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SIX NATIONS
COMMUNITY-BASED SOURCE WATER PROTECTION PLAN

FIRST DRAFT

December 19, 2007

WATER IS LIFE.
With one mind we send greetings and thanks to the water.

December 19, 2007

DISCLAIMER

"The opinions and comments contained in this document are solely those of the authors and do not necessarily reflect the opinions or comments of the Six Nations Council or Environment Committee. The authors of this document were Cory Hill and Tracy Martin who were hired as "Community Source Water Protection Planners" for Six Nations Community-Based Source Water Protection Planning pilot-project. Formatting, editing, and grammar/spell check have not yet been completed on this document. This incomplete draft is being provided as a discussion document on what a Community-Based Source Water Protection Plan might include. This document should not be used or reproduced for any other purpose."

1.0 Introduction

The purpose of the Community-Based Source Water Protection Plan is to identify threats to the quality and quantity of our surface and ground water and develop recommendations to reduce or eliminate those threats that impact, or have the potential to impact, source water on the Six Nations of the Grand River Territory. The Environment Office has agreed to participate in the development of the Six Nations Community-Based Source Water Protection Plan to address the environmental concerns for the health and safety of the residents of the community and future generations of people and natural resources.

1.1.1 Six Nations of the Grand River Territory

Six Nations of the Grand River Territory is a unique community. It is the largest populated First Nation community in Canada located in Southern Ontario. Six Nations was granted lands under the Haldimand Proclamation of October 1784 extending from the mouth of the Grand River at Lake Erie to the source, near Dundalk, six miles from each side of the river, consisting of 950,000 acres. Today, Six Nations people reside on 46,500 acres of the original tract.

Six Nations is located 25 km southwest of Hamilton between the cities of Brantford, Caledonia, and Hagersville. The boundary extends from the Grand River on the north and the Mississaugas of the New Credit and Regional Road #20 on the south. The eastern boundary is Oneida Road / CN railway tracks and the western boundary is Bateman Line. (See Appendix "X" for Figure 1 the Regional Map of the Area and Figure 2 Community Map.)

1.1.2 Community and People

Six Nations is uniquely governed by two bodies: an elected political body - the Six Nations Council (1 Chief Councilor and 12 District Councilors); and a traditional governing body - the Confederacy (50 hereditary chiefs and clan-mothers). Six Nations is the home to the Iroquois people who belong to six different nations-the Mohawk,

Cayuga, Oneida, Onondaga, Seneca, and Tuscarora**.** Discussion papers written by three community members were utilized as a form of input to help develop the direction of the draft. Community input and involvement is a fundamental component in developing the source water plan because of the Haldimand tract land interest and by the valued knowledge (cultural, spiritual and scientific).

1.1.3 Cultural and Spiritual Beliefs

Culture for Six Nations people is best described as a way of thinking, a way of feeling, "but also an intuitive way of problem solving" and expression. (1) More specifically, all of the inherited values, mores, ethics, philosophy and beliefs pertaining to the way of life of the Original People, the ancestors of Six Nations people.

Spirituality for Six Nations people is best explained as the ability to manifest belief; express the unseen parts of the world, and express individual personalities. Six Nations people have "trust and confidence in beliefs about the universe, about the spiritual powers of the universe and about how humans are to conduct themselves on their journey through life" (1). The community's value of culture and spirituality beliefs are interconnected and signifies the importance for input of traditional knowledge that will aid and benefit in ideas, risks and strategies.

1.1.4 Grand River Watershed and Conservation Authority

The Grand River Watershed is of concern for the Six Nations community. The river is 300 kilometers in length, with a drainage area of 6800 square kilometers. The source of the Grand River is in the area of Dundalk, Ontario and runs to the mouth near Dunnville, Ontario. Currently thirty-eight (38) municipalities are located within the watershed area, where approximately nine hundred-twenty five thousand (925,000) residents reside which includes five major cities. The major cities in the watershed include: Kitchener, Waterloo, Guelph, Cambridge and Brantford. Six Nations also uses the Grand River on a small scale water system but nothing in comparison with the previous named cities. Six Nations primarily relies on domestic wells for a community of approximately twelve thousand (12,000) residents. Six Nations interest in the Grand River Watershed is also shared by the conservation authority of the watershed.

The Grand River Conservation Authority's (GRCA) is the Conservation Authority for the Grand River Watershed. The GRCA is located in Cambridge, Ontario. "The Grand River Conservation Authority is a corporate body established to enable municipalities to jointly undertake water and natural resources management on a watershed basis-for the benefit of all". (2) The GRCA will be a key factor in discussing risks for upstream of the Six Nations community.

1.2 Community-Based Source Water Protection Plan

The purpose of the Community-Based Source Water Protection Plan is to identify the threats to the quality and quantity of Six Nations of the Grand River's surface and ground water, and, develop recommendations at reducing or eliminating those threats that exist both within and upstream of the Six Nations community. This phase of the project, from October 2006 to March 2007 focused on threats located within the Six Nations community. It is expected that the next phase of this project will focus on threats located upstream of the Six Nations community.

What is Source water?

Source water is untreated water from streams, lakes, rivers or underground aquifers that people use to supply private wells and public drinking systems. Source water comes from one or two sources: surface (lakes, rivers, streams) or ground water (water that fills the spaces between soil particles and fractured rock underground).

What is Source water protection?

Source water is simply protecting lakes, rivers, streams and ground water from contamination or overuse. Protecting water at the source ensures that there is safe water for all uses-now and in the future. It also examines the ways that water is collected and travels through the watershed through the understanding of the hydrologic cycle of water.

1.2.1 Proposed Mission Statement

"WATER IS LIFE
With one mind we send greetings and thanks to the water. With this as the foundation of our thoughts, we will attempt to develop and implement a Community-Based Source Water Protection Plan that is spiritually, culturally, and scientifically appropriate for the Six Nations of the Grand River community. This will help maintain and sustain the inherent right to clean and safe water, and protect, conserve, restore and increase awareness of the quality and quantity of surface and ground water."

The Environment Office staff developed an initial rough draft version of a mission statement. The rough draft version was presented at the first Water Task Force meeting and it was subsequently transformed into the above statement. It was agreed that a good mission statement was needed right at the beginning because this statement guides the development of the CBSWPP. It was also agreed that the mission statement could be improved while the CBSWPP is being developed.

1.2.2 Purpose for Participating

We agree that we must work together to improve the quality and quantity of the water; no single person or entity can do this alone. The following quote explains this perspective:

"*We do not live alone on this land. Nothing makes the point more clearly than the concept that ultimately all water is shared by life on Mother Earth.*

If we are to protect our land for future generations we must protect our water. We must ensure that the source of our water supply is properly managed by those who would have impact upon it. We must get involved in planning and design activities that are about to commence in our Grand River Watershed. We must exert our influence and be included in the plans at the beginning, not sitting outside and being left with the consequences of other peoples actions. At the same time we must manage our own effluent water to ensure that the water we pass onto others is a clean source for their needs.

We are part of a circle; a circle of water, a circle of air and soil, indeed a circle of life." (W. B. Hill, 2007)

Our traditional culture also tells us that we all have a responsibility to Mother Earth, and, that we should consider our 'source water' the blood of our Mother Earth.

For these reasons we agreed to work on developing a CBSWPP.

1.2.3 Environment Canada: Source Water Protection Handbook for First Nations

With funding from the First Nations Water Management Strategy, the National Guidelines and Standards Office of Environment Canada prepared a Draft Source Water Handbook for First Nations. Environment Canada subsequently provided pilot-project funding to the Six Nations Environment Office to utilize and evaluate the SWP Handbook while developing our CBSWPP. This pilot-project allowed us to hire two Community Source Water Protection Planners from October 2006 to March 2007.

1.2.4 Multi-Barrier Approach

The multi-barrier approach to protecting water is a preventive approach that identifies all known and potential hazards and ensure barrier are in place to reduce or eliminate the risks of contamination. The implementation of this watershed plan is the first step in protecting source waters. "It cannot be stressed enough that source water protection is only the first barrier to preventing waterborne disease or illness". (4)

Source water protection is the first of five barriers used in a multi-barrier approach to ensuring safe drinking water. The other barriers include: water treatment systems, distribution systems, training and regular testing. However, in this plan, our focus upon

source water means protecting surface and groundwater on the reserve by addressing all factors that may or are risks to contamination to these waters.

1.2.5 Benefits of Source Water Protection

Protecting water at the source is an important and effective measure to ensure the health of humans, ecosystems and resources. “It is a proven cost-effective strategy”. (5) It also enables a community to participate individually and collectively to implement strategies and solutions to have water of quality and quantity which is clean and safe. This approach also empowers the community to develop a plan with values of cultural, spiritual and scientific perspectives in which the community supports.

2.0 Background

The Environmental Management Action Plan prepared by the Environment Committee, Fourth Revision August 2005, identified the need manage watershed features on a community-wide level. In 2005/2006, the Environment Committee received funding from Environment Canada (under the First Nations Water Management Strategy) to increase community awareness of the Source Water Protection initiatives. A Water Task Force was formed under the Environment Committee in November 2006. The purpose of the Water Task Force is to oversee the development of the Community-Based Source Water Protection Plan. See appendix XXX for a list of the members.

Six Nations has known for awhile that our water is not the best quality, especially our well water.

- In 1995, Health Canada sampled 63 private and public water supplies for biological and chemical contamination. In 1996, Health Canada sampled 23 private wells under the Green Plan Program. The data of these two sampling events showed that the well water did not pose any health concerns, but did show aesthetic concerns
- In 2001, a boil water advisory was issued to Six Nations residents relying on well water due to high coliform counts found in drinking water samples
- May 2002- Justice O’Connor issued Part 2 of his Walkerton Inquiry and identified First Nations as having some of the poorest water quality in the province
- In 2003, Advanced Research and Evaluation Services Inc. sampled 312 wells, of which 256 were dug / bored, and 56 were drilled. The results indicated that there was considerable biological contamination and aesthetically unpleasing compounds present in our well water
- In 2004, Neegan Burnside (NB) was hired to conduct a hydrogeological study based on the Ontario Ministry of the Environment, Technical Terms of Reference for Groundwater Studies
- Neegan Burnside confirmed that there is a widespread problem with coliform bacteria in our well water. They also confirmed that no significant aquifer is present within the clay overburden.

The planning process being followed enables the Six Nations community to utilize all the information available to prepare a CBSWPP. It is hoped that the CBSWPP will be a flexible, evolving plan with recommendations that are based on current conditions, potential risks and hazards, and desired water quality and quantity objectives.

2.1 Grand River Watershed

In order for the CBSWPP to be an effective, methodical and successful plan, the hydrological cycle and the watershed must be understood.

The hydrological cycle is a fundamental aspect to understanding how water moves through the environment. It exemplifies that everything in a watershed is connected. Water can travel between the atmosphere, the ground, river, lakes and the ocean while changing its form as a liquid, solid and gas through various processes in the hydrologic cycle. The journey may be complicated but the cycle is never ending and necessary to understand when considering source water protection.

A watershed can be compromised of several smaller sub-watersheds inside one large watershed. The Grand River watershed is compromised of several smaller watersheds. The area of Six Nations contains two sub-watersheds, the Mackenzie Creek sub-watershed and the Boston Creek sub-watershed, within the Grand River watershed. See Figure 3 the Grand River Watershed Area Map and Figure 4 the Six Nations Watershed Area Map.

The 2005 Neegan Bunside hydrogeological report and Geographical Information System (GIS) computer model, provides a very good scientific understanding of the ground and surface water on Six Nations.

2.1.1 Topography and Drainage

According to the study, the topography the highest point of elevation is 230 meters above mean sea level (m amsl) and the lowest elevations are of 190m amsl. The general surface elevation falls away towards the north along the banks of the Grand River in the vicinity of Caledonia. It manifested the eastward flow of the Grand River from the township of Brantford, ON towards Caledonia, ON. It established the Grand River as the main drainage channel which has many smaller tributaries south of the Grand River in a SW-NE direction. Also in the southern area, a few drainage channels were developed and flowed southward towards systems that emptied directly into Lake Erie.

2.1.2 Physiography

The study of the physical features of the earth’s surface around the Six Nations Reserve area stated it was predominantly glaciolacustrine deposits with modern alluvial deposits surrounding the major drain channels. Exposed bedrock occurs in the southern portion of

the reserve around the town of Hagersville. Neegan Burnside stated the study area lies within both the Norfolk sand plain and the Haldimand clay plain. “The slope on the plain is very gentle ranging from 20 to 40 cm per kilometer in the larger portions of the plain. The till of the area has not been all buried by clay but comes to the surface generally on low ridges. The low moraine ridges control drainage on the plain, except in the central portion where the Grand River has cut a deep valley and consequently there has been dissection by tributary drainage”. (7)

2.1.3 Climate

The Hydrogeologic Study established the climate based on two local climate stations data to prevail climate at Six Nations. The average annual precipitation for the area ranges from 892 mm (Brantford MOE) to 940 mm (Hagersville). Daily mean temperatures range from a low of -4.4 C (Hagersville) to -5.9 C (Brantford MOE) in January, to highs ranging from 21.2 C (Brantford) to 21.3 C (Hagersville) in July, with the annual mean daily temperature between 8.0 C in Brantford and 8.5 C in Hagersville.

2.1.4 Bedrock Geology

An understanding of the bedrock is a key component to understanding the distribution and potential of deeper aquifers, as well as associated groundwater movement. It is a description of rock layers and structural features that identify potential aquifers for the purpose of assessing groundwater resources for the community.

The bedrock underlying the Six Nations’ reserve stated that it consisted mainly of Paleozoic systems of rocks and sedimentary deposits. These beds dip slightly southward and form a vertical cliff. The uppermost bedrock beneath, consists of Upper Silurian aged rocks of the Salina Formation. These rocks are grey shale and have thin to medium bedded grey brown dolostone with in numerous thin seams of white gypsum.

The Salina Formation is exposed in the southeast part of the reserve Hagersville near the Onondaga Escarpment. In this area, the gypsum is found in sufficient quantities for mining. The Salina Formation is underlain at depth by dolostones of the Guleph and Lockport Formations. The Guelph-Lockport and Salina formations are considered as the primary aquifer in areas where overburden supplies are absent.

2.1.5 Bedrock Surface Elevation

Bedrock surface elevation identified bedrock valleys in which thicker permeable overburden deposits occur that may act as aquifers and defined bedrock highs and lows which may have a bearing on groundwater occurrence and movement in the area.

The study identified Six Nations with bedrock highs occurring in the regions of high elevations around the southern edge of the study area and around Hagersville. In the

north regions of low elevation the bed rock is lower and the areas around Hagersville the bedrock are exposed.

2.1.6 Sand and Gravel

The thickness of sand and gravel units presented in the groundwater study represented the total thickness of sand and /or gravel layers logged in the MOE water well records. This information was used to outline areas of thicker permeable material, identifying areas of potentially significant aquifers within overburden material. It does not differentiate between sands and gravels above the water table vs. saturated material below the water table, and so it would over-estimate potential aquifer thickness.

The eastern section of the reserve between Caledonia and Hagersville has significant deposits of sand and gravel. Deposits in this area are found mainly between 6 and 12.2 m, but some deposits are found at depths greater than 12.2 m. Scattered and less deposits occur along the south of the study where sand gravel deposits are found at depths less than 12.2 m. Significant deposits of this type are found in the area of Little Buffalo, Victoria Mills and Burtch. In the north and west of the reserve, sand and gravel deposits are sparse and where present are mainly about 12.2 m in depth.

2.1.7 Water Usage

Water within the Six Nations and surrounding area can be grouped into following main categories of individual/domestic, municipal/public, commercial/industrial and agriculture.

The residents of Six Nations area are supplied by either individual domestic wells or the communal water system that obtains its water from the Grand River north of Ohsweken.

2.2 GRCA Relationship with Six Nations

Six Nations of the Grand River is entirely contained within the Grand River watershed. The GRCA covers the entire Grand River watershed. The Six Nations and the GRCA have developed a formal working relationship. In 1999, a Memorandum of Agreement was jointly developed and renewed in 2003. There is potential to improve the relationship with the Source Water Protection Plan initiatives.

The working relationship between GRCA and Six Nations is challenging due to the political landscape. GRCA is a provincial organization and Six Nations is federal land and therefore operates different laws and regulations which create challenges for information sharing and decisions about land use.

GRCA focus upon watershed management & recreation and environmental education and are committed to environment protection through delivering services in a manner that will ensure the well being of the environment and its inhabitants.

GRCA is involved with the Ministry of Environments (MOE) Source Water Protection Plan under the Clean Water Act, 2006. This act establishes the Lake Erie Source Protection Region which includes the Grand River Watershed and three other conservation authority's watershed areas. The three other conservation authorities are: Kettle Creek, Catfish Creek and Long Point Region. A Lake Erie Source Water Protection Committee will be set up, with one seat being reserved for a First Nations representative.

Six Nations would like to discuss upstream threats with the GRCA in order to ensure our concerns are included. However, due to time constraints and limited funding, off reserve threats will be included in the second phase of this draft plan.

2.3 Community Beliefs and Responsibility

The issues of culture and spirituality beliefs have significant impacts for the community and reflect their connection and responsibilities towards water**.** Culture has shared values held by each generation that contribute to the concept of self. It is our belief that all people have "the capacity to grow and change" physically, mentally, emotionally and spiritually when there is "a vision of what is possible and when we use our (will) to change our actions and our attitudes" by our values. (8) If there is not a balance between our values concerning ourselves and our values concerning others, we cannot continue to develop our potential as human beings" for the future nor the environment or water. (9)

After read the discussion paper written by a community member, it is apparent that water is only one element of our society and one cannot reflect upon it without talking about things interconnected. He stated that water plays an integral part of Iroquois society because nature plays a vital role in our survival. He emphasized that respect was taught in every step in the process, and every other aspect of fishing, hunting, and collecting and growing foods.

The traditional teachings tell us that humans are apart of the natural world. The Thanksgiving Address, help us remember our human connection to water by giving thanks to the water while it states that water is life. If water is life then it implies that water is critical to all aspects of our lives. "Every individual resident, organization and agency within the watershed has a responsibility to take measures to protect source waters. The result of these actions will ensure clean water supplies for the future."(10)

Therefore, it appears that the community-based view of 'source water protection' goes beyond the definitions used in the handbook and the federal and provincial definitions.

3.0 Community-Based Source Protection Plan Draft

As mentioned before, the main objective of this CBSWPP is to "identify threats to the quality and quantity of our surface and ground water and develop recommendations to

reduce or eliminate those threats that impact, or have the potential to impact, source water on the Six Nations of the Grand River Territory".

A healthy watershed is important because the watershed is where all source water (surface and ground water) originates. Community members need to understand the purpose of the plan and their role within the plan. The community members also need a good understanding of the natural environment and how water flows through our community. It is hoped that this understanding will help in the development and implementation of the plan.

The plan will be following the process described in Environment Canada's Draft Source-Water Protection Handbook for First Nations. This first draft will focus on the reserve. The second draft will expand to upstream off-reserve areas. The source-water protection plan will include the utilization of the data collected and create strategies for that data to be objectively evaluated and implemented with names responsible for their activity and deadlines involve. The strategies developed intended will be based on the issues with the highest potential risk.

"This plan is not intended to be the complete nor the comprehensive solution for source water protection; it is a start towards the right direction as a draft in the works". (11) Its success is dependant on the community members, businesses, and the surrounding watershed residents, as everyone can contribute in making the Grand River watershed a healthier environment.

3.1 Source Water Protection Planning Methodology (Process)

Consistent with the Source-Water Handbook for First Nations, the Six Nations Community-Based Source Water Protection Plan was developed by following the guidelines in this plan. Although relatively new in Canada, the source water protection process is critical to protecting the quality of our drinking water. This process has two main components: a source water assessment and a source water plan.

First Component: Source Water Assessment

The source water assessment was completed in large part through the Hydrogeological Study (June 2005) conducted by Neegan Burnside. While this study describes a number of potential point source and non-point sources of contamination, they are not prioritized in terms of risk to Six Nations source waters.
A detailed look at specific risks to Six Nations source waters was required and community members assisted with the identification and prioritization of these risks. These Priorities were divided into High, Medium, and Low risks to the surface and ground water on and off the reserve.

Limited groundwater data was available for the active landfill while preparing this draft plan and, as such, the site was tentatively rated a medium risk until more up-to-date data

was obtained. Additional groundwater sampling was undertaken while this draft plan was being prepared, and, preliminary analysis of the data suggests that the risk may be higher. A formal report on the groundwater results will be prepared in late 2007.

Second Component: Source Water Plan

The Source Water Protection Plan consists of a *DRAFT* list of actions to be carried out to address the High Priority risks identified in the Assessment, responsibility, and deadlines for these actions to be taken.

Due to time and financial constraints, a list of Action Items were developed only for High Priority Risks to Six Nations source water located ON reserve. OFF reserve risks and Less than High Priority risks will be addressed at a later date.
Of significant importance to the success of this Plan, is community participation. People living in the source water area have an important role to play, as their daily activitites have a direct effect on the quality of their drinking water. Having the opportunity to participate in the source water protection process allows members to realize the importance of this Plan as well as provide a better understanding of the issues present on the reserve. Two groups were formed to assist with parts of the source water protection process.

3.2 Water Task Force

Consistent with the Handbook, a source water protection committee was assembled to provide input and assist the Six Nations Environment Office with the development of a Community-Based Source Water Protection Plan. Under Six Nations Council, the term "Committee" is used to describe a group of Band Councillors, of which this team would not be. Therefore, the source water protection committee, as described in the Handbook, was called the Water Task Force instead.

The Water Task Force was assembled under the direction of The Environment Committee. The Direction is as follows:
"The Environment Committee directs Councillor Chris Martin and Clynt King, Environmental Manager, to establish a Water Protection Task Force. The Task Force will be responsible for developing the Community-Based Water Protection Plan. The Task Force will report back to the Environment Committee as required."

The staff of the Six Nations Environment Office and Councillor Chris Martin selected the members of this Task Force following requirements agreed upon by both members.
The requirements were:

They should have an interest in source water
They should have experience in some aspect of the plan
They should be available to attend meetings to discuss the plan

Meetings with the Water Task Force took place on November 15, 2006, December 13, 2006, and January 11, 2007. (See Appendix "X" for a list of members and titles)

3.2.1 Community Focus Group

A Community Focus Group was organized to facilitate discussion with community members with specialized practises that may affect or assist with the protection of source water. This Group (See Appendix "X" for a list of members and titles) was assembled to assist with the identification of threats, vulnerabilities, and ultimately rating Risks to Six Nations source water. Four members of this Group were asked to write a discussion paper on their expertise and how it relates to this plan. These discussion papers have been used as a reference throughout this plan and for future use as required.
The first meeting with the Focus Group took place on January 11, 2007.

3.3 Community Involvement

In the past, Six Nations Environment Office has given the community a chance to participate with a Community Plan by the Six Nations Environment Office (Environmental Management Action Plan, Community-Based Solid Waste Management Plan, etc.) by holding public meetings to gather public opinion.

Two public meetings were held to educate the community and gather information regarding issues or concerns that they feel should be addressed in this plan. The public meetings were considered to be valuable learning tools as we received input on issues and ideas to be considered for the community. Some of these ideas or concerns will be addressed throughout this plan. Many residents of Six Nations were interviewed, to varying degrees, to understand the community's views on source water and source water protection.

This process will continue throughout the planning and preparation stages of the SWP Plan and the Final Copy will be available to all community members who are interested.

3.3.1 Public Meetings

Two meetings were held to receive input from the community as well as inform them of the Community-Based Source Water Protection Plan. These meetings were held in conjunction with the regular Environment Committee meeting in the event that a motion needs to be passed that day as well as having the Committee available to the public to discuss any issues if needed.

The Public Meetings are summarized below:

1. **November 23, 2006** – First Public meeting to introduce the public to the plan, explain how it is set up, discuss goals, objectives, action items, and our mission statement. This meeting attracted approximately 40 residents with limited

feedback received. Clynt King gave a short presentation summarizing past and future work by the Enviroment Office on source water protection. The presentation was well received with a number of questions following.

2. **January 25, 2007** – The Second Public Meeting was organized to receive more detailed feedback from the community; approximately 60 residents attended this meeting with varying levels of interest and feedback. The majority of the residents agreed that there should be a plan in place to protect our waters for future generations.

3.3.1.1 Community Concerns

After the consultations with the community, a number of comments and concerns were documented, some that are able to be addressed in this plan, and some that do not necessarily meet the criteria of a Community-Based Source Water Protection Plan. Some of the concerns we received at the meetings are described below:

- GRCA should be helping out more with this Plan.
- Are problems upstream going to addressed?
- Sewage Treatment plants up and down the Grand River need to be upgraded to improve the river.
- How is Traditional/Cultural Knowledge going to be incorporated into the plan?
- Drainage is a huge problem and needs to be improved. Are the government ditches going to be cleaned out?
- All abandoned wells should be documented and, if no money is available, then at the very least should be covered up to eliminate the risk of human and animal casualty.
- Are off reserve issues going to be addressed?
- More youth needs to be involved.
- The stones are our grandfathers and should be removed from old dug wells when we decommission them.
- All Six Nations Council departments should have some sort of recycling/environmental impact/waste reduction protocol in place, including purchases of new land or buildings.
- Regaining the spiritual connection to Mother Earth

Some of the suggestions from this meeting were implemented right away (Council Departments having recycling mandatory) and some didn't fit into the Plan (Indoor air quality issues). Overall, the meetings were very informative, as it gave the Environment Office an idea of where the community stands on source water protection.

3.3.2 Reconnect to Nature Challenge

After consultation with a spiritual consultant, the issue of Indigenous peoples connection to Mother Earth was discussed and it is apparent that many of us have lost that connection.

In an attempt to help the community in reconnecting with Mother Earth, we issued a Reconnect to Nature Challenge where contestants were encouraged to consider how important role water plays in their everyday lives and were rewarded with points with respect to the Ballot system the Challenge adopted. (The rules for this Challenge are in Appendix X). This challenge was organized to promote our spiritual and cultural connection to Mother Earth, especially water, and added a weight loss portion to it as an incentive for more participants. A $20 entry fee was charged and 20 people joined. Prizes were given to the contestant with the most points and to 3 contestants whose ballot was drawn from a ballot box. This contest can be used on any Reserve that is trying to have their residents reconnect to nature to help feel the emotional connection that we, as Indigenous people, share with Mother Earth.

Although very different from other challenges occurring at the same time (i.e. other weight loss challenges), many have said it has helped them realize the importance of water. A number of contestants began recycling as a result of this challenge.

3.4 Source Water Assessment

To fully understand where Six Nations source water originates and what it needs to be protected from, a source water assessment was completed.

Source water assessments identify the area of land that contributes the water we use for drinking. They also identify the specific potential and actual sources of contamination to drinking water supplies. This information is used to determine how susceptible the water system is to contamination and how to protect it.
There are 3 main steps to source water assessment.

- delineate the source water area
- identify contaminants
- assess vulnerability

As mentioned previously, the majority of the assessment was completed in the form of a Hydrogeological Study, by Neegan Burnside Engineering and Environmental Ltd. in June 2005. This study presents an inventory of potential contaminant sources, however, these sources do not capture all potential sources specific to Six Nations, nor does it rate the risk of these contaminants entering our source waters. The Water Task Force and Community Focus Group identified additional risks and prioritized these risks according to a Risk Chart similar to the Calculation Matrix (12) in the Handbook, Table 5, 6.2.1 Methods. Some minor changes were made to the matrix, where high priority risks were

considered as only the High Threat and High Vulnerability. Risks that fell into this category are the focus of this report and others will be addressed at a later date.

3.4.1 Delineation of the Source-Water area

Delineation of the source water area for Six Nations consists of surface water (Grand River) and groundwater (from wells). The surface water area is restricted to the catch basin with a drainage pattern from the north of the water intake located at Six Nations Public Works Water Treatment Plant, located at Chiefswood Park. Any discharge into the Grand River or its tributaries upstream of the intake is considered to fall within the source water area for Six Nations. It is this area that is the focus of the surface water delineation.

Since the source of the Grand River is off reserve, near Dundalk, then all actions off reserve would be considered. However, due to time constraints and funding issues, off reserve issues will be addressed at a later date as all off reserve risks will be included as part of the second phase of this draft plan.

Source water delineation for groundwater is generally considered to be south-west of Six Nations.

3.4.1.1 Surface Water

The Grand River is the surface water supply for 594 customers, 406 of which are residential households, 97 commercial customers, and 91 residents have approved access to the public taps located at 1953 Fourth Line. The water is drawn from the Grand River and treated with chlorine. The treated water services the Ohsweken area, sections of 4th Line and 3rd Line, and Onondaga Road between 3rd and 4th Line. Although the main water line runs past a series of households, not all are connected to the system. (Map of area serviced with communal system should be attached here)

The plant is currently servicing its maximum capacity and operating 24 hours a day, 7 days a week, producing between 12 L/s and 13 L/s, while the estimated (calculated) water demand is 12.6 L/s (13).

Six Nations Public Works has stopped all commercial construction in the Village of Ohsweken (serviced by the Water Plant) until a new plant is constructed. The construction of the new Water Plant is expected to be in the next 3 – 5 years.

3.4.1.2 Ground Water

Six Nations residents who reside in a rural setting are not connected to the Water Treatment Plant and therefore rely on well water. Different types of water systems are used for rural residents including, but not limited to, dug/bored wells, drilled wells, and cisterns.

As mentioned Six Nations overburden is predominantly clay/silty clay, which acts as an aquitard, which restricts the flow of water until it contacts Sand and Gravel. "Regionally, extensive overburden aquifers usually consist of Sand and Gravel materials," which does not appear to be present in the Six Nations overburden. There are areas that may contain pockets of Sand and Gravel, however, "there does not appear to be a well-defined overburden aquifer within the (Six Nations).

"Water is more abundant in the upper portion of the bedrock, however it is highly mineralized with a sulphurous odour, which is unappealing to some residents. As a result, many people have chosen to utilize shallow bored, dug wells and/or cisterns in an attempt to obtain better quality water. Bored and dug wells rely on a large storage volume to provide enough water for domestic supplies." (14)

Many residents with a bored well have water trucked in to fill their well that is not producing enough water to sustain the needs of the household. Because the overburden for Six Nations is predominantly clay/silty clay, "…the overburden beneath Six Nations at most locations will yield less than 2 Igpm (0.15 L/s) and that difficulties will be encountered in obtaining enough water for any purpose." (14)

In addition to installing a well into a clay overburden, homeowners have been, in many cases, restricting the depth of their well to 40 feet without the consideration of water production. It is believed to be "…due to funding constraints." (15)

Many of the wells that are installed on Six Nations do not meet the standards of Reguation 903, as indicated during the Neegan Burnside Domestic Well Investigation. During this investigation, it was noted that the majority of wells weren't sealed properly or at all, had visible leakage between tiles, did not have a vermin proof lid, had a presence of vermin in the well, the pipe to pump hole wasn't sealed properly or at all, and/or debris had fallen into the well. During these inspections it was also noted that a number of siting issues were present, where wells and septics were too close together and improper grading was noted.

These sub-standard conditions have contributed to water quality impacts to residents utilizing a shallow well.

Residents relying on well water have been under a boil water advisory by health representatives since 1990.

In addition to the well integrity being an issue, abandoned water wells are present on Six Nations without proper covering or decommissioning. "Unused wells are not abandoned correctly and are acting as conduits" (15) for surface contamination to enter the overburden water and in some case, directly to the bedrock aquifers.

"All unused wells, including bored wells/cisterns, should be abandoned and properly decommissioned immediately." (16)

Although most deficiencies were found with dug/bored wells, drilled wells also exhibit deficiencies regarding aesthetic qualities, most notably sulfur, hardness, iron, and manganese.

As mentioned above, this is likely due to the geological conditions of the area, and these aesthetics qualities are to be expected. In many cases, treatment is required for drilled wells for hardness, iron, and/or sulfur.

Although bedrock water may be lacking in aesthetic quality, it has been determined that there is sufficient water available based on the simplified Water Budget Calculation. According to Neegan Burnside's calculations, the 1,449 households not on the communal system will use 740,500 m^3 per year of approximately 32,900,000m^3 available per year based on the infiltration rate which is calculated utilizing rain fall and geological conditions of the area. The households used do not include those that utilize trucked water, other systems, and those without a water supply. Water usage for all residents not on the communal system (2214 homes) would be 1,132,000m^3 per year.

Using this calculation there appears to be an abundant amount of water available in the bedrock to supply Six Nations residents that utilize a drilled well for domestic purposes.

The potential for a Communal Drilled Well System has been discussed in the Hydrogeological Study, but its viability needs to be researched further.

3.4.2 Potential Contaminant Sources

The Six Nations Hydrogeological Study provided an inventory of potential contaminant sources. Potential point source contaminants include field storage facilities, septic systems, septage spreading locations, communal sewage lagoons, waste disposal facilities (uncertified and approved landfills), road salt storage, cemeteries, unused/abandoned wells, oil and gas wells, uncontrolled waste disposal, and materials storage.
In the report, non-point source contamination included mostly farmer's fields with the application of pesticides and manure. However, in a Discussion Paper written by Barry Hill, P. Eng., Hillsfield Farm, he states "(t)he potential for negative impacts from animal manure at Six Nations is low" and that "(f)ertilizers are needed but applied sparingly."(17)

(More discussion can be found under 3.4.2.1)

3.4.2.1 On Reserve

On reserve issues have been divided into 2 categories, risks to ground water and risks to surface water. The lists below have been broken into 4 categories for the purpose of this plan, they are High Priority risks to ground water, High Priority risks to surface water, Less than High Priority risks to ground water, and Less than High Priority risks to surface water. The Water Task Force and the Community Focus Group, in conjunction with the

Hydrogeological Study by Neegan Burnside, have developed the following lists of risks. These lists are not restricted to those identified and more risks may be added or removed from each list as more information becomes available.

For potential contaminant sources to our ground water, the following have been identified as High Priority:

- any well that is improperly sited or improperly constructed
- abandoned water wells
- improperly sited septic systems
- areas contaminated with natural gas
- landfill leachate

Less than High Priority risks to our ground water and therefore not the focus of this *draft* plan at this time:

- active gasoline stations
- inactive gasoline stations
- abandoned natural gas wells
- The Canadian Gypsum Company (CGC) Gypsum Mine
- uncertified waste disposal sites
- appliance waste
- cemeteries

High Priority risks to our surface water

- agriculture/Livestock run off, manure, fertilizers, and pesticides (if used)
- road Salt, stockpile and use
- vehicle accidents with gas/diesel run off (if upstream of water intake)
- residential development affecting wetlands and swamps

Less than High Priority risks to our surface water and therefore not the focus of this *draft* plan at this time:

- lagoon discharge into McKenzie Creek
- landfill site leachate and tobacco burning schedule
- uncertified waste sites (including shingles, tires, railway ties, and demolition waste)
- appliance waste
- dead animal decay

Although a number of issues have been identified as risks to our source waters, this list does not suggest that

The Six Nations Landfill site is considered to be very vulnerable to contamination and has in fact caused odour problems to residents in the vicinity of the landfill site.

3.4.2.2 Off Reserve

Off reserve issues will be addressed at a later date. Due to the short time frame given to develop this first draft, only high priority On-Reserve risks to surface and ground water will be addressed at this time.

Some off reserve issues that will likely be included in the next draft, are:

- sewage treatment plant effluents
- MISA regulated industries that have a direct discharge to surface waters
- Non-point source runoff

3.4.3 Assessing Vulnerability

Vulnerability of our source water was assessed based on how easily a contaminant can access our source water. For example, discharge directly into the Grand River or one of its tributaries close and upstream of our water intake are considered highly vulnerable. For ground water, highly vulnerable areas are areas of recharge, areas with little or no overburden between the point of impact, etc.

STILL NEEDED
– ISI MAP OVERLAPPED WITH CONTAMINANT INVENTORY
– SURFACE ELEVATIONS OVERLAPPED WITH CONTAMINANT INVENTORY

3.5 Source Water Protection Plan

In environmental and financial terms, it costs far more, to clean up a contaminated aquifer or to find an alternate water supply than to carry out protection measures.

After identifying potential contaminants and comparing to the vulnerability of the bedrock aquifer on Six Nations and the associated Risk, Goals were developed to reduce, eliminate, or manage the High Priority Risks to Six Nations Source Water. From the Goals, Action Items were developed to provide actions that need to be taken to achieve the identified Goal. The Action Items will allow Outcomes, Responsibility, and Completion Dates to be provided.

From the proposed *DRAFT* Mission Statement, 5 Goals were developed. They are as follows:

Goal #1: Protect, Conserve, and Restore Six Nations Ground Water by Addressing On-Reserve Issues

Goal #2: Protect, Conserve, and Restore Six Nations Surface Water by Addressing On-Reserve Issues

Goal #3: Protect, Conserve, and Restore Six Nations Ground Water by Addressing Off-Reserve Issues

Goal #4: Protect, Conserve, and Restore Six Nations Surface Water by Addressing Off-Reserve Issues

Goal #5: Increase Awareness of Six Nations Community on the Source Water Protection Plan and their responsibilities

Under Goal #1, the following Objectives were developed

Obj. #1 Eliminate Direct Pathways to Aquifers

Obj. #2 Delineate and restore areas contaminated with Natural Gas

Obj. #3 Improve Landfill operations to decrease leachate production and contamination

Under Goal #2, the following Objectives were developed

Obj. #1 Minimize negative Agricultural Impacts to Surface Water

Obj. #2 Minimize the risks of Road Salt

Obj. #3 Improve protocol for Gas/Diesel Spills Near the Water Intake

Obj. #4 Improve Protection Efforts of Wetlands/Swampy Areas from Residential Development

Obj. #5 Research Drainage Alternatives/Studies to assist with flooding

Under Goal #3, the following Objectives were developed

Obj. #1 More research needs to be done to identify High Priority Risks to Six Nations Ground Water

Under Goal #4, the following Objectives were developed

Obj. #1 More research needs to be done to identify High Priority Risks to Six Nations Surface Water

Under Goal #5, the following Objectives were developed

Obj. #1	Work with local youth and nature groups and organizations
Obj. #2	Educate the Six Nations community on Agricultural impacts on water quality
Obj. #3	Increase awareness of intrinsic, spiritual, and cultural value of water
Obj. #4	Hold 4 workshops annually to educate public on programs developed from the Source Water Protection Plan

The GOALS and OBJECTIVES were developed to give the overall direction of the Source Water Protection Plan and are not in order of importance nor are they static. As more information becomes available, Objectives may be added or deleted.

By following these goals and objectives, clear action items can be developed for each objective.

3.4.1 GOAL #1: Protect, Conserve, and Restore Six Nations Ground Water by Addressing On-Reserve Issues

3.4.1.1 Objective #1 Eliminate Direct Pathways to Aquifers

Although Six Nations bedrock aquifer is protected by a dense clay overburden, some areas are less 10 m thick. In the Hagersville area, it was noted that the bedrock is above surface soils and has a clay coverage of 0 m in the area.

Having a clay overburden provides ideal protection for the bedrock aquifer. However, if this protection is penetrated without consideration for the continued protection of the bedrock aquifer, then this will offer a direct conduit for surface contamination to enter the bedrock water or areas in the overburden that has a sand and gravel layer. To alleviate this concern, proper safeguards need to be put in place prior to well installation and address issues regarding abandoned wells and improperly decommissioned wells.

RISK #1 - Any well that is improperly sited or constructed

In 2003, Ontario updated its regulatory requirements for water well siting, construction, maintenance and abandonment to better protect well users and groundwater resources. Ontario's Well Regulation (Reg. 903 under the Ontario Water Resources Act) provides for the licensing of well contractors and well technicians by the Ministry of the Environment, and sets minimum construction standards for all wells.

A well contractor license requires that well contractors be insured against liability claims, employ only licensed well technicians, and comply with all requirements of the Regulation.

A well technician's license is required for anyone working on well construction. There are a number of detailed requirements and minimum well construction standards in Regulation 903. They cover such things as casing, grouting, sealing, and pump testing of the well.

Currently, Six Nations follows a Sanitation Program through the Six Nations Housing Department. This program allows the Six Nations Environment Office the opportunity to make recommendations to the homeowner regarding water systems based on the geological conditions of the property. Because Six Nations is primarily clay/silty clay with minor deposits of sand and/or gravel, bored wells are not recommended as there is not enough water to yield an adequate supply for domestic use. Outside of bored wells and the communal system, two other common water systems for domestic service are drilled wells and cisterns. Each of these systems are suggested to the homeowner with a description of each to help with the decision. (Template of report is included in Appendix X)

Through the Sanitation Program, the Environmental Health Officer (EHO) will inspect the well or cistern to ensure that it is installed properly. However, the EHO does not ensure the water system installed is actually what was recommended.

Unfortunately, this program is restricted to new systems only. Residents who do not go through this program are able to use the water system of their choice without consultation from the Environment Office.

Key Action Items	Completion Date	Responsibility
Develop a Six Nations Well Assessment Program	2008	Six Nations Environment
Develop a Water Well Remediation Cost Sharing Program	2009	Six Nations Council Grand River Conservation Auth. Other Governmental Agency
Alter existing Sanitation Program to ensure recommendations from Environment Office are followed	2007	Six Nations Housing Six Nations Environment

RISK #2 - Abandoned water wells

Wells are expensive commodities and are generally an asset to the property even if they are not currently in use as long as they are properly maintained. Proper maintenance may be as simple as making sure that the well head remains above the land surface where it is protected from flooding. The well must also be fitted with a sanitary well cap or concrete cover depending on the type of well so that contaminants cannot enter the well.

If it is decided that a well has no useful purpose, has no potential future use or has no real value and may constitute a liability, then the well is, for all practical purposes, abandoned and must be properly decommissioned.

Wells that are unused and have been improperly decommissioned also pose a serious risk to groundwater quality. Improperly decommissioned wells can directly channel contaminated surface water into ground water. Since ground water flows through soil and rock formations, contamination from an improperly decommissioned well can spread to other wells in the area. Because of these risks, abandoned wells must be filled, sealed and plugged according to provincial regulations.
The Hydrogeological Study (June 2005) by Neegan Burnside recommends that "(a)ll unused wells, including used bored wells/cisterns, should be abandoned and properly decommissioned immediately." (16)

Because of the area of Six Nations reserve (46,500 acres) an unknown number of abandoned wells are likely present. These wells should be located and mapped using a GPS/GIS mapping. Once the wells have been located to the best of the abilities of those carrying out the project, they will be prioritized according to the risk they present to the ground water.

Key Action Items	Completion Date	Responsibility
Develop a Six Nations Abandoned Water Well Program	2008	Six Nations Environment
Develop a Water Well Remediation/Decommission Cost Sharing Program	2009	Six Nations Council Grand River Conservation Auth. Other Governmental Agency

ACTION ITEM:

A Six Nations Abandoned Water Well Program needs to be developed that will locate, map, assess, and properly decommission abandoned water wells on private and public properties.

This Program will include:

- locating abandoned water wells or improperly decommissioned wells
- obtaining permission from all homeowners that currently have an abandoned water well on their property to perform the duties in this program

- capture GPS/GIS information and map the coordinates over the Intrinsic Susceptibility Index map and the Potential Contaminant Sources to prioritize abandoned wells from High Risk to Low Risk and work accordingly
- assess wells to determine if it presents a risk to the ground water
- if well presents risk to ground water, then hire a certified well driller to decommission abandoned water wells according to Regulation 903 in order of the prioritization schedule created by Six Nations staff
- have trained technical expert on site for all work to ensure wells properly completed
- restore damage to lawn as a result of work

This type of program is not new. Many rural communities have begun to recognize that abandoned wells present significant risk to the quality of their ground water. Private wells are often left to the homeowner to manage, if there are funding issues, then the management of that well is likely to deteriorate.

Ottawa has addressed this issue by starting an Ottawa Rural Clean Water Program that offers incentive grants and educational initiatives to promote rural best management practices that includes decommissioning of abandoned water wells.
GRCA has an incentive program, however, the program for the Brant County and Brantford area is not for abandoned wells. Rather, it is for financial assistance to share the cost of selected best management practices that improve water quality and is limited to Agricultural landowners who have completed an Environmental Farm Plan. The financial assistance will cover 50% - 70% of the cost of individual projects and up to a maximum of $25,000 per farm for multiple projects.

RISK #3 - Improperly sited septic systems

Key Action Items	Completion Date	Responsibility
Develop best management practices for those potentially impacted by improperly sited septic systems		

3.4.1.2 Objective #2 Delineate and restore areas contaminated with natural gas.

Key Action Items	Completion Date	Responsibility
Organize a team to carry out delineation and restoration of area contaminated with Natural Gas		
Ensure proper delineation and restoration takes place at sites contaminated with Natural Gas		Six Nations Council Six Nations Environment Min. of Natural Resources?

3.4.1.3 Objective #3 Improve Landfill operations to decrease leachate production and contamination

Currently, the community of Six Nations disposes of its waste at the local landfill site located at 2470 Fourth Line. This landfill site has been in operation since 1986 and was originally 40 acres in size, which was to be available to the community at no cost for 40 years. However, due to uncontrolled waste disposal at the site, specifically off reserve waste, the landfill reached capacity on February 17, 2006, 20 years earlier than originally anticipated.

INSERT MAP HERE

During this time, the landfill site has relied on natural attenuation for the leachate generated on site. Occasionally, the leachate will be hauled by a certified hauler to a certified receiver if leachate levels are too high in volume. The leachate odours present another problem for area residents. (For more detailed information on the Six Nations Landfill Site problems and recommendations, please refer to the Six Nations Community-Based Solid Waste Management Plan.)

The Six Nations Environment Office received funding to complete a sampling and analysis program of the ground water within the boundaries of the landfill site. Monitoring wells that were installed by Aqua Terre Solutions Inc. (2000) and Marshall, Macklin, Monaghan Limited (1994) were developed and sampled according to procedures in the *DRAFT* Technical Reference Manual: Source Water Quality Monitoring Protocol for First Nations provided by Environment Canada.

Enough funding was provided to complete two rounds of sampling and analyses of 9 wells. In the initial sampling, 6 wells were periphery wells, 2 were considered interior wells, and 1 was a trip blank. The results of the analysis of these wells suggest the periphery wells may be impacted by indicator inorganic leachate parameters within the covered cells as identified in Schedule 5 of the Ministry of the Environment's Landfill Standards. (18)

(The results of the second round of sampling and analysis were not available for reference at the end of the contract provided to the source water planners)

It appears, at present, there needs to be a more comprehensive environmental monitoring program for the landfill site.

A recommendation was made by Aqua Terre to "(i)nvestigate the source(s) and extent of groundwater contamination identified. In particular, wells for which health-based metals exceedances were measured…and periphery wells in the vicinity of leachate wells…for which health-based organic exceedances were measured…should be sampled for the contaminants of concern." (19)

To the knowledge of the staff of Six Nations Environment Office, this recommendation has not been carried out, and this recent sampling project appears to be the first since the development of the wells in 2000.

NEED TO REDO TO INCLUDE CURRENT SAMPLING RESULTS

Key Action Items	Completion Date	Responsibility
Develop a scope of work for an environmental monitoring program at the Landfill Site		Six Nations Council Six Nations Public Works Six Nations Environment
Carry out Program for the Landfill Site		Six Nations Environment Six Nations Public Works

3.4.2 GOAL #2: Protect, Conserve, and Restore Six Nations Surface Water by Addressing On-Reserve Issues

3.4.2.1 Objective #1 Minimize negative Agricultural Impacts to Surface water

As mentioned in 3.3.2, the Hydrogeological Study identified Agricultural activities as a potential non-point source for contamination to surface water on reserve. However, in a Discussion Paper written by Barry Hill, P. Eng., Hillsfield Farm, he states "(t)he potential

for negative impacts from animal manure at Six Nations is low" and that "(f)ertilizers are needed but applied sparingly."(17)

As a farmer, Mr. Hill has provided insight to the operations of Six Nations farmers especially those who are members of the First Nations AgriGroup. Members are encouraged to follow the *First Nations AgriGroup Code of Best Practices* (Appendix X) as well as the *Best Management Practices for Nutrient Management* issued by Canada and Ontario.

"Not all farms create pollution problems. As well, not all pollution problems are serious. However, the *potential* for environmental problems to arise due to agricultural activities is well documented. There are practical ways to ensure that risks to the environment are minimized without sacrificing economic productivity. These pollution-prevention farming methods are known as Best Management Practices (BMPs)." (20)

By following these suggested practices, Six Nations' farmers are aiming to reduce "inputs" to the natural environment, especially water. "Reducing inputs is an important element of pollution prevention. The less a potentially harmful substance is used in agriculture, the less likely it is to affect other parts of the environment. This applies most directly to fertilizers, manures and pesticides.

"Nutrient management is the practice of applying fertilizers and manures only in the amounts that can be taken up by a crop. Applications in excess of these needs have the potential to enter surface and ground water." (20)

In addition to the amount of fertilizer being applied, The *FNAG Code of Best Practices* suggests timing of application is equally important. Between June 21st and September 21st is when manure is most effectively applied as it is likely to "…avoid compaction and runoff while being easy to incorporate as soon as possible. In other words, by avoiding spring, fall, and winter, likely periods of high rainfall and hence runoff, we stand a better chance of preventing manure from being washed away from the fields and ending up in ditches, thereby serving no value as a replenishment of the soil." (17)

Soil erosion is a concern on Six Nations as well as surface run off. The clay overburden on Six Nations doesn't allow water to filter quickly into the ground, but rather stay on the surface and run off into the nearest drainage area. "No till" farming helps control this. "In a no till crop production system, the field is left virtually undisturbed from planting to harvest. Fields are no longer plowed. Plant residues remain on the soil to provide protection from erosion. No till farming will reduce cropland erosion and runoff. When soul and crop inputs stay on crop land, water quality can be maintained. Less sediment reduces the need to clean out ditches and drains." (17)

While controlling erosion and runoff is an important practice of best management strategies, it will not reduce the potential of erosion or runoff into a drainage area completely. To assist with the decreased ability for sediment and nutrients from traveling into drainage areas, areas surrounding the drainage should be left undisturbed, as to

create a grassed waterway. "Grassed waterways act as buffers to trap sediment and nutrients moving into the waterway from surrounding agricultural lands. The vegetation also stabilizes the banks and shores from the erosive action of the waterway itself." (20)

In doing so, this would be of great benefit to the drained water and would serve as a filter of nutrients and sediment that travel to a larger course of water, in this case the Grand River.

A working relationship should be built to better understand the operations of Six Nations farmers and allow the sharing of information between planners, farmers, and the community.

IN SUMMARY: B HILL, IN HIS OPINION, CURRENT AGRICULTURAL PRACTICS BY . . . DO NOT PRESENT A SERIOUS THREAT TO WATER…

Key Action Items	Completion Date	Responsibility
Include Agricultural Groups with Workshops/Education		Six Nations Environment Agri-Group
More research on how Agricultural activities impact water		Agri-Group Six Nations Environment

3.4.2.2 Objective #2 Minimize the risks of Road Salt

The Six Nations Public Works is responsible for the purchase, storage, and application of Sand and Road Salt. A 5:1 mixture of sand to sodium chloride is applied to roads in the winter months as required. A 10' – 15' pile of the mixture is stored in the Public Works yard in the winter months without an area of containment. In the past, salty water has drained from the pile and adversely impacted vegetation in the area towards the McKenzie Creek, a tributary of the Grand River.

All drainage ditches eventually drain to the Grand River and an attempt to decrease the use of road salt should be investigated further.

Under the *Canadian Environmental Protection Act*, road salt is considered "toxic" meaning it is harmful to the environment in excessive amounts.

“Road salts are used as de-icing and anti-icing chemicals for winter road maintenance, with some use as summer dust suppressants. Inorganic chloride salts considered in this assessment include sodium chloride, calcium chloride, potassium chloride and magnesium chloride. In the environment, these compounds dissociate into the chloride anion and the corresponding action. In addition, ferrocyanide salts, which are added as anti-caking agents to some road salts formulations, were assessed. It is estimated that approximately 4,750,000 tonnes of sodium chloride were used as road salts in the winter of 1997-98 and that 110,000 tonnes of calcium chloride are used on roadways in a typical year. Very small amounts of other salts are used. Based on these estimates, about 4.9 million tonnes of road salts can be released to the environment in Canada every year, accounting for about 3.0 million tonnes of chloride. The highest annual loadings of road salts on a road-length basis are in Ontario and Quebec, with intermediate loadings in the Atlantic provinces and lowest loadings in the Western provinces.

“Road salts enter the Canadian environment through their storage and use and through disposal of snow cleared from roadways. Road salts enter surface water, soil and groundwater after snowmelt, and are dispersed through the air by splashing and spray from vehicles and as wind-borne powder. Chloride ions are conservative, moving with water without being retarded or lost. Accordingly, all chloride ions that enter the soil and groundwater can ultimately be expected to reach surface water; it may take from a few years to several decades or more for steady-state groundwater concentrations to be reached. Because of the widespread dispersal of road salts through the environment, environmental concerns can be associated with most environmental compartments.

“The use of de-icing agents is an important component of strategies to keep roadways open and safe during the winter and minimize traffic crashes, injuries and mortality under icy and snowy conditions. These benefits were recognized by the Minister's Expert Advisory Panel on the second Priority Substances List, even as they recommended that this assessment of potential impacts on the environment be conducted. Any measures developed as a result of this assessment must never compromise human safety; selection of options must be based on optimization of winter road maintenance practices so as not to jeopardize road safety, while minimizing the potential for harm to the environment. Any action taken to reduce impacts on the environment is also likely to reduce potential for contamination of groundwater-based drinking water supplies, which is clearly desirable.” (21)

While efforts to limit the impact of road salt to the natural environment of Six Nations and surrounding communities should be made, it should not come at the expense of the safety of the Six Nations community.

NEED TO REWORD; MAYBE REPHRASE TO MATCH WORDING USED BY OTHER JURISIDICTIONS

ALSO, NEED TO INCLUDE PLANS AT BUILDING A SAND/SALT DOME

Key Action Items	Completion Date	Responsibility
Research the viability of reducing the use or concentration of road salt	2008	Six Nations Public Works Six Nations Environment
Store road salt in a contained area	Immediately	Six Nations Public Works Six Nations Environment

3.4.2.3 Objective #3 Improve protocol for Gas/Diesel Spills Near the Water Intake

In recent years, a number of accidents occurred involving leaks of gas/diesel near the water intake for the water treatment plant. While these accidents did not impact the water system, the potential was there, and the clean up procedure seemed to be disorganized. An improved emergency plan needs to be set up in the event of a major spill with yearly training of all personnel who may be involved. The plan is currently under review and likely to include suggestions from the Six Nations Environment Office.

Key Action Items	Completion Date	Responsibility
Include procedure for gas/diesel spills in the Emergency Plan	2008	SN Emergency Planner Six Nations Fire Six Nations Environment Six Nation Public Works
Implement training for those involved in Gas/Diesel clean up.		Six Nation Public Works SN Emergency Planner

3.4.2.4 Objective #4 Improve Protection Efforts of Wetlands/Swampy Areas from Residential Development

Maps of areas that may be vulnerable with respect to wetlands, swampy areas, bogs, etc are not existent for Six Nations. A map of these vulnerable areas should be created and

available to the Community Planner, the Emergency Planner, Six Nations Environment Office, Six Nations Public Works, and any other department that would be of interest.

Proper planning for the protection of these unique ecological features needs to be established.

Any future development should consider this protection prior to any form of construction begins, for example, no digging is to commence until areas of protection are identified and recommendations made to ensure disturbance is kept to a minimum, if not totally avoided.

Key Action Items	Completion Date	Responsibility
Create map of sensitive areas including drainage and swampy areas/wetlands	2008	Six Nations ECO Centre Six Nations Environment
Incorporate protected areas in Construction approvals	2008	Six Nations Housing SN Community Planner

3.4.2.5 Objective #5 Research Drainage Alternatives/Studies to Assist With Flooding

Key Action Items	Completion Date	Responsibility
Assess Drainage issues on Reserve	2008	Six Nations Council
Develop "Grassed Waterway Agreement" with Six Nations Farmers	2009	Six Nations Council The SN AgriGroup

3.4.3 GOAL #3: Protect, Conserve, and Restore Six Nations Ground Water by Addressing OFF-Reserve Issues

3.4.3.1 Objective #1 More research needs to be done to identify High Priority Risks to Six Nations Ground Water

Key Action Items	Completion Date	Responsibility
Continue to research and identify risks to SN Source Water upstream	2008	Six Nations Environment

3.4.4 GOAL #4: Protect, Conserve, and Restore Six Nations Surface Water by Addressing OFF-Reserve Issues

3.4.4.1 Objective #1 More research needs to be done to identify High Priority Risks to Six Nations Surface Water

Key Action Items	Completion Date	Responsibility
Continue to research and identify risks to SN Source Water upstream	2008	Six Nations Environment

3.4.5 GOAL #5: Increase Awareness of Six Nations Community on the Source Water Protection Plan and their Responsibilities

People often take good quality abundant water for granted. They do not always understand how their actions or opinions affect the water and land-use practices can be implemented to improve and maintain their water.

Educational programs can raise awareness of watershed and change the values and beliefs people have regarding watershed resources. This attitudinal change must come first before behavioural change can take place.

Changing behaviour is fundamental to promoting sustainability, as the cumulative impact of individual and group actions far outweighs what can be accomplished by the Water Task Force.

MENTION WEBSITE, FLYER, EDUCATIONAL MATERIAL

3.4.5.1 Objective #1: Work with local Youth and Nature Groups and Organizations

Key Action Items	Completion Date	Responsibility
Develop and Implement an Education and Communication Strategy with Various Local Groups		Six Nations Environment
More research on Educational Activities Impact Water Proactively		Six Nations Environment
Support and develop Workshop/Education/Activities with Youth Groups i.e. 4H Program Camps		

3.4.5.2 Objective #2: Educate Public on Agriculture Impacts on Water Quality

Key Action Items	Completion Date	Responsibility
Include Agricultural Groups with Workshops/Education		Six Nations Environment Agri-Group
More research on how Agricultural activities impact water		Agri-Group Six Nations Environment

3.4.5.3 Objective #3: Increase Awareness of Intrinsic, Spiritual and Cultural Value of Water

Water is an integral and vital role of the Iroquois society both culturally and spiritually. Many activities for collecting and using water have changed from the past. Due to the changes of modernization, water is also not the same in quality and quantity. As Iroquois people, we have an innate connection and responsibility to mother earth. Yet, modernization has also changed us as a people and it is now that we as a people must regain and obtain that responsibility to help ourselves to heal and unblock our own heart and spirit to help the environment".

Key Action Items	Completion Date	Responsibility
Develop relationships and Include Various Cultural Groups or Teachers/Elders/Faith keepers with Workshops/Education		Six Nations Environment
More Research on Spiritual and Cultural Activities		Six Nations Environment
Develop and Implement Hands-on Workshops/Programs that Integrate Cultural Knowledge with Environmental Activities		Six Nations Environment

3.4.5.4 Objective #4: Educate Public on Programs Developed for the Community-Based Source Water Protection Plan

Educating members of the community through increasing their knowledge helps to have or show realization and, perception that the community understands the issues and develop support by the community's input, direction and, participation.

Key Action Items	Completion Date	Responsibility
Develop and Implement an Education and Communication Strategy to Residents, and Community Organizations		Six Nations Environment
Develop and Implement information Activities for School Programs		Six Nations Environment

Develop and Provide Fact Sheets on Watershed Information through Printed Material	Six Nations Environment
Release Information on Accomplishments and Issues as Required	Six Nations Environment
Develop Relationships with Surrounding Communities Develop Workshops/Education Strategy	Six Nations Environment

3.4.5.5 Objective #5: Hold four (4) workshops per year to educate Public on and promote the Community-Based Source Protection Plan

Key Action Items	Completion Date	Responsibility
Develop and Implement and Education Workshop for Youth		Six Nations Environment
Develop and Implement Education Workshops for Agriculture		Six Nations Environment
Develop and Implement Education Workshop for Various Surface and Ground water Concerns		Six Nations Environment
Develop and Implement Education Workshop for Six Nations Council and Departments		Six Nations Environment

3.4.6 Implement, Monitor, and Evaluate the Action Items

An important part of any plan, is the implementation and monitoring of the recommendations. This plan holds significant importance on the implementation and monitoring of the Action Items and is time sensitive, as the Risks identified are serious and the potential is great. Education of the risks is important for the community as it is the residents that need to implement the changes.

Ideally, the Six Nations Environment Office would be responsible for carrying out the majority of these recommendations as it has the ability and knowledge to effectively and efficiently ensure Key Action Items are implemented in a timely and cost effective way.

To date, there are funding issues surrounding the availability of staff to carry out the recommendations in this report. The Six Nations Environment Office is committed to improving the environmental conditions of Six Nations for traditional use as well as daily living needs. However, the Environment Office will not have the staff required to carry out these recommendations, as of March 31, 2007.

The governing body of the Environment Office is the Six Nations Environmental Management Committee. The Mission Statement of the Environment Committee is, "To protect, conserve, restore, and increase awareness of the environment on the Six Nations of the Grand River territory."

The operations of the Six Nations Environment Office fall under this Mission Statement.

Key Action Items	Completion Date	Responsibility
Provide funding to hire 2 source water planners to finish the *DRAFT* SWP Plan	2007	Environment Canada
Hire additional staff to complete the SWP Plan and to implement and oversee the recommendations contained within this report	2008	Six Nations Council
Work with other Gov't agencies to stay abreast of new developments for SWP	Ongoing	Six Nations Environment

3.4.7 Cost Estimates for identified Risk and associated Action Item

3.5 Funding Request/Arrangements/Plans

Due to time and funding constraints we were unable to obtain cost estimates for the proposed Action Items

4.0 Summary of Action Items

Address On-Reserve Risks to Ground Water

Key Action Items	Completion Date	Responsibility
Develop a Six Nations Well Assessment Program	2008	Six Nations Environment
Develop a Water Well Remediation Cost Sharing Program	2009	Six Nations Council Grand River Conservation Auth. Other Governmental Agency
Alter existing Sanitation Program to ensure recommendations from Environment Office are followed	2007	Six Nations Housing Six Nations Environment
Develop a Six Nations Abandoned Water Well Program	2008	Six Nations Environment
Develop a Water Well Remediation Cost Sharing Program	2009	Six Nations Council Grand River Conservation Auth. Other Governmental Agency
Develop best management practices for those potentially impacted by improperly sited septic systems		
Organize a team to carry out delineation and restoration of area contaminated with Natural Gas		
Ensure proper delineation and restoration takes place at sites contaminated with Natural Gas		Six Nations Council Six Nations Environment Min. of Natural Resources?
Develop a scope of work for an		Six Nations Council

environmental monitoring program at the Landfill Site		Six Nations Public Works Six Nations Environment
Carry out Program for the Landfill Site		Six Nations Environment Six Nations Public Works

Address On-Reserve Risks to Surface Water

Key Action Items	Completion Date	Responsibility
Include Agricultural Groups with Workshops/Education		Six Nations Environment Agri-Group
More research on how Agricultural activities impact water		Agri-Group Six Nations Environment
Continue to research and identify risks to SN Source Water upstream	2008	Six Nations Environment
Research the viability of reducing the use or concentration of road salt	2008	Six Nations Public Works Six Nations Environment
Store road salt in a contained area	Immediately	Six Nations Public Works Six Nations Environment
Include procedure for gas/diesel spills in the Emergency Plan	2008	SN Emergency Planner Six Nations Fire Six Nations Environment Six Nation Public Works
Implement training for those involved in Gas/Diesel clean up.		Six Nation Public Works SN Emergency Planner
Create map of sensitive areas including drainage and swampy areas/wetlands	2008	Six Nations ECO Centre Six Nations Environment
Incorporate protected areas in Construction approvals	2008	Six Nations Housing SN Community Planner
Provide funding to hire 2 source water planners to finish the *DRAFT* SWP Plan	2007	Environment Canada
Hire additional staff to complete the SWP Plan and to implement and	2008	Six Nations Council

oversee the recommendations contained within this report		
Assess Drainage issues on Reserve	2008	Six Nations Council
Develop "Grassed Waterway Agreement" with Six Nations Farmers	2009	Six Nations Council The SN AgriGroup
Work with other Gov't agencies to stay abreast of new developments for SWP	Ongoing	Six Nations Environment

5.0 Environmental Laws/ Regulations on-Reserve

The land based of the Six Nations of the Grand River is considered federal land, of which provincial laws and legislations do not apply. The management of potable drinking water and wastewater is a shared responsibility between the Federal government (Indian and Northern Affairs (INAC), Health Canada (HC), and Environment Canada (EC)) and the Six Nations through programs and services. The Six Nations Environment Office uses both federal and provincial environmental regulations as guidelines for environmental work on the reserve. Although federal and provincial environmental laws are not enforceable on reserves, the most strict or comprehensive standard is used to guide work.

Since these laws are not enforceable on reserves a new approach should be taken. One suggestion was to set "environmental standards" to which residents would live to. To set this standard, federal and provincial laws and regulations would be used. The following list includes, but is not limited to, key environmental laws and regulations.

Title:	Specific For:
The Federal Water Policy	The management of water resources, balancing water uses with the requirements of many interrelations with the ecosystem.
The Canada Water Act	It provides provisions for formal consultation and agreements with the provinces
The Department of the Environment Act	Provides Leadership for water management to the Minister of the Environment
The International River Improvements Acts	Provides for licensing of activities that may alter the flow of rivers into the U.S.A

Other legislation to consider:

Title	Specific For:	Consideration
The Fisheries Act	to ensure pollution prevention	
Canadian Environmental Protection Act		
Great Lakes Water Quality Agreement	The prevention and improvement of water pollution	The Grand River flows into Lake Erie
Clean Water Act	Enables the federal and provincial govt. to make joint arrangements for water resources and quality management	We need to become involved in the decision process in regards to the future of our community's drinking water
Species At Risk Act (SARA)	The protection and recovery of species	How this may affect community planning and source water protection

Specific to Six Nations

Regulations, Guidelines to research and educate

Specific For:	Title:
Well Construction, Maintenance, Abandonment	Ontario Well Regulation (Regulation 903)
Septic Systems	Ontario Well Regulation (Regulation 903)
Fuel and Tank Storage	
Agriculture	
Road Salt	CEPA
Residential Development	
Waste Water (Sewage) Treatment	
Gypsum Mining	

Although current practices do not have the desired impact on reserve as they do off reserve, we can use these practices to develop our own standards. These standards will set a level to which community members would like each other to live by. As opposed to the enforcement of laws, these standards should be supported by an expectant of the community as a whole and as individuals.

To develop these standards, much discussion will be required between the community, the Water Task Force, the Community Focus Group, Six Nations Band Council, and the Confederacy Council.

DISCUSS INACS PROTOCOL FOR DRINKING WATER? IMPLEMENTATION? CHALENGES? EXPERT PANEL THOUGHTS??

6.0 Conclusion

Although this plan is an incomplete first draft of a Community-Based Source Water Protection Plan, it's very clear that the problems on Six Nations are plentiful, complicated, and potentially dangerous.

As a result of this plan, a sampling program was conducted on the Six Nations Landfill Site and it appears that indicator parameters are impacting the perimeter wells. This is a significant finding as a number of residents in the area use wells for their primary drinking water. Although Six Nations overburden is mostly clay, there are pockets of sand and gravel and, according to a computer model generated by Neegan Burnside, it appears as though there is a sand and gravel layer near or under the Landfill Site. This would increase the likelihood of leachate travel off of the Landfill Site. This is a serious situation that needs immediate attention. Another local landfill site located south of Six Nations, the Tom Howe landfill site, recently discovered a sand lense and immediately altered their plans to avoid a potential disaster.

This plan does not list all the potential contaminants to Six Nations source water, as more time and staff is needed to research off reserve risks, but it does list a number of important risks that can be addressed once funding is in place.

In the short time that this plan has been under preparation, a number of community members have gained knowledge on the importance of the plan and its effect on the protection of our water. The majority of First Nations people, including the Six Nations community, understand that water is critical to all aspects of our lives and it is important that we ensure there is a safe and reliable source of water for all our uses, now and in the future.

With the development of this incomplete *DRAFT* Plan, a number of steps have been taken to begin the protection of Six Nations source waters within the Six Nations community. While these steps are small, they are in the right direction and support of this plan is essential to its success.

WATER IS LIFE.
With one mind we send greetings and thanks to the water.

7.0 Glossary of Terms (in progress)

A

Aquatic	consisting of, relating to or being in water; living or growing in, on or near water
Aquifer	a permeable body of rock capable of yielding usable quantities of ground water to wells and springs
Aquitard	
Assessment	

B

Base of groundwater exploration	a feature shown on the provincial groundwater maps. Defines the depth to which it is generally considered to be uneconomic to explore for groundwater because of the depth of drilling required and /or the water at that depth is considered to be too highly mineralized for the intended use.
Bedrock	The solid rock that underlies loose material such as soil, sand, or clay
Bedrock Formations	Rock deposited prior to glaciations. These layers are overlain by glacial deposits which consist of glacial till, sand and gravel
Biodiversity	(Biological Diversity) the many and varied species of life forms on earth, including plants, animals, micro-organisms, the genes they possess and their habitats.
Bogs	An area having a wet, spongy, muddy grounds that usually grow shrubs, herbs and sometimes trees
Bored Well	A shallow augered well lined with concrete tiles that are usually, on average, 3 feet in diameter and has a removable lid for access

C

Climate	meteorological elements (e.g. precipitation, temperature, radiation, wind cloudiness) that characterize the average and extreme conditions of the atmosphere over long periods of time at a location or region of the earth's surface
Climate Change	an alteration in measured meteorological conditions that significantly differs from previous conditions and is seen to endure, bringing about corresponding changes in ecosystems and socio-economic activities
Conservation	the preservation adrenal, when possible, of human and natural resources. The use, protection and improvement of natural resources according to principles that ensure their highest economic and social benefits
Conserve	To use or manage natural resources wisely, preserve, save
Culturally	Considering those things that are culturally sensitive

D

Deleterious substance	any substance that is deleterious to fish, fish habitat, or to the use by man of fish that frequent that water. See the Fisheries Act for further details
Delineate	
Development	building, engineering, mining, or other operations that alter or intensify the use of a resource
Discharge	the flow of surface water in a stream or ditch or the flow of ground water from a spring or flowing artesian well; the rate of flow
Dissection	
Distribution	

Diversion	the removal of water from any water body, watercourse or aquifer (either for use of storage), including the removal of water for drainage purposes.
dolostones	
Drainage	movement of water off land, either naturally or man-made
Drilled Well	A deep well that is drilled to or into the bedrock and lined with a steel casing that is usually about 6 inches in diameter
Drought	generally in reference to periods of less than average or normal precipitation over a set time, sufficiently prolonged cause serious hydrological imbalance that results in biological or economic losses
Dug Well	A shallow hand dug well, usually lined with bricks or stone

E

Ecological	pertains to the relationship between living organisms and their environments
Economic Development	the process of using and converting resources into wealth, jobs and an enhanced quality of life
Ecosystem	a dynamic complex of organisms including humans, and their physical environment, that interacts as a functional unit in nature

F

Focus Group	
Forested Slew	A mixed forested area that holds surface water after a significant rainfall event. Unique plant communities are found in slews on Six Nations

G

Geology

Ground water	water beneath the surface of the earth in the pores and fractures of sand, gravel, and rock formations.
Guelph-Lockport Gypsum	

H

Habitat	natural surroundings or native environment where a plant or animal grows and lives
Headwater	small streams and lakes that are the sources of a river, located in the upper reaches of a watershed
Hydrogeological	The study of water in the ground dealing with how water moves in the ground
Hydrogeology	the science of subsurface waters and related geologic aspects
Hydrology	the science of the waters of the earth, their occurrences, circulation and distribution on or below the earth's surface

I

Increased Awareness	To expand and develop the community's understanding and knowledge of Source Water Protection
Infiltration	The act or process to filter into or through

L

Land cover	predominant vegetation on the surface of a parcel of land
Leachate	a liquid that has percolated through or out of another substance such as soil or refuse, and may contain nutrients or contaminants

N

Non-point Source Pollution	single or multiple contaminants of unknown origin that enter waterways, degrading water quality

O

Overburden: Loose material, such as soil, sand, clay, gravel found on top of solid rock

P

Permeability the ability of a material to allow the passage of a liquid, such as water through rocks.

Permeable materials such as gravel and sand, allow water to move quickly through them where as impermeable material, such as clay, does not allow water to flow freely

Physiography

Point Source Contamination a static point and easily identifiable source of air, soil or water pollution

Protect To defend or guard from harmful or dangerous conditions

R

Recharge replenishment of the groundwater by the addition of water

Restore To bring/put back to a former, original, or normal condition; reestablish

Riparian an area of land adjacent to or connected with a stream river, lake or wetland that contains vegetation that is distinctly different from vegetation of adjacent upland areas

Riparian areas the zone of vegetation along side waterways and other surface water. Lush and diverse vegetation is the best sign of healthy, well managed riparian areas and is critical to filtering and slowing runoff

Risk

River Basin an area that contributes to form a water shed

S

Salina Formation	
Scientifically	With science taken into consideration
Sewage	the waste and wastewater from residential or commercial establishments that is normally discharged into sewers
Sewage Lagoon	a shallow pond where sunlight, bacterial action and oxygen work to purify wastewater; also used for storage of wastewater
Silurian, Upper	
Source water	Untreated water from streams, lakes, or underground aquifers. Usually described as surface water or ground water
Source water protection	the prevention of pollution and the sound management of factors and activities that (may) threaten water quality and quantity of lakes, reservoirs, rivers, streams and ground water
Spiritually	Of, or pertaining to, the spirit or sacred things or matters
Surface Elevation	
Surface Water	Water present above the soil surface. Eg: river, lake, steam, ponds, water run-off
Sustain	To keep in existence; maintain
Sustainability	The power or capacity to keep something in existence; maintain
Swamps	A seasonally flooded bottom-land with more woody plants than a marsh and better drainage than a bog

T

Task Force	
Threat	
Topography	
Treatment	
Tributary	

W

Waste water	Used water carrying waste from homes, businesses, and industries; sewage
Water Quality	the chemical, physical and biological characteristics of water with respect to its suitability for a specific use
Watershed	an elevated boundary contained by its drainage divided and subject to surface and subsurface drainage under gravity to the ocean or interior lakes
Watershed and Aquifer Management	a process, within the geographic confines of a watershed or aquifer, that facilitates planning, direction, monitoring, and evaluating activities to endure sustainable, reliable, safe and clean water supplies
Watershed and Aquifer Planning	a process, within the geographic confines of a watershed or aquifer and with the planning of community, to develop plans to manage and protect water resources
Watershed Health	the desired maintenance overtime of biological diversity, biotic integrity and ecological processes of a watershed
Wellhead	
Wetland	an area of low-lying land covered by water often enough to support aquatic plants and wildlife for part of the life cycle. The wetland area includes the wet basin and adjacent upland.

8.0 Appendices

ADD LATER

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