part of a long term action plan, include the following:

Table 13 - Long Term Action - Water and Sewage Communal Systems

Community	Action to be Undertaken
All Communities	• Develop and implement a training program that will lead to certification of all operators
	• Develop and implement a system for obtaining water analyses of raw water, treated and distributed water
	• Develop and implement a system for obtaining influent and effluent analyses for all sewage treatment facilities
	• Ensure all non compliance results are reported to the appropriate authorities
	• Provide separate laboratory, office space, maintenance areas, washroom, and shower facilities at all plants
	• Develop and implement a comprehensive preventative maintenance program for all systems
	• Develop and implement a comprehensive contingency plan to address all potential emergencies and unusual circumstances for all systems

5.3.2 Water and Sewage Individual Systems

The investigation of individual sewage holding tanks, water holding tanks, individual wells, and other individual water and sewage systems were outside the scope of this study. There is potential for individual systems to cause health and environmental problems. Items that should be considered for implementation, as part of the long term action plan, include the following:

Table 14 - Long Term Action - Water and Sewage Individual Systems

Community	Action to be Undertaken
All Communities	• Develop and implement a training program for truck haulers
	• Develop and implement a protocol for taking water samples and put in place an action plan to address non-acceptable sample results
	• Develop and implement a protocol for regular cleaning and disinfecting individual water holding tanks
	• Implement an individual well inspection program to ensure potential contamination is minimized
	• Implement a sewage septic tank inspection program to inspect all septic tanks for potential contamination of ground water supplies and the environment

6.0 Summary of Observations

The OCWA representative visited two of the four communities of IFNA in late March and early April 2001 and met with the various operators. Muskrat Dam and Lac Seul communities were not visited. This report summarizes the information gathered and observations made at the time of the visits.

The IFNA is made up of four communities of which three are located between 15 and 400 km north of Sioux Lookout, and one is located 85 km north of Red Lake. Based upon information obtained from the INAC report, there are 3,645 people occupying a total of 932 houses, as reported by CAIS, within the communities.

The Pikangikum community's existing water treatment plant was flooded in September 2000. Subsequently, a Zenon plant was installed on a temporary basis for drinking water only. Water is supplied to the distribution system, but is only chlorinated and not intended for drinking. The communal sewage system services only the nursing station, school and 'teacherage', and consists of a small sewage collection system with one pumping station pumping sewage to a lagoon.

The Kitchenuhmayoosib Inninuwug community's surface water source is chlorinated only at the pumping station and trucked to individual holding tanks. There is no in-ground water distribution system. The communal sewage system consists of a collection system with one lift station and a lagoon.

The OCWA representative did not visit the Muskrat Dam and Lac Seul communities.

In the IFNA communities, the water supply systems consist of 287 houses (31%) with communal service, three individual wells, 244 houses (26%) with water holding tanks and trucked water, and 398 houses (43%) have other individual delivery systems.

In the IFNA communities, sewage facilities consist of 287 houses (31%) with communal service, 210 houses (23%) serviced by truck hauling sewage from individual holding tanks, and 435 houses (46%) have other individual sewage disposal systems.

Pikangikum and Kitchnuhmayoosib Inninuwug have Class I water treatment facilities.

Pikangikum and Kitchnuhmayoosib Inninuwug have Class I sewage treatment facilities.

Operators informed OCWA that there had been one Boil Water Advisory placed on the Kitchenuhmayoosib Inninuwug community, and Health Canada informed OCWA that there was one Boil Water Advisory on the Lac Seul community.

The Pikangikum communal water system is rated as high risk because of the Boil Water Advisory and the water treatment plant not being operational.

The Kitchenuhmayoosib Inninuwug communal water supply is rated high risk because of equipment malfunctions, infrequent sampling, needed repairs to chlorine line, and illness in the community. The communal sewage facilities are rated high risk because of pumping station bypasses, and illness in the community.

The sewage collection system for Pikangikum was not evaluated. The Kitchnuhmayoosib Inninuwug is identified to be high risk because of effluent bypassing, lack of backup power and service disruptions.

OCWA did not visit the Muskrat Dam or Lac Seul community facilities. Based upon the Health Canada sample results, the water treatment facilities have been assessed as high risk for both communities and the sewage treatment facility in the Lac Seul community as high risk.

The high risk items identified in the Community Reports, and summarized in Tables 9 and 10, should be acted on immediately. These items may include repairs to critical components of the treatment processes that, if not addressed, could lead to contamination of water supplies or contamination of the environment by sewage. Also included are monitoring items that ensure the treatment process is operating properly.

Short term action items have also been identified and summarized under Tables 11 and 12. These items deal with operator health and safety issues, which improve the response time of the operator to correct alarm situations. Capital and operational improvements, required to bring performance of the facilities up to standard, are also included.

Finally, the long term recommendations, listed under Tables 13 and 14, are to maintain or improve the operational excellence of the facilities, minimize the long term health and safety risks to the communities, and maintain the value of the capital assets.

Overall observations would indicate that operator training is the main area that requires a long term strategy to be developed, to ensure that health and safety risks to the communities are minimized. In addition, occupational health and safety issues should also become part of the operating requirements.

Sampling and testing, together with reporting and remedial actions, are essential to the proper operation of water and sewage facilities. From OCWA's experience in operating facilities across the province, it becomes readily apparent that operational excellence can only be achieved through compliance with all of the provincial regulations. These regulations cover all aspects of treatment, including compliance issues, training and certification, testing and reporting, documentation, and contingency planning. By meeting these regulatory requirements, the health and safety risks to the operators, the community residents, and the environment are mitigated.

Although not included in the Terms of Reference of this study, it is recommended that further in-depth studies be considered for the facilities, including the distribution and collection systems, to review design, compliance and capacity issues.

A continuing review and monitoring program should be undertaken of individual systems, including water holding tanks, septic systems and other means of service, to ensure the integrity of those systems and to mitigate any health risks.