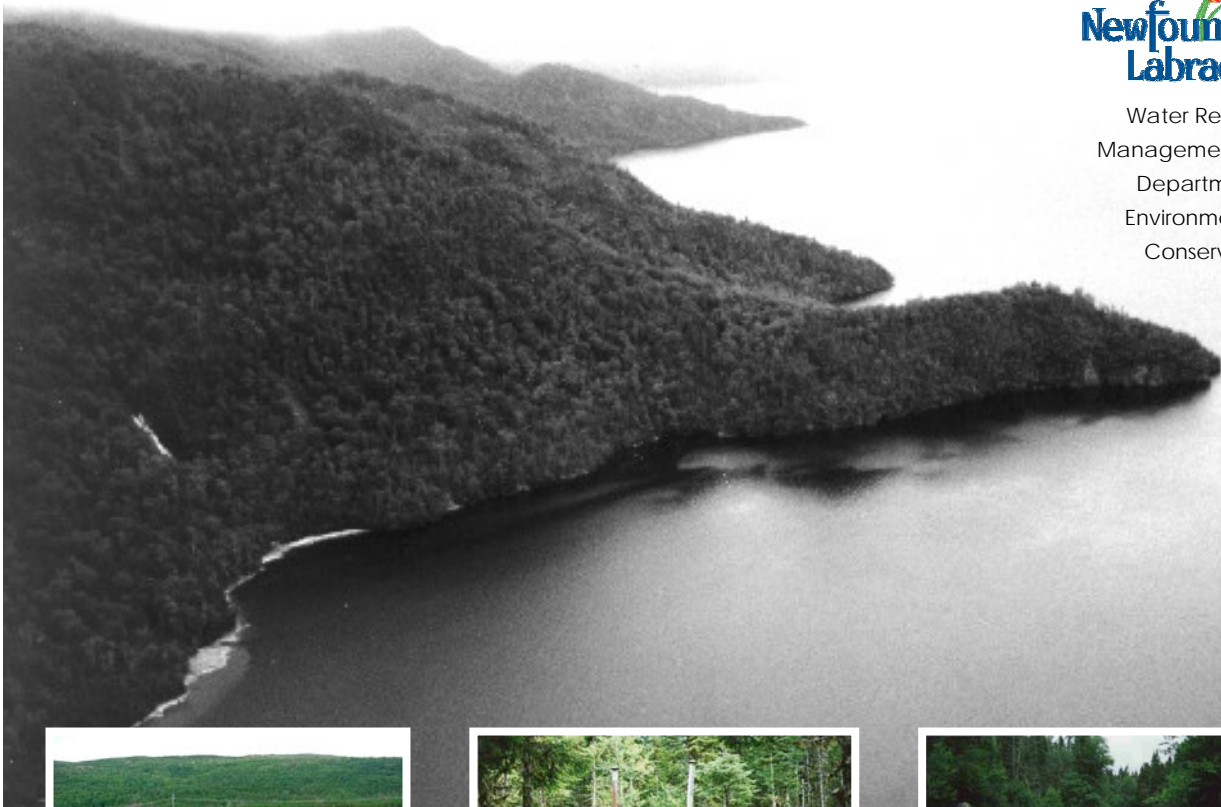


In Partnership with:



Water Resources  
Management Division,  
Department of  
Environment and  
Conservation



## **A Municipal Guide to the Development of a Watershed Management Plan**

Based on the experience of the Town of Steady Brook, Newfoundland  
and Labrador

D. Hearn  
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Acknowledgements should also be made for the guidance provided in the Nova Scotia publication *Developing a Municipal Source Water Protection Plan: A Guide for Water Utilities and Municipalities*. This guide was used extensively in fashioning a process specifically for Newfoundland and Labrador.



# **A MUNICIPALITY'S GUIDE TO THE DEVELOPMENT OF A WATERSHED MANAGEMENT PLAN**

*Building Capacity for Responsible Resource Management*

## **1.0 INTRODUCTION**

Access to clean and safe drinking water is essential for overall human health. In Newfoundland and Labrador, an abundant supply of safe drinking water has always been taken for granted. However recent events in the country concerning contaminated water have rightfully prompted citizens and municipalities to question the safety of their drinking water. The watersheds that supply our drinking water are often also sources for other human needs and enjoyment, such as recreation, commercial and domestic forestry, cabin development and mining. These same watersheds are home to wildlife and are functioning ecosystems. All of these uses can still coexist with the supply of safe drinking water, if they are regulated under a long-term management strategy.

In Newfoundland and Labrador, the Department of Environment and Conservation and the Department of Government Services and Lands currently monitor water quality. The monitoring of water quality enables water supply agencies to detect whether or not their drinking water is safe and then act accordingly, i.e. maintain or increase treatment (chlorination) or communicate a [boil water advisory](#) (Appendix 1) until the problem can be rectified. Municipalities can reduce the need for excessive treatments and boil water advisories by protecting the quality of their drinking water at the source. A plan to protect and manage the watershed that is the source of their drinking water can be a more cost-effective way of ensuring safe drinking water, and enables the municipality to be proactive rather than reactive.

The Western Newfoundland Model Forest, with the sanctioning of the Water Resources Management Division of the Department of Environment and Conservation, has incorporated a number of methods to fashion a process to assist

municipalities in the development of a watershed management plan for their drinking water source. This process was developed as a result of a pilot project conducted in cooperation with the Town of Steady Brook in western Newfoundland. Staff of the Western Newfoundland Model Forest sat as members of the Steady Brook Watershed Management Planning Committee and led the Committee in the development of their watershed management plan. The exercise was used to produce this guide, which would enable other municipalities to benefit from the experience. Examples from the Steady Brook process are provided throughout the guide. This manual will lead municipalities through all the steps necessary to produce a plan that will enable them to manage activities in the area that is the source of their drinking water. This process was developed to address [surface source](#) water rather than [groundwater source water](#), but the overall process would be the same – only management options would differ.

## **1.1 Background**

In Newfoundland and Labrador water resources are abundant. Lakes and ponds occupy up to 20% of the land base area, providing a reliable and easily-accessible supply of water. This explains why 88% of the public water supplies in the province use surface water as their source of drinking water.

The Government of Newfoundland and Labrador, through four different government departments, has adopted a multi-barrier approach to ensure clean and safe drinking water is available to the public. This approach works on three levels:

Level 1: Source water protection; water treatment; and water distribution system operation and management;

Level 2: Monitoring; inspection, abatement and enforcement; management and reporting; and operator education, training and certification;

Level 3: Legislative and policy frameworks; public involvement and awareness; guidelines, standards and objectives; and research and development.

The primary goal of this approach is *“to ensure that adequate safeguards are in place at each stage of the water supply system to minimize the possibility of [pathogens](#) and other [contaminants](#) entering the water.”*<sup>1</sup> The development of a

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<sup>1</sup> Drinking Water Safety in Newfoundland and Labrador Annual Report 2004

watershed management plan by municipalities involves all three levels: source protection in Level 1; monitoring in Level 2; and public involvement and awareness in Level 3.

Source water protection is ensured by legislation (<http://www.hoa.gov.nl.ca/hoa/sr/> ). In 1974, under what is now the *Water Resources Act*, [protected public water supply areas](#) (PPWSA) were first designated, and land and water uses were regulated within these areas to protect water quality. The Department of Environment and Conservation has continued to designate protected public water supply areas. However, the *Water Resources Act*, and other Acts that pertain to safe drinking water (and their associated regulations, policies and guidelines), may not provide for complete protection in all situations in all watersheds. As such, under the *Municipalities Act*, municipal councils may make regulations that are seen as required to prevent pollution of their drinking water supply source. This can be accomplished through the development of a watershed management plan.



## **1.2 Steps in the Development of a Management Plan**

Each step in the process is summarized below. Subsequent chapters are dedicated to each of the steps, expanding on the information required and the resource material available to assist in the process. Those gathering information for, or developing a watershed management plan are reminded that the web contains a wealth of knowledge related to watershed management in general, and other information required to develop a watershed management plan.

### **1.2.1 Establish a Watershed Management Committee**

The municipality must first establish a committee that will: develop a plan to protect the source of their drinking water; advise Council on how to proceed with this plan; and then monitor the implementation of the plan. Committee members should include all stakeholders, that is, all those affected by the management plan. This would include those with resource utilization interests, municipal councils or private incorporated communities, local non-governmental organizations/individuals, and government agencies. Including all stakeholders is imperative to the success of the plan.

Once established, the Committee needs a terms of reference for guidance. A sample of a Terms of Reference can be found in Appendix 2. If the municipal council has not already developed this, the Committee can write its own and submit it to Council for approval. The terms of reference should include the background to the plan, the purpose of the Committee, and the make-up and responsibilities of the membership. The operational guidelines also need to be agreed upon, with respect to decision-making, meetings, confidentiality, etc.

Finally, by identifying the scope and intensity of the plan's development, the Committee can address areas that will require funding. Some agencies and organizations provide work 'in-kind', while others are potential sources of funding. If the Committee needs to hire a consultant to complete some aspect of the plan, funding will have to be found. The Committee will also need to create guidelines for the consultant, to indicate exactly what is expected.

### **1.2.2 Characterize the Watershed - Protected Public Water Supply Area**

Not all public water supplies in the province have been designated as protected public water supply areas and therefore are not legally protected. Applying for the protection of a water supply area is the first action of a Watershed Management Advisory Committee if their public water supply is not already designated. If the area is already designated or while the application is being processed, the general location and natural features, such as land formation, climate, and soils, can be identified. Resources such as water, vegetation, animals, and minerals, as well as any historic or cultural assets within the watershed, should also be determined and described and/or quantified.

One of the most important parts in this stage of information gathering is the identification of all existing and potential uses of the watershed, both water and land. At this point, a meeting with the public would serve to secure their input and make them aware of the watershed management process. This watershed-use information will be utilized in a later step to determine potential contaminants, so it is imperative that the comprehensive list of uses be identified.

Finally, the Committee should identify the many agencies responsible for the protection and management of resources within their watershed, that is, provincial government departments, federal government departments, and municipalities. The Committee should also become familiar with the responsibilities of those agencies, the legislation which assigns this responsibility and any developments and activities that are regulated.

### **1.2.3 Identify Potential Contaminants & Conduct Risk Assessment**

Once the existing and potential uses of the watershed are identified, the next action is to determine the potential contaminants which may result from these uses. Potential contaminants are pollutants associated with particular activities that could negatively impact water quality. Any land and water use inside a watershed can potentially be a source of pollutants to the drinking water obtained from that watershed. A review of all current and possible uses is necessary to determine potential contaminants and their causes.

The above exercise can identify numerous causes of potential contaminants which cannot all be addressed at once, so it is necessary to assess the level of risk each activity or contaminant poses to drinking water quality. Two methods of [risk assessment](#) are presented, and the Committee will choose their preferred method based on the technical expertise of their membership or the availability of resource personnel.

A final exercise in this step involves mapping areas in the watershed suitable for different levels of development activity, based on the risk of potential water contamination from each activity. This involves identifying areas that would be particularly sensitive to contamination, considering distance from the [water supply intake](#), distance from streams, lakes and ponds, and slope of the land.

#### **1.2.4 Develop a Watershed Management Plan**

In order to prepare a watershed management plan, the Committee must first decide on a goal or a set of goals, that the plan will address. The goal(s) should be realistic and achievable. Ideally the goal would include the protection of water quality while allowing for traditional activities and developments that are considered sustainable. Objectives, which will help the Committee attain its goal(s), also need to be determined. With goals and objectives established, and armed with the information gathered in the previous steps, the Committee is now ready to prepare the management plan for their watershed.

A strategy to meet the objectives is the backbone of the plan and is made up of a variety of components: regulatory, non-regulatory and education and [stewardship](#). The *regulatory* component includes any regulations and policies that have been established by legislation. This component is most effective and useful for protection measures i.e. prohibiting development in specific areas. The *non-regulatory* component uses best management practices and incentives for the implementation of environmentally-friendly land-use activities. This approach works best for activities where work is allowed only under application, and guidelines or best management practices are required for approval. A contingency plan for spills of hazardous materials would be an example of this component. Finally, *education* of watershed users and instilling in them a sense of *stewardship* is yet another component of the

watershed management plan. This approach is applicable to activities where effective monitoring and enforcement is impossible due to the number of users and the scarcity of funds.

Examples of these components already exist, and the Committee must determine which of these are required by law and which best management practices are appropriate for its situation. Recommendations for new policy and best management practices will also have to be made, and these will be based on the characteristics and uses of the watershed and the objectives of the plan. A program to monitor water quality and activities in the watershed will need to be developed in order to ensure they follow regulations and guidelines outlined in the strategy.

When all this is completed, the Committee should present the plan components to the public for review. This will allow the public to examine what is being proposed and make comments or suggestions. It will also give them the opportunity to feel ownership of the plan, which will ultimately aid in its implementation. The Committee must be prepared to incorporate the suggestions raised during the public review process, or justify why they cannot.

#### **1.2.5 Implementation, Review and Amendments**

Before the plan is brought to Council for approval, there are two final processes that need to be established – implementation and review. An action plan to implement the recommendations made will assist in the execution of the plan, and provide Council with an idea on the time frame for implementation. Before the plan is finalized it must undergo review by Water Resources Management Division and be approved by the Minister of Environment and Conservation. There should also be established a schedule for periodic review of the plan, when it can be evaluated for its effectiveness, and any necessary amendments made. Once the implementation and review process have been determined, the plan should be presented to Council for their review and approval.

#### **Clarification:**

The use of 'Council' reflects the decision-making body of a municipality. It is recognized that other agencies or elected bodies may be responsible for decision-making.



## **2.0 ESTABLISH A WATERSHED MANAGEMENT ADVISORY COMMITTEE**

The production of a watershed management plan requires a committee to develop or oversee the development of a plan. Under the *Water Resources Act*, the municipal authority is required to “Request the Minister of Environment for the appointment of a Watershed Monitoring Committee and the development of a watershed management plan, if the designated area is under increasing pressure for multiple development activities.” This is the first action of the municipality towards the development of the plan. The request to the Minister should include a generic list of groups, agencies, departments and individuals that the municipality would like to see on their Committee.

In order to determine the Committee membership, the municipality must be clear on its role for the committee. Ultimately, the goals of the Committee should be to:

- Develop a management plan for the watershed supplying the municipality’s drinking water;
- Advise the municipal council on matters associated with the management of the watershed;
- Implement the management plan;
- Monitor the implementation of the plan.

Once the municipality knows what it wants from the Committee, it can proceed with the formation of the Committee. This is a very important step, as the membership of the Committee will determine the quality and effectiveness of the plan.

Different municipalities will choose different names for their Committee. Legislation refers to it as a Watershed Monitoring Committee, while some municipalities call it a Watershed Management Committee. To address the management plan development role of a Committee some municipalities have dubbed it a Watershed Management Planning Committee, and then changed it to a Watershed Monitoring Committee once the plan was developed. To avoid the need to change names and, at the same time, cover all the roles of the Committee, this guide suggests the title Watershed Management Advisory Committee. You should choose what works best for your municipality.

## **2.1 Committee Membership**

Stakeholders, or interested parties, are the individuals and groups that will be affected by the watershed management plan. It is essential that a representative from all interested parties be invited to participate in the planning process through the Advisory Committee, so that they have input into the decisions made. Local interested parties and individuals will consider the community's environmental, social and economic conditions and values, when determining management strategies. By having input into how management of the watershed will affect them, they will be more content to abide by and/or enforce the decisions made.

Interested parties can be divided into groups according to their interests:

- municipal councils and/or private incorporated communities;
- resource utilization interests;
- local non-governmental organizations or individuals; and
- Government agencies.

The first group would include a number of councilors of the municipality that is seeking protection of their water supply, as well as representatives of any other communities that may reside within the watershed boundary or use the same water source.

The category "resources utilization interests" involves groups, agencies and companies with a stake in the resources of the watershed:

- Mining
- Transportation
- Agriculture
- Military Operations
- Forestry
- Commercial/Industrial Development
- Recreation/Tourism Industry (Outfitters)
- Residential Development (Real estate agencies)
- Linear Development/Utility
- Sewage/Waste Treatment Facilities

Local non-governmental organizations or individuals also have a stake in the watershed and they would include:

- Service groups

- Local citizens
- Environmental groups
- Community associations
- Landowners or Landowners Association

The Advisory Committee should include one representative from each provincial and federal government departments. Contact information is provided in Appendix 3. It is imperative that specific provincial government departments participate whose mandate deals with water quality, health, municipal interests, and in virtually all cases, land owned by the Crown. These departments are listed below with, where possible, the title of the appropriate representative or Division:

- Department of Environment & Conservation – Watershed Management Specialist
- Department of Government Services – Environmental Health Officer
- Department of Municipal Affairs, Regional Managers
- Department of Environment & Conservation, Crown Lands – Regional Managers

Depending on the land uses in the watershed, a representative from the following provincial government departments should also be invited to participate:

- Natural Resources, Forestry Branch
- Tourism, Culture & Recreation
- Natural Resources, Mines Branch
- Transportation & Works
- Natural Resources, Agrifoods Branch
- Fisheries and Oceans Canada (Federal)
- Environment and Conservation, Wildlife Division

This is a long list of potential members of the Advisory Committee. The municipality must determine what individuals, groups or agencies are essential to make the Committee effective without making the membership so large as to be non-functional. Some interested parties may not want to join the Committee, but would welcome the opportunity to present their ideas and concerns to the Committee during a meeting.



## **2.2 Committee Terms of Reference**

Once established, the first task of the Watershed Management Advisory Committee is to establish a *Terms of Reference* for the Committee. The *Terms of Reference* should contain a section on each of background, purpose, responsibilities, membership, operation and approval.

### **2.2.1 Background**

The background section should include:

- A short description of the watershed size,
- The population the water supply serves,
- When the watershed was designated a Protected Public Water Supply Area,
- Why the municipality wants a watershed management plan
- When the municipality received the approval of the Minister of Environment to form and appoint a Watershed Monitoring Committee (Watershed Management Advisory Committee).

### **2.2.2 Purpose**

The *Terms of Reference* should briefly describe the purpose of the Committee. This could be very simple, such as to develop and implement a management plan to ensure safe drinking water for the municipality. However, the Committee may want to elaborate and specify that they (the Committee) will provide technical assistance to the municipality in order to minimize environmental impacts of activities in the watershed, and ensure approved undertakings are carried out in an environmentally acceptable manner. This will include the review of applications for development activities in the watershed.

### **2.2.3 Responsibilities**

The specific responsibilities of the Committee should be outlined. The following are suggestions for statements of responsibility.

The Committee will obtain the assistance of technical experts and request representation from individuals and groups where necessary to assist in the completion of the tasks outlined below:

- Collect available information and describe the (Name) *Protected Public Water Supply Area* in terms of its natural features and

- resources, land uses and ownership, management practices, hydrology and water quality, and environmentally sensitive areas;
- Inventory existing land and water uses within the watershed, determine potential future uses and assess the compatibility of the various uses and their operational practices, in light of legislation and policy guidelines developed for Protected Public Water Supply Areas.
  - Identify pollutants (and their sources) that may result from the existing and potential uses (including wildlife) and natural occurrences. Assess the level of risk that each cause of pollutants poses to the quality of drinking water.
  - Based on the risk assessment of pollutant causes and areas determined to be sensitive, map the watershed according to management zones, identifying areas where development is prohibited, restricted and permitted.
  - Prepare a watershed management plan for the (Name) *Protected Public Water Supply Area*, based on the results of the inventory and assessments, and make recommendations regarding water quality protection and sustainable resource utilization. Include existing and recommended regulations and guidelines, a contingency plan to deal with environmental emergencies that may occur within the watershed, and public education programs.
  - Add a watershed monitoring program, as part of the watershed management plan, to ensure compliance with prohibited, restricted and permitted activities and their regulations and guidelines.
  - Implement the watershed management plan recommendations and oversee the monitoring of watershed activities. Produce and review an annual watershed report derived from compiled information about the quality of water, activities undertaken, and natural phenomenon of concern over the previous year.
  - Review all *Applications for a Permit for a Development Activity in a Protected Public Water Supply Area* submitted to the municipality, for adequacy of proposed environmental protection measures, in light of municipal regulations and guidelines outlined in the watershed management plan. Recommend changes where necessary, or reject the proposed development activity.

#### 2.2.4 Membership

This section should list the representatives of the interested parties that will form the Watershed Management Advisory Committee, based on the groups outlined above: councils and members of the public; resources utilization interests; non-government organizations/individuals; and government agencies. It is recommended that an alternate member be named from each interested party as well, to assist with interaction and communication within that party, and to aid with the replacement of regular members when necessary. Although both the regular and alternate members may be considered members of the Committee, only one will be able to vote in the consensus process. It should be stated that other representatives may be added as required, with the agreement of the Committee. A facilitator hired to write the plan would not be considered a member of the Committee, but would be required to abide by the principles and processes of the *Terms of Reference*.

#### 2.2.5 Operation

The *Terms of Reference* for the Committee needs to state the operational guidelines which will be followed. This can be divided into principles and process.

#### 2.2.6 Principles

Principles are rules of behavior. The following principles are recommended for adoption by your Committee and incorporated into a ground rules document. All of these principles contribute to the consensus decision-making process, which should ensure ownership of the plan by all parties:

- **Respect.** Participants agree that respectful conduct is expected of all who are involved in the process. All parties recognize the legitimacy of the views, interests and values of others and expect that their views, interests and values will be respected as well. Differing views among members will be explored in a non-personal manner.
- **Opportunity.** The process will provide a time for all to speak, and a time for all to listen.
- **Responsibility.** Members have the responsibility to keep their respective organizations informed of group deliberations, and to

keep group members informed about the opinions and feelings of their organizations.

- **Decision-Making.** Consensus is the general agreement of all parties. Participants may not like every part of the agreement, but they are able to live with the total package.
- **Dealing with Disagreement.** Where an impasse develops, the Municipal Council may appoint a facilitator. If this fails, voting may be necessary, requiring a predefined majority vote such as two-thirds of the membership.
- **Confidentiality.** When discussing information of a privileged nature, members will keep this information confidential.

### 2.2.7 Process

In order for the Committee to run smoothly, rules of process are necessary. The following rules are suggested:

- The Committee should have co-chairs - one official of the municipality, and the Watershed Management Specialist from the Water Resources Management Division. The Co-Chairs should develop agendas for the meetings or assign a coordinator to do so, and ensure orderly progress through the agenda. The Co-Chairs will serve as official media spokespersons. Outgoing Co-Chairs will brief incoming Co-Chairs and new Municipal Council members.
- The municipality should provide secretarial duties including: keeping the minutes; distributing the minutes and other relevant documentation; and notifying members of meeting dates. The minutes should summarize the discussions of the meeting and include a list of action items and the person(s) responsible for completing each action item.
- Meetings should be scheduled by the Co-Chairs, in consultation with Committee members. The Committee will meet as necessary, but no less than 3 times per year. (While the plan is being developed, meetings could be held monthly.) Meetings should be closed except when individuals are invited to give input or technical information. Where possible, all meetings will be held on the same day of the week, at the same time and location, and should last a maximum of two hours.

- No meeting should occur without a quorum (determined by the Committee) and the Watershed Management Specialist.
- The media should not be permitted to attend meetings of the Committee. Members should not speak about the comments, views or interests of other members or member organizations or about the discussions of the Committee. Only the Co-Chairs should speak for the Committee.
- After a report in the media concerning or of interest to the Committee, a debriefing by the Co-chairs or person most knowledgeable about the report is recommended. The Committee may want to officially respond to the media report by way of a letter, as often information used in the media is general in nature and may give the wrong impression.
- To avoid conflict of interest, any Committee member who has a personal or financial interest in an application or proposal will be asked to leave the room during discussion of that application or proposal.
- To aid in information flow the Committee should develop a rule on absenteeism. Normally, the Committee should not back track for absent members or alternates replacing regular members.

The District 16 Planning Team Ground Rules may be consulted for further reference when establishing principles and processes.

#### **2.2.8 Approval**

The *Terms of Reference* should be documented with the date they were approved. Revision dates should also be documented.

#### **2.2.9 Funding**

All Committees will require funding of some sort to support their operational requirements, whether it is "in-kind" or cash. The Committee must determine what aspects of the development and implementation of the management plan will require funding. To do this, the Committee should decide if its members will develop the plan, or if a consultant will be hired. Can the Committee members collect the information, then hire a consultant to analyze this information and write the plan? This decision will be based on

the available time and expertise of potential committee members and the ability of the municipality to source funds to hire a consultant. Before making this decision, the Committee must review the remaining chapters of this guide to understand what is required to develop a plan.

Much of the information necessary to describe the watershed can be collected within the Committee. Some of the Committee members (government resource departments, resource-based companies) will have access to the resource information required, and may be able to provide it as an 'in-kind' contribution. They will also be knowledgeable about some of the uses of the watershed resources and may be able to provide maps that will be required. Other uses can be ascertained from local residents through a public meeting. The identification of pollutants which could negatively impact water quality and assessing the level of risk they pose will require expertise that may exist on the Committee. Chapter 4: Identify Potential Contaminants and Conduct Risk Assessment – provides a list of contaminants identified during the pilot project, which will be a good start for watersheds with similar uses.

The actual writing of the plan will require dedicated time by one or more individuals. Government members of the Committee may have time to review drafts of the plan, but may not be able to commit the time to writing the plan. At this point, if no one else on the Committee can provide this service, it will have to be contracted out. However, it is advisable to form a subcommittee of knowledgeable members to act as advisors to the writer and review drafts of the plan before they are presented to the full Committee.

The Department of Municipal and Provincial Affairs has a source of funding under Municipal Grants, whereby watershed management planning may be funded on a cost-shared basis. For more information, contact the Regional Engineer in the regional office of Municipal and Provincial Affairs. A listing of regional offices can be found in Appendix 3. When applying for funding, remember to list all expenditures being provided "in-kind" by the municipality, resource departments and agencies, and all the Committee membership.

## **2.3 Management Plan Terms of Reference for a Third Party**

If a consultant must be hired to conduct some aspect of the development of the watershed management plan, the Committee needs to write a *Terms of Reference* to outline exactly what is expected of the consultant. The *Terms of Reference* should contain the following information.

### **2.3.1 Background**

The background should include the same information as in the Committee *Terms of Reference*, that is, a brief description of the watershed size, its significant features and why the municipality requires a watershed management plan.

### **2.3.2 Purpose**

State the purpose or goal of the management plan, i.e to protect and maintain the quality of the drinking water at the source while allowing for the sustainable development of the watershed's natural resources.

### **2.3.3 Objectives**

The objectives of the work expected of the consultant should be stated. This, of course, depends on what the Committee will be able to do itself, and what it will need a consultant to do. The Committee may "borrow" from its list of responsibilities a set of objectives for the consultant, selecting those responsibilities it cannot cover. The following is an example of objectives for the consultant that could be used if the Committee can collect the required information, identify potential contaminants and their risk, and develop their own monitoring program.

With the information and guidance provided by the Committee, the consultant shall:

1. Designate management zones to protect areas sensitive to contamination, based on the distance from the water supply intake, distance from streams, lakes and ponds, slope of the land, and the risk of potential water contamination from identified activities.
2. Evaluate existing best management practices, environmental protection guidelines and regulations for compatible land uses in

the watershed (supplied by the Committee) and build upon or supplement them.

3. Prepare a watershed management plan for the watershed, based on the designation of management zones and the evaluation of practices, guidelines and regulations, regarding water quality protection and resource utilization.

#### **2.3.4 Information Resources**

Indicate where the consultant may access information about the watershed, its resources, and uses. This information may be supplied by the Committee, but if not, excerpts from Chapter 2 of this guide, which indicates how it can be obtained, can be included.

#### **2.3.5 Deliverables**

The Committee should state exactly what it expects the consultant to deliver. This would include the products resulting from the stated objectives. For the sample objectives above the deliverables would be:

1. A map designating management zones based on the parameters described in the objectives.
2. A management plan for the watershed including: the description of the watershed resources and uses, identification and assessment of potential contaminants, agencies responsible for the protection and management of resources within the watershed, establishment of management zones and a management strategy which incorporates regulatory, non-regulatory and educational/stewardship components.

#### **2.3.6 Timelines**

The Committee must determine when it would like the management plan to be completed, taking into consideration the amount of work necessary and the urgency of its need. Any delay in delivery could be linked with a financial disincentive.



### 3.0 CHARACTERIZE THE WATERSHED

By now, the Watershed Management Advisory Committee should be established, and its member's responsibilities verified. Funding sources, if required, should have been approached and possibly accessed. The Committee can now turn its attention to collecting information about the watershed.

At this point, it may be helpful to define a watershed. To help visualize what a watershed is, the Nova Scotia Department of Environment and Labour (2004), in their guide to the development of a municipal source water protection plan, use the analogy of a bowl. Water poured into any part of a bowl (the watershed) will settle at the bottom of the bowl (the water supply). Water poured outside the bowl's rim will not affect the water supply, making the bowl's rim the watershed boundary.

The first order of business is to determine if the water supply area has already been designated as protected. Most of the major water supply areas in the province have been protected, and municipalities are notified once their water supply area has been designated.

A map of all designated Protected Public Water Supply Areas (PPWSA) can be viewed on the Department of Environment and Conservation website: [http://www.env.gov.nl.ca/Env/env/waterres/GIS/Wallmaps/pws/pws\\_wallmap\\_Prot\\_supplies-large.jpg](http://www.env.gov.nl.ca/Env/env/waterres/GIS/Wallmaps/pws/pws_wallmap_Prot_supplies-large.jpg).

The designation notices of all PPWSAs, outlining the boundary coordinates, can be found on the House of Assembly website: <http://www.hoa.gov.nl.ca/hoa/sr/>. Once on the site click Table of Regulations, then "W", then ***Water Resources Act***.

If you determine that your water supply area is not protected, you must submit an "Application for Protection of a Water Supply Area" to the Water Resources Management Division of the Department of Environment and Conservation. These forms are available from the regional offices of the Department of Environment and Conservation, which are listed in Appendix 3, and are also on the Department's website at: <http://www.gov.nl.ca/env/Env/waterres/Forms/WRMD-Forms.asp>.

The steps of the designation process have been described in a document produced by the Department of Environment and Conservation, *Management of Protected Public Water Supply Areas*(2006), available on the Department's website at: [http://www.env.gov.nl.ca/env/Env/waterres/Template\\_SW.asp#mark](http://www.env.gov.nl.ca/env/Env/waterres/Template_SW.asp#mark) . Your Committee (or municipality) may use this publication to assist in the designation process, or you can call the nearest regional office and request assistance from the Watershed Management Specialist.

### **3.1 Location & Physiographic Characteristics**

If your water supply area is already designated, you need to get a map of the watershed. The Department of Environment and Conservation has an atlas of the protected public water supply areas and also has digital maps of these areas incorporated into a Geographical Information System (GIS). Other resource agencies (e.g., companies and other government departments) with GIS capabilities can produce these maps as well, if they have the boundaries of the PPWSA in digital format compatible with their GIS (e.g., ArcView shapefiles). Shapefiles of PPWSA are available for download from the following Department of Environment & Conservation web site:

<http://www.env.gov.nl.ca/Env/env/waterres/GIS/PWS/PWSLayer.asp>.

If you are waiting for designation of your water supply area to determine the official boundaries, you may still produce a tentative map of your watershed, with the help of the resource agencies represented on your committee. The most commonly-used and basic method to outline a watershed is by using a topographic map (or air photo), and connecting the points of high elevation around the body of water supplying your drinking water (the drainage basin). This will ensure that all streams feeding into the water body are included in the watershed map. Knowledgeable technicians working with resource agencies are capable of doing this for the Committee, if they have the time and have been given approval.

Once the Committee has obtained a map of the watershed area (either tentative or designated) it can proceed with gathering and documenting information. The information you will need is described below. You may check the following link to see how this information was addressed in the *Steady Brook Watershed Management Plan*:

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20>

[watershed%20plan.pdf](#). An excellent source for some of this information, specific to Newfoundland, is *Biogeography and Ecology of the Island of Newfoundland*, edited by G.R. South (1983).

### 3.1.1 Location

Describe the size of the watershed (ha or km<sup>2</sup>), general location (e.g. central Newfoundland), and the distance from a major center. Mention any reserves or protected areas of any other sort which may lie within the water supply area. Indicate if the watershed flows into a larger watershed or river system.

### 3.1.2 Ecoregion

A. Damman (1983), an ecologist, subdivided the island of Newfoundland into ecoregions to reflect differences in regional climate. A climatic description of the ecoregions can be found in Damman's paper, *An Ecological Subdivision of Newfoundland* (see [Additional Information](#)). A map of the ecoregions can be found on the Department of Natural Resources website:

[http://www.nr.gov.nl.ca/forestry/maps/eco\\_nf.stm](http://www.nr.gov.nl.ca/forestry/maps/eco_nf.stm).

### 3.1.3 Hydrology

Describe the flow of water in the watershed (e.g. from east to west) from its point of origin. Include the major streams that may flow into the major waterbody that is the source of drinking water. The *Water Resources Atlas of Newfoundland* (Department of Environment and Labor, 1992) provides good background information for hydrology, geology and soils.

### 3.1.4 Geology

Knowledge of the structure of the earth's crust within your water supply area will provide information about how water will act inside the watershed. The amount of water that penetrates into a rock (porosity) and the speed with which it penetrates (permeability) vary for different rock types. These properties affect the rate of infiltration of rainwater into the ground. This, in turn, determines the amount of surface runoff. The ability of rocks to be dissolved (solubility), determines what chemicals might be leached into the groundwater. The geology of an area influences the location and yield of groundwater resources, which are the sources of surface water.

The geology of your watershed may be found with the assistance of the Mines Branch of the Department of Natural Resources (regional offices listed in Appendix 3). Another possible source is the *Forest Management Strategy* for the Forest Management District under which your water supply area falls, as these documents contain information on the physiographic, natural and historic resources of the management area. The representative on your Committee from the Forestry Branch of the Department of Natural Resources should have access to this document, or you can contact one of the regional offices listed in Appendix 3.

### **3.1.5 Soils**

As was the case with geology, water quantity and quality are affected by the hydraulic, chemical, and physical properties of soils. Fine-textured soils such as clays hold water and so water movement is slow. Coarser, sandy soils don't hold water well and therefore drain quickly.

Soil maps exist for a limited number of areas of Newfoundland. The Agrifoods Branch of the Department of Natural Resources provides a link to the soil survey reports for these areas on their website:

[http://www.nr.gov.nl.ca/agric/soil\\_land/mapsites.stm](http://www.nr.gov.nl.ca/agric/soil_land/mapsites.stm).

Regional Agrifoods representatives may also be able to assist you. And once again, the *Forest Management Strategy* for the Forest Management District in your area is a good source of information about soils. Other sources are listed in Additional Information under Roberts (1983) and Wells, Bouzane & Roberts (1972).

### **3.1.6 Topography**

The topography of an area describes its surface features, for example, whether it is flat or mountainous, or intersected with numerous waterbodies. This information can be obtained from locals, or others familiar with the area. Once again, the *Forest Management Strategy* will contain a description of topographic features for the Forest Management District.

### **3.1.7 Climate**

The combination of temperature, precipitation and wind that characterizes an area is called climate. Locals with intimate knowledge of the watershed can provide general information about its climate. Airports keep climate data, so

watersheds near airports may access this information from them. Environment Canada has at least 15 years of climate data for 73 stations in Newfoundland and Labrador, which is available on their website at: [http://climate.weatheroffice.ec.gc.ca/climate\\_normals/index\\_e.html](http://climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html) . The *Forest Management Strategy* usually reports local climate for the various forest management districts, and other sources can be found in Damman (1983) and Banfield (1983), listed in Additional Information.

### **3.2 Natural & Historic Resources**

When identifying the natural resources of an area, it is important that you get an overall picture of land class distribution, i.e. the number of hectares (and percentage) that is classified as fresh water, forest, barren, bog, developed, etc. The Department of Natural Resources has this information for all of Newfoundland and Labrador, in a forest-based classification. The required information can be extracted from this classification, but first you need to supply the forestry office with the boundaries of the watershed in a format usable by GIS. As discussed earlier in this chapter, boundaries of the Protected Public Water Supply Areas are available from the Department of Environment and Conservation.

There are a number of natural resources in your watershed that require noting including water, forest (and other vegetation), wildlife and minerals. Historic resources also need to be identified and discussed. Again, you may check the [Steady Brook Watershed Management Plan](#) for its discussion of natural and historic resources. Each category is outlined in the following discussion.

#### **3.2.1 Water**

Background information on the existing water supply system, treatment, and usage, and on water quality and quantity is necessary when developing a management strategy for the watershed. This will provide you with details such as: if the present usage will continue; if water quantity is enough to support an increase in usage; and if there are any water quality issues that need to be addressed.

##### **3.2.1.1 Water supply system**

Collect the following information about the water supply system:

- Existing structures
- Location of the intake
- Date the system was installed
- Treatment methods (chlorination, filtration, pH adjustment, fluoridation)
- Daily usage, adequacy of supply, and potential for increased supply
- Other observations of relevance - periods of increased sediment, number and causes of boil water advisories, etc.

### 3.2.1.2 **Water quality data**

Monitoring of drinking water quality in Newfoundland is the responsibility of the provincial government. The process consists of monitoring for chemical, physical and microbiological parameters.

The province uses the *Guidelines for Canadian Drinking Water Quality* as the standard against which test results for all parameters are compared. For summary tables of the guidelines for each of the parameters, visit the following website: [http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc\\_sup-appui/sum\\_guide-res\\_recom/index\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html).

[Chemical and physical parameters](#) are monitored by Watershed Management Specialists of the Department of Environment and Conservation. The samples are taken from both the source (lake, pond, river etc.) and the tap. Chemical and physical monitoring is generally conducted twice a year, except for [trihalomethanes](#) and [haloacetic acids](#), which are monitored seasonally. Complete reports of all chemical and physical parameters tested for your public water supply, for both source and tap water, can be obtained from the Department of Environment and Conservation. For an example of the reports, see Appendix B in the *Steady Brook Watershed Management Plan*. These reports show the trends in water quality since testing began, which varies with municipality. A discussion of the results of water quality testing of your water supply should be included in the management plan, but you will probably want to include only those parameters that have exceeded the *Guidelines for Canadian Drinking Water Quality*. It may be easier to discuss the results of source water testing and tap water testing separately. For more information about the effects of parameters that exceed the guidelines, the Committee is

encouraged to refer to the most recent publication of the annual report *Drinking Water Safety in Newfoundland and Labrador* at:  
<http://www.env.gov.nl.ca/Env/env/waterres/Reports/Reports.asp>.

Monitoring for [microbiological parameters](#) is the responsibility of the Department of Government Services and samples by Environmental Health Officers are taken from tap water only. Microbiological testing of tap water is conducted routinely, the frequency is based on population and the number of water supplies per municipality. Testing is usually performed at two locations per water supply: at the water supply uptake (before it enters the community system), and at the end of the system. The Department of Health and Community Services then assesses the health impacts of any microbiological or chemical contamination of the drinking water, and advises the Environmental Health Officer accordingly. The most recent boil water advisories for communities in Newfoundland and Labrador can be found on the following Environment & Conservation website:  
[http://www.env.gov.nl.ca/env/Env/waterres/CWWS/Microbiological/su  
mmary.pdf](http://www.env.gov.nl.ca/env/Env/waterres/CWWS/Microbiological/su<br/>mmary.pdf).

Data on testing for microbiological parameters and all boil water advisories (recent and historical) can be obtained from the Environmental Health Officer servicing your water supply.

The Environmental Health Officer for your area can be contacted at the Government Services Centre nearest your municipality. See Appendix 3 for a listing of Government Services Centres.

More information on the state of Newfoundland and Labrador public water supply systems, with respect to source protection, water treatment, and drinking water quality monitoring and reporting, can be found in *Source to Tap – Water Supplies in Newfoundland and Labrador*, available on the following website:  
<http://www.env.gov.nl.ca/env/SourceToTap/SourceToTap/Report.asp>

### **3.2.1.3 Water quantity**

Water quantity data is collected by Environment Canada at hydrometric stations established on water bodies across the province.

This information can be used to determine stream flow for the watershed, which will indicate if water quantity is sufficient to meet the water demand of the municipality. Access to this information is restricted. The provincial Department of Environment and Conservation can access this information, but may not have the human resources to satisfy all the demands from municipalities. However, local residents can also enlighten the Committee about the history of water quantity, e.g. if water use has ever been restricted, and when peak flows occur. The Committee should determine if and how these occurrences affect water quality.

### **3.2.2 Forest**

All of Newfoundland and Labrador is a part of the boreal forest region. The boreal forest is a green belt which spans much of the northern hemisphere. It is characterized, among other things, by the phenomena of periodic stand-replacing natural disturbances, such as fire and insect outbreaks. These disturbances typically result in uniform, even-aged forests dominated by a few tree species. The tree species that characterize the Canadian boreal forest include black spruce, white spruce, balsam fir, eastern larch, trembling aspen, white birch and jack pine (DFRA, 2002). All of these, with the exception of jack pine, occur commonly in Newfoundland. The dominant species, however, are black spruce and balsam fir: together they represent more than 90% of the growing stock on the island.

The Committee should determine for their watershed the tree species distribution, the age of the forest, and the productivity of the area (Figures 5, 6, & 7 in [Steady Brook Watershed Management Plan](#)). You should also verify the origin of the forest. Most of the forest close to settlements is second-growth forest, having been harvested once already, or destroyed by fire or insects. The present forest may have seeded in naturally or it may have been planted with seedlings. All this information is available from the Department of Natural Resources inventory files, if you can provide Natural Resources with the ArcView shapefiles for the watershed boundaries.

### **3.2.3 Other Vegetation**

Field surveys to determine other vegetation in the watershed would be an expensive undertaking, and, in most cases, would not add information



imperative to the plan. However, it is important to know if any endangered or threatened plant species have been found in your watershed. In 1999, a Newfoundland Rare Plant Project was initiated by the Inland Fish and Wildlife Division of the Department of Environment and Conservation. You should contact the Wildlife Division (contact information can be found in Appendix 3) to determine if your watershed is home to an endangered or threatened species.

#### **3.2.4 Disturbances**

The history of disturbances in your watershed will provide you with information on the ability and speed with which the resources will rejuvenate. Determine any areas that were harvested for wood fiber and/or the areas that suffered insect damage or fire, the extent of the damage, and when areas were cleared for agriculture or by any other disturbance.

#### **3.2.5 Wildlife**

Specific data on wildlife species in your watershed will be harder to find than forest data. The Inland Fish and Wildlife Division have broken up the province into "Management Areas" for various game and furbearers, and can provide you with data for the management area that includes your watershed. This information is provided by hunter and trapper license returns, various reports and publications, and personal communication with field staff. They can also advise you if your watershed contains any endangered species, reserves, sensitive wildlife areas, parks, or areas closed to shooting, trapping or snaring.

The Committee should endeavor to collect information for the following categories:

- Big game
- Small game & furbearers
- Small mammals
- Inland fish
- Avian species
- Amphibian and invertebrate species

#### **3.2.6 Mineral Potential**

To determine if any mineral claims exist or any mines or quarries are presently active, you can check the claims map online at: [www.nr.gov.nl.ca/mines&en/maps/mapclaims.stm](http://www.nr.gov.nl.ca/mines&en/maps/mapclaims.stm). Alternatively, you can

contact the Mineral Lands Division of the Department of Natural Resources (contact information provided in Appendix 3). You should also determine if there is potential for minerals in the area. You can check the online maps of the Geoscience Resources Atlas at: <http://gis.geosurv.gov.nf.ca/>, or you can contact the Geological Survey Branch of the Department of Natural Resources.

### **3.2.7 Historic Resources**

The Provincial Archives of Newfoundland and Labrador of the Department of Tourism, Culture and Recreation can advise you if any archeological sites are registered in your watershed, and possibly the potential for such sites to exist. This information is restricted, so you will need to contact the Provincial Archaeology Office listed in Appendix 3.

## **3.3 Watershed Uses – Existing and Potential**

In order to determine what effects activities in a watershed might have on water quality, the Committee must assemble a list of existing and potential watershed uses. Municipal council members should be able to identify many of the activities, but to get a better idea of the frequency and location of these activities, the Committee should hold a public meeting. A public meeting or Open House will serve a number of purposes:

- it will determine the public's uses of the watershed (what, when, where and how often);
- it can be used to enlighten residents about the process of the watershed development plan; and
- it can gather the public's ideas and concerns about activities in the watershed.

The survey employed to gather information on watershed uses at the Open House for the Steady Brook pilot project is found in Appendix 4. To read the discussion of the results of the survey, check the [\*Steady Brook Watershed Management Plan\*](#).

The watershed uses you identify can be divided into water use and land use. The following will help you document the relevant information about these uses (see the *Steady Brook Watershed Management Plan*).

### 3.3.1 Water Use

The primary use of your watershed is to provide quality drinking water for the municipality. However, other water uses exist as well. Questions to answer in this respect are:

- Does the water supply serve more than one municipality?
- What is the population that the water supply must serve?
- What is the average daily consumption of water in summer and in winter?
- Are there any industrial or commercial uses of the water (marinas, ski hills, fish plants, etc.)?
- What are the recreational uses (boating, fishing, swimming, etc.)?

### 3.3.2 Land Use

Land uses are many and varied. You should report on the historical, present and potential land uses of the watershed. For each of these uses, include a discussion of the history of use, the approximate area of the watershed included in this use, the current status, and the associated activities.

Categories of uses and the agencies to contact for information include:

Table 3.1 Categories of Uses and Regulatory Agencies

Forestry (commercial & domestic)	Dept. of Natural Resources, Forest Resources Abitibi Consolidated Inc. Corner Brook Pulp and Paper Ltd. Municipality
Transportation (roads, trails, airstrips)	Dept. of Transportation & Work Services Abitibi Consolidated Inc. Corner Brook Pulp and Paper Ltd. Crown Lands
Communications/Services (power lines)	Newfoundland Hydro Newfoundland Power Aliant and other cell phone service providers
Agriculture (animal & crop production)	Dept. of Natural Resources, Agrifoods Municipality, local farmers
Recreation & Tourism	Municipal Open House Dept. of Tourism, Culture & Recreation Dept. of Government Services (cabins) Municipality N&L Snowmobile Federation N&L Outfitters Association

Mining (exploration, mines, quarries)	Dept. of Natural Resources, Mines & Energy Exploration Companies Construction companies
Residential (individual and sub-division)	Municipality Cabin Associations
Commercial/industrial development	Municipality

Once the uses have been identified, it will be beneficial to locate the uses on a map of the watershed. This will help in other stages of the plan development, particularly determining what uses coincide spatially.

### 3.3.3 Compatibility of Uses

Using the history of water quality as a guide, review the past performance of activities in the watershed. Considering the worst case scenario, assess whether these activities have been compatible with the primary use of supplying quality drinking water. If activities are deemed compatible with water quality, they should also be examined for compatibility with each other, over time and space.

### 3.3.4 Jurisdiction of Watershed Protection and Use

Uses of a watershed vary; they include government, private industry, non-profit organizations and the general public. Jurisdiction of the protection and use of a watershed is also divided among a number of parties. The following table lists the agencies responsible for management of *Protected Public Watershed Supply Areas* (and management of activities in PPWSAs). The specific responsibilities, relevant legislation and the type of development regulated by that agency are outlined.

Table 3.2. Legislation, regulatory agencies and their responsibilities for Protected Public Water Supply Areas.

Agency Responsible	Legislation, Regulations / Policies	Responsibilities	Development Regulated
Department of Environment and Conservation – Water Resources Division	<ul style="list-style-type: none"> <li>▪ <b>Environmental Protection Act, 2002</b> <ul style="list-style-type: none"> <li>▫ Heating Oil Storage Tank System Regulations</li> </ul> </li> <li>▪ <b>Water Resources Act, 2002</b> <ul style="list-style-type: none"> <li>▫ Policy for Treated Poles in Water Supply Areas</li> <li>▫ Policy for Land and Water Related Developments in Protected Public Water Supply Areas</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Provides a framework for protection and preservation of water quality                             <ul style="list-style-type: none"> <li>▫ Provides regulations for heating oil storage tank systems</li> </ul> </li> <li>▪ Designations of and enforcements within Protected Public Water Supply Areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments                             <ul style="list-style-type: none"> <li>▫ Legal Cabins</li> </ul> </li> <li>▪ All Developments                             <ul style="list-style-type: none"> <li>▫ Transmission Lines</li> <li>▫ All Developments</li> </ul> </li> </ul>
Department of Environment and Conservation – Crown Lands Administration Division	<ul style="list-style-type: none"> <li>▪ <b>Lands Act, 1991</b> <ul style="list-style-type: none"> <li>▫ License to Occupy</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Grants permits for occupancy of Crown Land</li> </ul>	<ul style="list-style-type: none"> <li>▫ Legal cabins</li> </ul>
Department of Environment and Conservation – Environmental Assessment Division	<ul style="list-style-type: none"> <li>▪ <b>Environmental Protection Act, 2002</b> <ul style="list-style-type: none"> <li>▫ Environmental Assessment Regulations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Requires review of development proposals, policies and plans under the Act</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments</li> </ul>
Department of Environment and Conservation – Pesticides Control Section	<ul style="list-style-type: none"> <li>▪ <b>Environmental Protection Act, 2002</b> <ul style="list-style-type: none"> <li>▫ Pesticides Control Regulations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Controls pesticide usage through licensing applicators, training and emergency response</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments</li> </ul>
Municipality	<ul style="list-style-type: none"> <li>▪ <b>Municipalities Act, 1999</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ Makes regulations to prevent the pollution of, and prohibit and control the use of a municipality's water supply.</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments</li> </ul>

Agency Responsible	Legislation, Regulations / Policies	Responsibilities	Development Regulated
Watershed Monitoring Committee	<ul style="list-style-type: none"> <li>▪ <b><i>Water Resources Act</i></b>, 2002</li> </ul>	<ul style="list-style-type: none"> <li>▪ Development and monitoring of a Watershed Management Plan</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments</li> </ul>
Fisheries and Oceans Canada	<ul style="list-style-type: none"> <li>▪ <b><i>The Fisheries Act</i></b>, 1985 <ul style="list-style-type: none"> <li>▫ Fishery (General) Regulations</li> <li>▫ Atlantic Fishery Regulations</li> <li>▫ Policy for the Management of Fish Habitat</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Reviews any development which would have an impact on fish habitat. <ul style="list-style-type: none"> <li>▫ Describes process to apply for letter of advice or authorization to alter fish habitat.</li> </ul> </li> <li>▫ Regulates recreational fishery.</li> <li>▫ Guides the application of habitat provisions.</li> </ul>	<ul style="list-style-type: none"> <li>▪ All Developments</li> </ul>
Department of Health and Community Services	<ul style="list-style-type: none"> <li>▪ <b><i>Public Health Act</i></b>, 1996 <ul style="list-style-type: none"> <li>▫ Sanitation Regulations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▫ Regulates standards for disposal of sewage</li> </ul>	<ul style="list-style-type: none"> <li>▫ Legal Cabins</li> </ul>
Department of Natural Resources – Forest Resources Division	<ul style="list-style-type: none"> <li>▪ <b><i>Forestry Act</i></b>, 1990</li> </ul>	<ul style="list-style-type: none"> <li>▪ Controls commercial and domestic cutting, and access road construction; prepares timber management plans</li> </ul>	<ul style="list-style-type: none"> <li>▪ Domestic and Commercial Forest Harvesting</li> </ul>
Department of Natural Resources – Mines and Energy Division	<ul style="list-style-type: none"> <li>▪ <b><i>Minerals Act</i></b>, 1990</li> <li>▪ <b><i>Mining Act</i></b>, 1999</li> <li>▪ <b><i>Quarry Materials Act</i></b>, 1998</li> </ul>	<ul style="list-style-type: none"> <li>▪ Governs the acquisition of rights to minerals.</li> <li>▪ Regulates the operation of mines.</li> <li>▪ Grants exploration licenses and quarry permits.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mineral Exploration</li> <li>▪ Mining</li> <li>▪ Quarrying</li> </ul>

### 3.3.5 Department of Environment and Conservation

The Environment and Conservation Minister's first responsibility through the [Water Resources Act \(2002\)](#) is to designate the area surrounding the source of public water supply as a PPWSA. The Minister also regulates "resource development and other activities to be undertaken" in a PPWSA, "and those activities shall not be undertaken without first obtaining authorization from the Minister". The **Act** also prohibits any activity that impairs the quality of the water or diminishes the quantity of water.

The [Environmental Protection Act, \(2002\)](#) requires a review of development proposals, policies and plans, and controls pesticide usage. It also regulates the storage of heating fuel in cabins under the [Heating Oil Storage Tank System Regulations](#). The Crown Lands Administration Division of the Department of Environment and Conservation grants permits for occupancy of Crown land, through the [Lands Act \(1991\)](#). The construction of legal cabins on Crown land anywhere is regulated by this Division, and can only proceed with a *License To Occupy*.

### 3.3.6 Municipality

The municipality operating a water works has the responsibility, under the *Water Resources Act*, to protect the source(s) of public water supply. The [Municipality Act \(1999\)](#) gives further power to the Municipal Council to make regulations:

- Prohibiting and controlling the use of a source of water that is considered dangerous to public health;
- Preventing the pollution of waters respecting the cutting of timber or the erection or establishment of a building, structure or work within the water catchment area, whether the watershed is wholly or partially within or outside municipal boundaries.

These two **Acts** allow the municipality, along with the Minister of Environment and Conservation, to control development in the watershed, even if the watershed boundaries fall outside the municipal boundaries.

### 3.3.7 Department of Natural Resources

Three divisions within the Department of Natural Resources have responsibilities for the development of resources in watersheds. The Forest Resources Division administers the [Forestry Act \(1990\)](#) and oversees forest operations on all Crown

lands. Ninety percent of the land in the province is Crown Land, so, in almost all cases, all watersheds are owned by the Crown. The Mines and Energy Division of the department regulates mineral exploration, mining and quarrying in the province, through three separate acts. Developments of these types must have the approval of the Mines and Energy Division as well as the Department of Environment and Conservation. The Agrifoods Division regulates agricultural activities.

#### **3.3.8 Other Agencies**

Fisheries and Oceans Canada enforces the [Fisheries Act \(1985\)](#), under which a number of regulations apply to watershed management. The department reviews developments that may affect fish habitat and requires an application for stream crossings and other alterations of fish habitat. Fisheries and Oceans Canada also regulates the recreational fishery, which is a common activity in the watershed. Through the *Public Health Act (1996)*, [Sanitation Regulations](#), the Department of Health and Community Services and the Government Service Centre regulates the standards for disposal of sewage, an activity associated with legal cabins.



## **4.0 IDENTIFY POTENTIAL CONTAMINANTS AND CONDUCT RISK ASSESSMENT**

Protection of the source of the water supply is the main function of a watershed management plan. As discussed in the introductory chapter, source water protection is one of the first level activities of the provincial government's three-level Multi-Barrier Strategic Action Plan, to provide clean and safe drinking water to the public. Protection of water quality at the source can reduce the need for more costly methods of protection at other levels, such as water treatment

Assuming that all existing and potential future uses in the watershed have been identified in the previous step, the Committee can now proceed with pinpointing the possible [contaminants](#) that may result from these uses.

### **4.1 Potential Contaminants from Identified Uses**

Pollutants in water can be of two types: point source and non-point source. Point source pollutants are those whose origins are known, and therefore are more easily monitored. Examples of point sources include landfill sites, wastewater or septic discharge, underground storage tanks, and wastes from mines or industrial sites. Non-point source pollutants are more difficult to track, their origins harder to pinpoint, and thus are more challenging to control. Examples of non-point sources include acid rain, pesticides, motorized vehicles, and agricultural and forestry activities. Both sources of pollutants can contaminate drinking water, but contamination from non-point sources is more common.

Probably the easiest way to identify potential sources and types of pollutants is to examine all water and land uses outlined in the previous chapter, and brainstorm activities associated with these uses that might cause contaminants. For this activity, it will be important to include individuals with a resource/environmental background, if they are not already members of the Committee. The Watershed Specialist, in particular, has a wealth of knowledge in this field.

To identify potential contaminants, you must first be aware of the possibilities. Contaminants that might be found in watersheds in the province can be organized into seven categories:

1. **Pathogenic Microbes** – disease-causing micro-organisms such as bacteria and viruses (coliforms, Escherichia coli, and Giardia), which may find their way into water through wildlife, sewage systems, domestic animal activities and human activities.
2. **Chlorination By-Products** – by-products resulting from the chlorination of water containing high levels of [organic matter](#), specifically trihalomethanes and haloacetic acids, which can be hazardous to human health.
3. **Toxic Substances** - poisonous substances, such as pesticides (insecticides and herbicides), that are capable of causing disease when introduced into the body tissues.
4. **Petroleum Products** – products such as gasoline that contain benzene, a chemical known to cause leukemia.
5. **Sediments** – particles of soil that are carried to water usually by run-off. Sediment can change water quality parameters such as [turbidity](#), dissolved oxygen and nutrients.
6. **Nutrients** – naturally occurring elements that can be added to water through human activity and cause excess plant growth which, in turn, reduces oxygen levels in the water.
7. **Salts/Metals** - inorganic compounds which can occur naturally or as a result of human activities, such as road salting and mining.

Below is a list of uses, potential contaminants and their causes, identified in the Steady Brook watershed pilot project, which can be used as a guide. There was no existing agriculture (or potential), year-round residential development, public highways or commercial/industrial development in the Steady Brook watershed, so these uses, and their potential contaminants and causes are absent from the table.

*Table 4.1: Use-Contaminant-Cause*

Watershed Use/Activity	Potential Contaminant	Cause
Drinking Water	Chlorination by-products	Chlorination of water high in organic matter
Natural Occurrences	Chlorination by-products	Natural organic loading
	Sediment	Increased Streamflow
		Forest Fires
	Pathogenic Microbes	Wildlife
	Nutrients	Forest Fires
Snowmaking for ski hill	Sediment	Increased volume of water required stirs up sediment

Watershed Use/Activity	Potential Contaminant	Cause
Forestry	Sediment	Forest cutting (Domestic and Commercial)
		Construction and use of logging roads
	Nutrients	Forest cutting (Domestic and Commercial)
	Petroleum products	Fuel spills or leaks
	Chlorination by-products from organic loading	Forest cover removal (Domestic and Commercial)
Construction and use of logging roads		
Transmission Lines	Petroleum products	Line Maintenance
		Vegetation Maintenance
	Sediment	Line Maintenance
		Vegetation Maintenance
Toxic Substances	Chromate copper arsenate treated utility poles	
Recreation/Tourism	Sediment	Motorized vehicle use
	Petroleum products	Motorized vehicle use
		Fuel storage at cabins
Pathogenic Microbes	Cabin pit privies/ <b>septic systems</b>	
	Human-related activities (camping & swimming)	
Mining and Quarrying	Sediment	Mineral exploration, mining and quarrying activities
	Nutrients	Vegetation Removal
	Petroleum products	Mineral exploration, mining and quarrying activities
	Salts and Metals	Mining activities

In addition to a table of contaminants like the one above, the Committee should also include a discussion of what activities of the various uses could affect water quality, and exactly what those affects would be. For examples see *Steady Brook Watershed Management Plan*, p.36-39:

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20watershed%20plan.pdf>.

## 4.2 Risk Assessment

In the previous exercise, you will likely have identified numerous possible causes of the seven categories of potential contaminants. Since it would be impossible to address all of the causes at the same time, it is necessary to prioritize them. The

best way to prioritize them is to conduct a risk assessment of the contaminants and their causes.

Risk assessment is an estimate of the likelihood of negative effects that may result from exposure to certain health hazards, especially pollutants in the environment. So by estimating the negative effects of all of the identified potential contaminants, the Committee can determine which activities require a higher level of control, regulation or even prohibition.

Two methods of risk assessment can be used to prioritize the potential causes of contamination. One method, risk matrix analysis, requires that the assessors have basic information and knowledge of the watershed, and the existing and potential activities. This method was adapted from the approach suggested by Nova Scotia Department of Environment and Labour (NSEL, 2004), in their watershed management guide. This assessment method should be conducted by Committee members using their traditional and experiential knowledge, and verified by resource people in the appropriate corresponding agencies. The second method, numerical risk index (Shook, 1993), requires significant knowledge of watersheds, regulatory programs and the effects of contaminants on water quality. This method should not be attempted without the Watershed Management Specialist, or an equivalent specialist with a similar knowledge base. Both methods are described and the Committee can decide which method matches their technical expertise. Additional risk assessment approaches should be researched and incorporated if appropriate.

#### **4.2.1 Risk Matrix Analysis**

The Royal Society (1992) defines risk, as it pertains to risk assessment, as “the combination of the probability or frequency of occurrence of a defined hazard, and the magnitude of the consequences of the occurrence”. This definition provided the foundation for the risk matrix method utilized in the development of the Steady Brook Watershed Management Plan. The first part – probability or frequency of occurrence – means the likelihood that a particular contaminant will occur due to an identified cause. The second part - magnitude of the consequences of occurrence – questions the severity of the effect of the contaminant, if it were present. In order to determine the risk from all threats of contamination, the risk matrix analysis entails three steps, which will be expanded upon in the paragraphs following:

1. Evaluate each possible cause of contamination as to its probability of occurrence;
2. Assess each potential contaminant for the magnitude of consequences or “severity of risk”;
3. Use a matrix to plot these two variables to determine a priority ranking.

### **Step 1:**

The first step is the evaluation of each possible cause of the potential contaminants as to their probability of occurrence, and to do this you need to establish a scale. The Steady Brook watershed pilot project used a scale of **very low, low, medium** and **high**. The assessment for probability of occurrence is a qualitative analysis. Where variables such as water levels cannot be predicted, it should be based on the worst-case scenario, i.e., very dry or very wet conditions. However, when specific conditions are known, it is best to evaluate probability of occurrence based on those conditions. The distance from cabins on a pond to the water supply intake would be an example of known conditions.

For the purpose of illustration, consider the following examples of potential causes of contamination from the Steady Brook pilot project and how they were evaluated:

- The probability of wildlife causing pathogenic microbes was assessed as **high**;
- The probability of commercial harvesting causing contamination by petroleum products was assessed as **medium**;
- The probability that manually clearing vegetation from utility lines would produce sediment was assessed as **low**;
- The probability that some level of nutrients would enter the water supply as a result of mineral exploration was assessed as **very low**.

To view the evaluation of all possible causes of contamination in the Steady Brook watershed, check Table 8, p. 41 in the *Steady Brook Watershed Management Plan*.

### **Step 2:**

Next, to assess each potential contaminant for severity of risk, you need to assign risk levels. In the Steady Brook watershed pilot project, a rating of **catastrophic, critical, moderate**, or **minor** was used, and a rating was

determined for each of the seven potential contaminant categories. Pathogenic microbes were rated as the most severe risk (***catastrophic***), because they could be life threatening. Chlorination by-products and toxins (toxic substances) were assessed as ***critical***, as they have the potential to cause cancerous, reproductive and developmental effects. Petroleum products and sediments were assessed as ***moderate***, and nutrients and salts/metals were rated as ***minor*** risks, as the consequences of these contaminants in the amounts possible would be minimal.

### **Step 3:**

The final step in the risk matrix analysis is to determine the priority ranking for each possible cause of contamination, by plotting the probability of occurrence against the severity of risk on a matrix like the one in Figure 4.1. The priority ranking in this matrix is based on a scale of 1 (high priority), 2 (medium priority), 3 (low priority), and 4 (very low priority). In Figure 4.1, the three grey blocks in the top right corner are considered priority 1. Moving diagonally down and to the left, the six white blocks are priority 2, and so on.

From the examples used above, the ranking of wildlife as the cause of pathogenic microbes would be priority 1, because the probability of occurrence of pathogenic microbes in wildlife was considered high, and pathogenic microbes were assessed a catastrophic risk. Through a similar process, petroleum products from commercial harvesting would be ranked priority 2, because the probability of commercial harvesting causing contamination by petroleum products was assessed as medium, and petroleum products were assessed a moderate risk. Similarly, sediment resulting from clearing vegetation under utility lines would be ranked priority 3, and nutrients produced from mineral exploration activities would be ranked priority 4.

**SIDEBAR:** *All catastrophic risk contaminants are not necessarily priority 1, nor are all minor risk contaminants determined as priority 4. Pathogenic microbes (***catastrophic risk***) as a result of campers and cabin residents was evaluated as a ***low probability***, and so ended up a ***priority2***.*

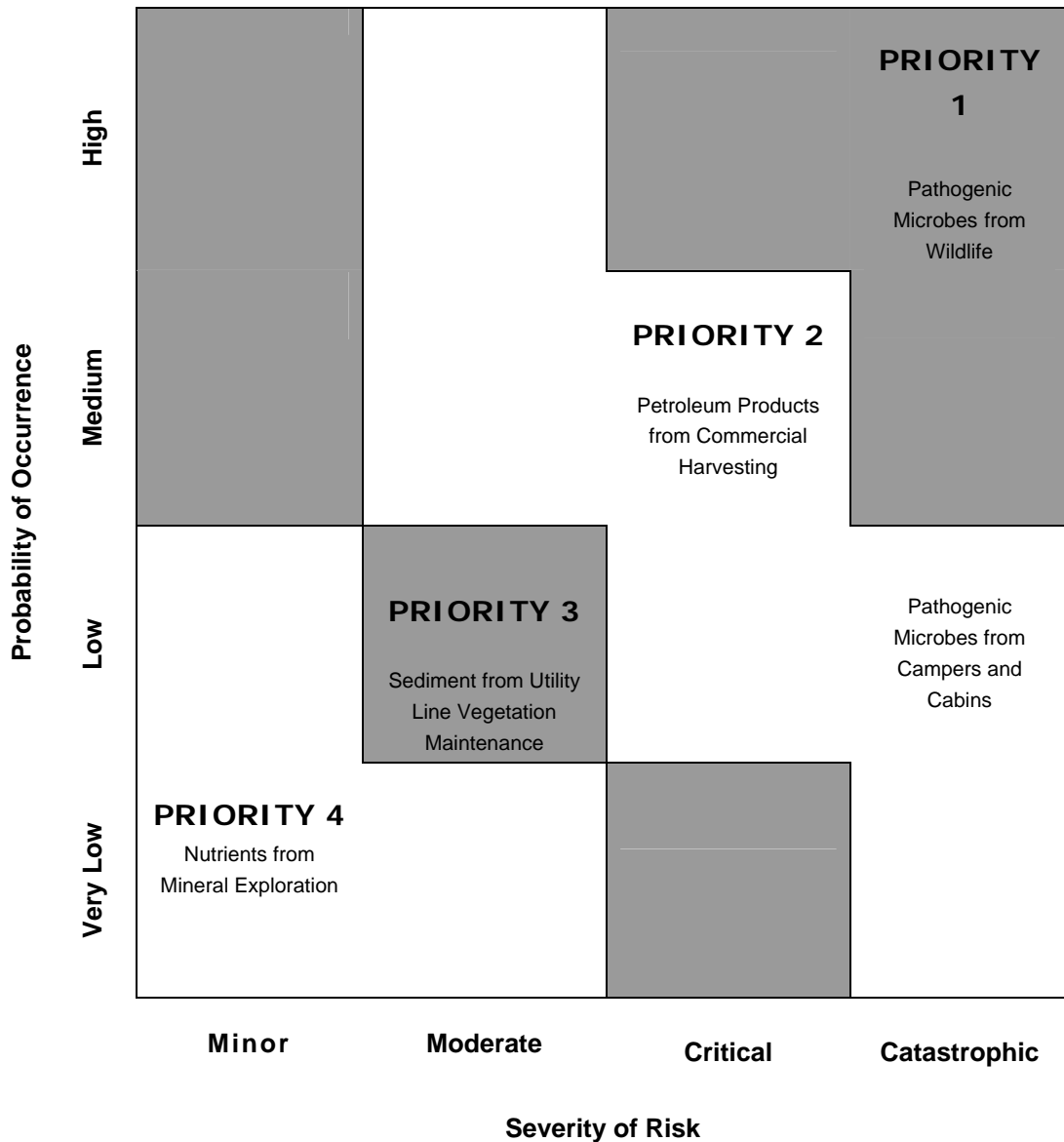


Figure 4.1 Risk matrix for priority ranking.

Table 8 and Figure 13 in the *Steady Brook Watershed Management Plan* show the priority ranking for all the possible causes of contamination in that watershed.

The priority ranking will provide the Committee with a means to determine which possible causes of contamination need to be addressed first, and which can be left until later. Although it may seem like there is an extremely large number of “causes” to deal with, the Committee will soon realize that many causes can be grouped, either by contaminant or by watershed use, and one

management practice will cover more than one cause. This will become more evident in the next chapter, which addresses the development of management strategies.

#### 4.2.2 Numerical Risk Index

The numerical risk analysis method involves both [subjective](#) and [qualitative](#) analysis. It considers any relationships between water quality factors, and involves a more holistic view of possible worst-case scenarios (Shook, 1993). This method incorporates three major factors to rank the risk of potential sources of water contamination. The first factor, regulatory adequacy, examines the ability of any regulatory program in place to prevent or remedy water contamination from potential sources. The second factor, public health, assesses the severity of the potential impact of a pollutant source on public health. The last factor, watershed vulnerability, is a measure of the extent to which watershed characteristics in the vicinity of a contaminant source may promote or impede water contamination (e.g., how slope affects sedimentation in the event of extreme rainfall). For each individual factor, a scoring mechanism uses a scale from low to high risk (see Table 4.2 below). As can be seen in the scoring mechanism table, this analysis requires significant knowledge of watersheds, regulatory programs and the effects of contaminants on water quality so should not be attempted without someone with that technical expertise.

*Table 4.2. Scoring mechanism for factors used to rank the risk of potential sources of water contamination.*

Factor	Low risk (1)	Medium risk (2)	High risk (3)
<b>Regulatory Adequacy</b>			
<b>Regulations</b>	Regulations with permits	Regulations or guidelines	No regulations
<b>Water quality monitoring</b>	No samples above guidelines	Some samples above guidelines	Many samples above guidelines
<b>Public Health</b>			
<b>Toxicity</b>	No harm	Reversible harm	Irreversible harm
<b>Population</b>	Low density	Moderate density	High density
<b>Quantity</b>	Low volume	Moderate volume	High volume
<b>Mobility</b>	Immobile	Some mobility	Extremely mobile
<b>Persistence</b>	Low persistence	Moderate persistence	Very persistent



<b>Watershed Vulnerability</b>			
<b>Soil type</b>	Moraine	Till	Bedrock
<b>Slope</b>	Flat	Moderate	Steep
<b>Runoff</b>	Low	Medium	High

To determine a numerical risk score, each factor is evaluated for each potential pollution source, assigning points to each parameter according to the scoring mechanism. These ratings are then summarized and averaged to produce a value for each major factor. These values are inserted into a formula to produce a total risk score. The *Steady Brook Watershed Management Plan Appendix D* contains the ratings for each potential cause of contamination for that project and *Table 10 (Steady Brook Watershed Management Plan)* demonstrates the formula for determining the total risk index, and the Risk Index Total for all potential causes).

#### **4.2.3 Comparison of Methods**

If your Committee has the capability to conduct the numerical risk index method of risk analysis, it is the most dependable and accurate way of prioritizing the potential sources of contamination. However, if your Committee does not have the expertise required to perform this method of analysis, the risk matrix analysis will produce an acceptable risk assessment of contaminant sources. In fact, in the Steady Brook pilot project, results of the two methods were in fairly close agreement (see Table 10, p. 45 of the *Steady Brook Watershed Management Plan*). The numerical risk analysis gave more recognition to contaminants from difficult to control sources, either originating from natural causes (wildlife, high levels of natural organics, increased streamflow and forest fires) or from hard to monitor activities (recreational camping and recreational motorized vehicle use).

### **4.3 Sensitivity Analysis**

The purpose of the sensitivity analysis is to map areas in the watershed suitable for different levels of development activity, based on the risk of potential water contamination from that activity. There are a number of steps involved in the sensitivity analysis:

1. Determine guidelines for development zones
2. Classify and buffer waterbodies (Appendix 6)

3. Delineate slope categories
4. Buffer the intake
5. Combine these classifications to create development zones

There are two ways to perform this sensitivity analysis, manually and by computer. The computer method uses a geographic information system (ESRI ArcGIS software), and this is the method that will be described here. The decision to conduct a sensitivity analysis will be based on the Committee's ability to access this technology, or access individuals with the time and capability to do the work required. Additional factors can be incorporated into the sensitivity analysis given time and resource constraints including land cover, land use, erosion potential, etc.

#### **4.3.1 Development Zone Criteria**

The first step in conducting a sensitivity analysis is determining guidelines for development zones. Development zone criteria can vary according to the watershed and/or issues. At the minimum, a plan should include 2 development zones – prohibited and regulated. In the Steady Brook pilot project, Watershed Management Specialists determined the guidelines for the four development zones based on 1) buffer widths, 2) land slope and 3) distance from the intake. In the Peter's River Plan, 7 watershed management areas were established; however, four restricted use zones were developed for the Gander Lake plan.

#### **4.3.2 Buffer Widths**

The buffer widths (Appendix 6) were based on provincial regulations, <http://www.env.gov.nl.ca/Env/env/waterres/Policies/PDWR95-01.asp>. This policy was developed under the *Water Resources Act*, to "ensure sustainable development of natural resources without adversely affecting water quality", inside protected public water supply areas. Within this policy, concrete guidelines specify buffer zone widths along and around waterbodies (Table 4.3). These are the minimum buffers to which all developments must adhere and within which all activities are prohibited. A review was conducted of regulated buffer zone widths from jurisdictions all across Canada and technical information on buffers for forestry, agriculture, etc. From this information, and knowledge of local conditions, the Department of Environment and Conservation then developed buffer widths specific to Newfoundland (see page 4 of Policy).

Table 4.3. Widths of buffer zones along and around waterbodies.

Waterbody	Width of Buffer Zone
Intake pond or lake	Minimum of 150 metres
River Intake	Minimum of 150 metres for a distance of 1 km upstream and 100 metres downstream
Main river channel	Minimum of 75 metres
Major tributaries, lakes or ponds	Minimum of 50 metres
Other waterbodies	Minimum of 30 metres

#### 4.3.3 Slope

Slope steepness is often the major cause of erosion and runoff potential, and consequently, a major contributor of pollutants to a waterbody. Precipitation runs off at higher velocities from steeper surfaces, and so has a greater capacity to erode and transport soil and the associated pollutants. To determine slope categories for the Steady Brook watershed, the Watershed Management Specialist looked at categories developed for other watershed management plans. In the Peter's River Watershed Management Plan, a range of slope was developed to determine pollution potential. The highest slope range was for slopes greater than 10% (ACRES, 1995). The Gander Lake Watershed Management Plan also identifies steep slopes as being the most sensitive areas in the watershed, and recommends slope as a good indicator of inherent sensitivity. In this plan, slope values were used in sediment delivery models and were divided into five categories. The most sensitive areas had slopes greater than 15% (EDM, 1996). The recommended slope categories for the Steady Brook sensitivity analysis are compared to the other plans in Table 4.4.

Table 4.4: Slope categories (%) for three watersheds on the island of Newfoundland

Peter's River	Gander Lake	Steady Brook
0-1	0-2	0-5
1-4	3-5	
4-7	6-8	5-20
7-10	9-14	
>10	>15	>20

#### 4.3.4 Distance from the Intake

Distance from the intake was also a major factor in determining development zones. It was decided that no development should be allowed within a 1 km radius of the intake, based on similar terms and conditions found in Permits for

Development Activity for PPWSAs in other areas of the province. Distance from the intake for other management zones also took into consideration distance to the main tributaries feeding into Steady Brook. For example, as can be seen in Table 4.5, the main stem of Steady Brook was a distance of 8 km, at the outlet of Steady Brook Lake.

Table 4.5: Development Zone Criteria

Zone	Buffer width	Water Body	Slope	Distance from Intake
<b>1. No Development Activity</b>	150m	For a distance of one km upstream and 100 m downstream of intake	N/A	1 km
	75m	Main river channel		
	50m	Major tributaries, lakes or ponds		
	30m	All other water bodies		
<b>2. High-Risk Slope Management Areas</b>	Outside Zone 1		> 20 %	> 1 km
<b>3. High-Risk Activities Prohibited, Remaining Activities Regulated</b>	Outside Zone 1		5-20%	> 1 km
<b>4. All activities Permitted and Regulated</b>	Outside Zone 1		< 5%	> 8 km

#### 4.4 Classify and Buffer Waterbodies

After the development zones are determined, the next step in the sensitivity analysis is to classify and then draw buffers around waterbodies. In the Steady Brook pilot project, the watershed boundary was used as a base, and digital layers of waterbodies were added and classified. The watershed boundary and water layers were sourced from the Water Resources Management Division. In order to apply regulation buffer widths, all waterbodies (river, streams and lakes/ponds)

needed to be manually classified by stream order (Appendix 5). This was accomplished using stream order from a 1:50,000 digital water layers map from the Surveys and Mapping Division of Environment and Conservation. Stream order is a widely used method of classifying streams based on stream hierarchy.

Many organizations (e.g. U.S. Environmental Protection Agency) develop stream buffers based on slope and stream order. First-order streams are usually in the headwaters, and are the first and smallest channel to make up the stream network. Two first-order streams join to form a second-order stream, and so on. Finally, all waterbodies were given a buffer width code (Appendix 7) based on the regulation buffer widths (Table 3). Third-order streams or larger were classified as major

#### **4.5 Delineate Slope Layers**

Once waterbodies are buffered, slope layers need to be established based on the development zone criteria. In the Steady Brook project, slope was determined using a 1:250,000 Digital Elevation Model (DEM)

obtained from Natural Resources Canada. (This was the only scale available at the time of analysis, but using a higher resolution DEM product (e.g., 1:50,000) is preferable for greater accuracy.) Using the 1:250,000 scale map, the slope layer was partitioned into the categories determined for the development zone criteria: < 5%, 5-20%, and > 20% (Appendix 7).

#### **4.6 Buffer Intake**

The next step in the sensitivity analysis is to buffer the water supply intake. In Steady Brook, the water supply intake was buffered at 1 kilometer and 8 kilometers (the main stem of Steady Brook), as was determined for the development zone criteria (Appendix 8).

Once all these steps are completed, the classified waterbody buffer, slope, and intake buffer layers are overlaid to create the development zones map. Figure 4.2 illustrates the development zones for Steady Brook.

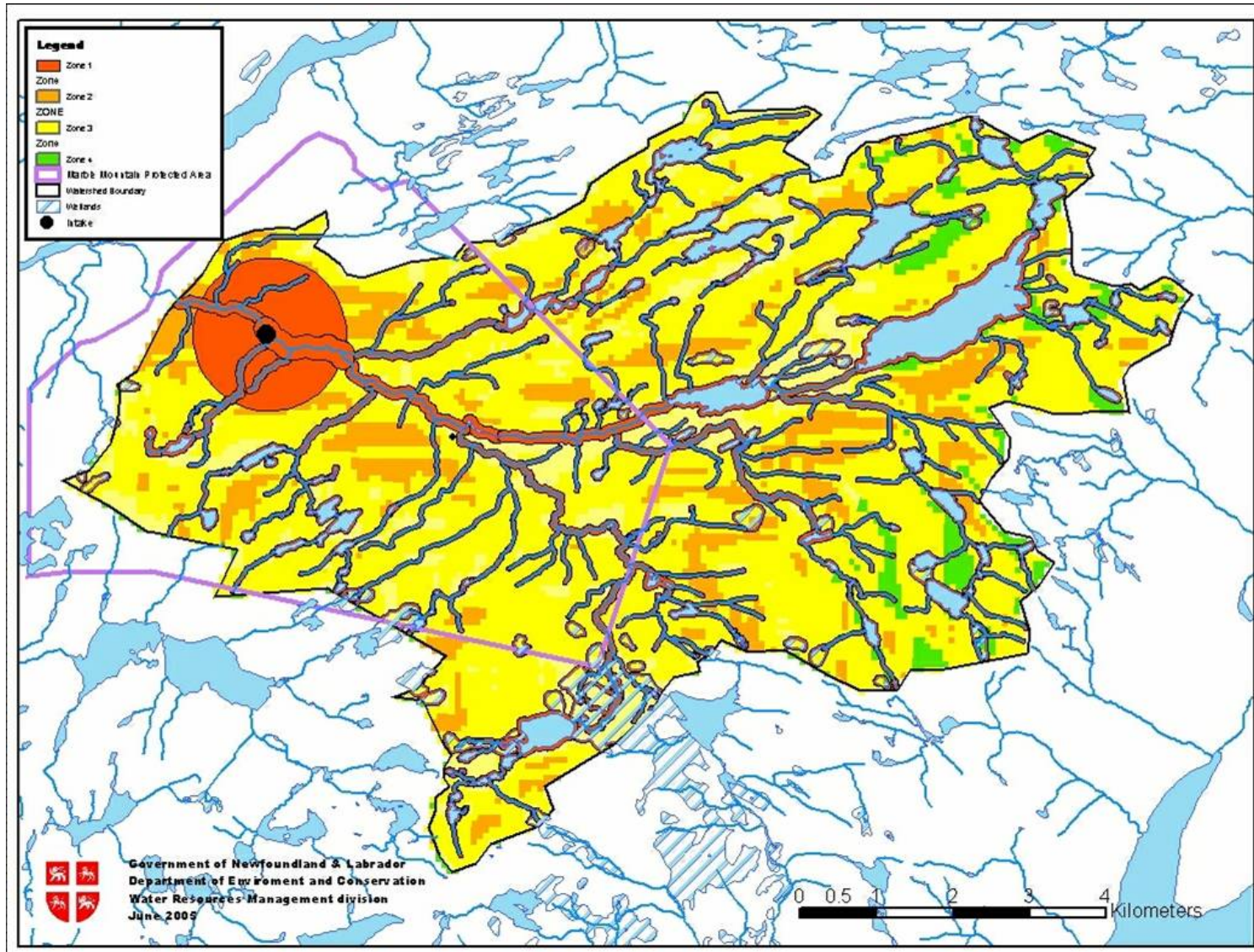


Figure 4.2. Proposed Development Zones for Steady Brook Watershed.

#### 4.7 Map Scale

In the Steady Brook pilot project, the proposed development zones in the sensitivity analysis were determined using the best mapping tools available at the time. The coarsest (smallest) map scale used, however, governs the refinement of the development zones; any use of the end product should keep this point in mind and be used at the user's own risk. If the coarsest map scale used in sensitivity analysis is a 1:250,000 DEM, then the development zone map produced is only suitable at the planning or reconnaissance level.

For more intensive resource activities such as forest harvesting, finer (larger) scale mapping at the semi-detailed and detailed level (e.g. 1:25,000, 1:10,000) is more commonly used (Table 4.6). In order for the sensitivity mapping of proposed development zones to be of practical use to different users, the differences in mapping scales will have to be considered. As more refined (larger scale) mapping becomes available, the proposed development zone mapping should be updated to reflect this as far as is practical. Better scale digital maps are expected to become available in March 2006.

*Table 4.6: Generalized categorization of mapping scales (IRECS, 1009)*

Scale	Map Refinement
1:1000-1:10,000	Intensive (Fine)
1:10,000-1:25,000	Detailed
1:25,000-1:100,000	Semi-detailed
1:100,000-1:1,000,000	Reconnaissance (Coarse)

#### **4.8 Forest Water Quality Index**

In 2003, the provincial Department of Environment, Department of Forest Resources and Agrifoods and the Western Newfoundland Model Forest combined resources to develop a new planning tool. This tool was developed to assess the impact potential forestry activities may have on the water quality and ecosystem health of protected water supplies in Newfoundland and Labrador. Historical water quality and forestry activity data were analyzed to identify variables that may have changed due to the forestry operations. The variables identified were turbidity, phosphorus, potassium, dissolved organic carbon, temperature, dissolved oxygen and nitrogen. The extent of change of these variables due to the volume and type of forestry activity was determined, and then used to predict potential impacts forestry activities may have on water quality.

The Forest Water Quality Index (FWQI) is calculated by comparing the water quality data to the *Guidelines for Canadian Drinking Water Quality*. This FWQI model calculates a score between 0 and 100 for the data analyzed. The higher the score, the better the quality of water. The scores are then ranked into one of the five categories described below:

- Excellent - Water quality is protected with a virtual absence of impairment; conditions are very close to pristine levels. These index values can only be obtained if all measurements meet recommended guidelines virtually all of the time.
- Very Good - Water quality is protected with a slight presence of impairment; conditions are close to pristine levels.
- Good - Water quality is protected with only a minor degree of impairment; conditions rarely depart from desirable levels.
- Fair - Water quality is usually protected but occasionally impaired; conditions sometimes depart from desirable levels.
- Marginal - Water quality is frequently impaired; conditions often depart from desirable levels.
- Poor - Water quality is almost always impaired; conditions usually depart from desirable levels.

Using the Forest Water Quality Index tool, the water quality data for Steady Brook was analyzed for the purpose of supplying drinking water. The same data was analyzed for drinking water, using parameters simulating impacts



of forestry operations and worst-case scenario conditions. (It is important to note that “worst case scenario conditions” do not reflect the requirements of the *Environmental Protection Guidelines for Ecologically Based Forest Resource Management*.) The results for the Steady Brook data illustrated in Table 4.7.

Table 4.7: Results of FWQI Modeling

	Score	Category
<b>Original Data</b>	80	Good
<b>Post-Forestry Data (Predicted)</b>	78	Fair

The score decreased only two points, changing the category from good to fair. The cause for the two-point score decrease was an increase in turbidity, i.e. the model predicted that worst-case scenario conditions in forestry operations would increase the level of turbidity. Turbidity is a measure of how cloudy water appears and it results from suspended solids and materials in the water. Increased turbidity may interfere with the disinfection process and causes drinking water to be less aesthetically pleasing.

It cannot be said that these results are absolute but it represents an idea of the basic trend that we might expect based on other watersheds that have been logged to date. The FWQI model is still being modified as more information is gathered from watersheds with logging and historical water data.

As with the sensitivity analysis, using the Forest Water Quality Index tool requires technical expertise and time, and may not be an option for all municipalities. If your Committee decides to use this tool, the Watershed Management Specialist on your Committee can assist you in acquiring the newest version of the FWQI Manual, and obtaining and analyzing the data.

## 4.9 Watershed Modeling

Predictive models can be used in watershed management plans by enabling land and watershed managers to make precise, authoritative determinations

about the affects of various changes on the environment over time, however this is a very high level approach. Types of models include: Water Quality Index, Better Assessment Science Integrating Point and Nonpoint Sources (BASINS), Forestry water Quality Index (FWQI), Agricultural Non-Point Source Pollution Model (AGNPS), and the Cartographic Watershed Decision Model.

#### **4.9.1. Forestry Water Quality Index (FWQI)**

A water quality index is a means to summarize large amounts of water quality data into simple terms (e.g. good or fair) for reporting to management and the public in a consistent manner. Similar to the UV index and air quality index, it evaluates and ranks the quality of water bodies for various beneficial uses of water, such as habitat for aquatic life, irrigation water for agriculture and livestock, recreation and aesthetics, and drinking water supplies. The Forestry Water Quality Index (FWQI) is a means to provide consistent procedures for Canadian jurisdictions to report water quality information to both management and the public and includes the forestry analysis option. The FWQI. The most basic type of predictive model was developed to determine the effects of forest management on water quality for use in sustainable forest management. This option allows for the prediction of water quality after forestry activities take place

(<http://www.env.gov.nl.ca/env/env/waterres/WQMA/WQI/FWQI/FWQI.asp>).

## **5.0 DEVELOP A WATERSHED MANAGEMENT PLAN**

A watershed management plan is a proactive approach to ensuring access to safe drinking water. It enables the municipality to protect water quality in a cost effective manner, by managing activities in the watershed, rather than reacting to issues resulting from these activities. It allows local interested parties and individuals to deal with issues that are affecting or may affect their drinking water supply. The ultimate goal is to protect drinking water quality without displacing or prohibiting traditional activities in the watershed. An effective management plan builds on existing programs, regulations, and guidelines, and finds strategies to address all developments, activities, issues, contaminants and risks.

A watershed management plan should include certain information in order for the reader to appreciate the whole picture. Information from the previous sections - watershed characterization, potential contaminants and risk assessment – is necessary, in addition to the following topics.

- Goals and Objectives
- Management Strategies
- Monitoring and Reporting
- Public Consultation
- Implementation
- Review and Amendments

The first four will be covered in this chapter, and the last two in the following chapter.

### **5.1 Goals & Objectives**

Before the actual plan is developed, the Committee must determine a goal or goals - what they want the management plan to achieve. Obviously, the primary goal is to protect and maintain source water quality, but the social and economic factors important to the watershed area also need to be considered. Consequently, the plan should also allow for sustainable development of natural resources. Objectives can be established from these goals; they are the necessary steps to achieving the goals. The Steady Brook Watershed Management Planning Committee identified the following general objectives for their management plan:

- Evaluate best management practices for compatible land uses in the basin and evaluate/build upon environmental protection guidelines for all

recommended land and water uses, which could minimize pollutant loadings from non-point sources including accidental spills;

- Prepare a watershed management plan for the study area, based on the results of the sensitivity analysis, and make recommendations regarding water quality protection of the watershed and resource utilization in the basin;
- Evaluate and build upon long-term water quality monitoring programs as part of the integrated watershed management plan, to assist in establishing a water quality trend, and considering resource use, take appropriate action to protect water quality;
- Recommend policy guidelines for the protection of water supply areas through watershed management.

The Watershed Management Advisory Committee may also want to develop objectives aimed specifically at the potential contaminants that could result from current and future activities in the watershed. Objectives addressing contaminants in the *Steady Brook Watershed Management Plan* were:

- Reduce the incidences of pathogenic microbes (total coliforms, E. coli and Giardia) in the water supply;
- Continue to keep chlorination by-products (THM and HAA) levels below the Canadian guidelines by minimizing preventable increases in organic loading;
- Ensure unacceptable levels of toxins do not enter the water supply;
- Minimize leaks and spills of petroleum products into the water supply and reduce their impact;
- Minimize sedimentation of the water supply and reduce its impact;
- Minimize the amount of nutrients from entering the water supply.

## 5.2 Management Strategies

To address the general and specific objectives of this plan, tasks required to achieve these objectives must be identified. Once this is done, a strategy to perform these tasks can be determined, and the agency responsible for implementing the strategy identified. All watershed management plans should identify the tasks required to address all potential causes of contamination. The following table contains some examples of tasks required to meet some of the specific objectives for the Steady Brook watershed. For

the complete list of tasks, see Table 16 in the [Steady Brook Watershed Management Plan](#).

Table 5.1. Tasks required to meet specified objectives.

Objective to Address Potential Contaminant	Potential Cause	Matrix Rank	Numerical Rank	Task and Audience
Reduce the incidences of <b>Pathogenic Microbes</b> (total coliforms, E. coli and Giardia) in the water supply by ensuring existing regulations are followed and educating watershed users of their potential contribution to this problem.	Pit Privies	High	232	Ensure pit privies are of sufficient distance from high water mark; educate <b>cabin owners</b> about risks of human wastes close to waterbodies
	Camping	Medium	248	Educate <b>campers</b> about risks of human wastes close to waterbodies
Continue to keep <b>Chlorination By-Products</b> (THM and HAA) levels below the Canadian guidelines by requiring BMPs that minimize increases in organic loading by watershed users.	Natural Organic Loading	Medium	216	Monitor natural organic matter indicators (DOC and colour)  Investigate necessity of additional treatment infrastructure with appropriate agencies.
Minimize leaks and spills of <b>Petroleum Products</b> and reduce their impact.	Motorized Vehicle Use <sup>1</sup>	Medium	224	Educate <b>residents, cabin owners, snowmobile owners, and tourism operators</b> about risks of fuel contamination
Minimize <b>Sedimentation</b> of the water supply and reduce its impact through BMPs and by	Forest Road Construction/Use	Medium	219	Adopt buffers and BMPs that reduce or minimize sedimentation

Objective to Address Potential Contaminant	Potential Cause	Matrix Rank	Numerical Rank	Task and Audience
educating recreational users.				Ensure <b>forest company</b> follows buffers and BMPs
Minimize the amount of <b>Nutrients</b> entering the watershed through BMPs and by educating users, particularly industrial users.	Forest Fire	Low	219	Develop Contingency Plan to deal with environmental emergencies.

<sup>1</sup> Includes ATVs, snowmobiles, and motorized boats.

During the Steady Brook pilot project, a literature review of watershed management approaches was conducted. From this review, and with guidance from the Department of Environment and Conservation, the most appropriate components of a watershed management strategy for municipalities in Newfoundland and Labrador were determined to be:

- Regulatory
- Non-Regulatory
- Education and Stewardship

The regulatory component includes any regulations and policies (of any of the governing bodies) that are required by law, such as those listed in Table 3.1 of [Chapter 3](#). A regulatory approach is most effective and useful for conservation measures, such as prohibiting development in specific areas. The proposed development zones produced as a result of the sensitivity analysis would fit into this category. The non-regulatory component uses best management practices and incentives for the implementation of environmentally-friendly land-use activities. This approach works best for activities where the proponent must apply for approval, and guidelines or best management practices are included in the approval. A contingency plan for spills of hazardous materials would also fit in this category. Finally, educating and instilling a sense of stewardship in the users of the watershed is yet another way to accomplish watershed management goals. This approach is suggested for activities where effective monitoring and

enforcement is impossible due to the number of users and the scarcity of funds. Many of the recreational uses of the watershed would best be approached in this way.

As was seen in Table 3.1 of [Chapter 3](#), some regulatory and non-regulatory strategies already exist. In the following sections, these will be outlined first, followed by a discussion of additional regulatory, non-regulatory and educational approaches that may be recommended.

## **5.3 Existing Strategies**

### **5.3.1 Regulatory**

The Minister of Environment regulates resource development in PPWSAs through Section 39 of the [Water Resources Act](#). No development activity can proceed without first receiving approval from the Minister. In Policy Directive W.R. 95-01, which is currently being updated, [Policy for Land and Water Related Developments in Protected Public Water Supply Areas](#), development is defined as “any activity or operations on, over, or under land or water for social or economic benefits, or the making of any change in the use or the intensity of use of any land, water, building or premises”. Further, this policy outlines the process required to receive approval for development of activities in PPWSAs, and other responsibilities of the proponent, should approval be granted. An application for approval must be completed and referred to the City, Town, Local Service District, operator of the water supply, or Watershed Management Committee for comment. This process ensures that the activity does not proceed without the knowledge of the municipality. The application for environmental approval of a development or activity can be found online at:

<http://www.env.gov.nl.ca/Env/env/waterres/Forms/PDF/SurfaceWater/Application%20Permit%20for%20Development%20Activity%20Section%2039.pdf>

Policy Directive W.R. 95-01 establishes guidelines for proposed and existing developments, outlining activities not permitted and activities regulated in PPWSAs. There are thirteen sections listing activities that are not permitted in PPWSAs, including, to name a few: using ice-covered water bodies for riding skidoos, ATVs, etc.; clearcutting of forests in

sensitive areas; resorts, hotels/motels and golf courses; specific activities, operations or facilities associated with aggregate extraction and mineral exploration; and application of herbicide in the right-of-way (power line). There are ten sections listing activities that are permitted under regulation in PPWSAs, including the following: expansion and upgrading of existing activities, operations or facilities; forest logging, resources road construction and use, stream crossing for controlled access, etc.; recreational activities or facilities including cottage development, fishing, swimming, boating, etc.; mineral exploration and aggregate extraction related activities; and construction of roads, bridges, culverts and other stream crossings. The policy also defines the responsibilities of the municipal authority, and the accountability of proponents to correct harmful conditions.

The most concrete guidelines laid out in the policy are the specified buffer zone widths along and around waterbodies (Table 3 in [Chapter 4](#)). These are the minimum buffers to which all developments must adhere and within which all activities are prohibited. As stated in Chapter 3, these buffer widths were based on a review of regulated buffer zone widths from jurisdictions all across Canada and a review of technical information on buffers for forestry, agriculture, etc. A review of the literature during the Steady Brook pilot project indicated that the buffer widths set in the policy are still valid today. Klapproth and Johnson's (2000) review found that buffers from 50-100 feet (15-30 metres) were recommended with greater widths for steep slopes and high sediment loads (5 feet (1.5 m) for every 1% increase in slope). The Chesapeake Bay Watershed Forestry Program (USFS, 2003) recommends buffer widths based on functions essential to the protection of water quality. This program found that the removal of nitrogen requires a 10-30m buffer, sediment removal and erosion prevention requires a 15-30m buffer, and moderation of storm flows and run-off require a 20-60m buffer. All of these are in line with PPWSA buffer widths.

Finally, the policy outlines the responsibilities of the municipal authority, which are mainly monitoring in nature. The municipal authority shall:

- "Ensure that no development activities are undertaken in a designated area without approval from the Minister";



- “Ensure that approved development activities are undertaken in strict compliance with the terms and conditions of the approval”;
- “Where an approval or the policy is violated, serve a stopping order on the violator after obtaining prior approval from the Minister...”;
- “Request the Minister for the appointment of a Watershed Monitoring Committee and the development of a watershed management plan...”

A second policy under the *Water Resources Act* regulating developments in PPWSAs is Policy Directive W.R. 93-01, [Policy for Treated Utility Poles in Water Supply Areas](#). This policy sets guidelines to be followed by utility companies, in order to minimize the risk of water quality impairment and the possible impact on public health from existing and new chemically-treated poles. The buffer zone widths mentioned above also apply to the installation of specified chemically-treated poles.

Under the [Environmental Protection Act](#), the environmental effects of proposed undertakings may be evaluated under an environmental assessment process. The [Environmental Assessment Regulations](#) lists specific undertakings that require an environmental assessment, but the Minister may require an environmental assessment for any activity or project that he/she determines may have a significant environmental effect. The Regulations outline the procedure for the required registration and environmental review of development proposals. These development proposals must pass the environmental review before the Minister can consider approval in PPWSAs, under the *Water Resources Act*. The types of development requiring registration and environmental review that might occur in a watershed are forest harvesting, mining, and trails and facilities for motorized recreational vehicles.

Fisheries and Oceans Canada uses the [Policy for the Management of Fish Habitat](#) to guide and approve applications for activities or development in areas affecting fish habitat. This policy supports the sections of the federal [Fisheries Act](#) that protect fish habitat by incorporating fish habitat protection requirements into land and water use activities and projects. It is based on the principle of no net loss of habitat, that is, to maintain without disruption the natural productive capacity of the habitat. Application of this policy in watersheds would apply to the approval of

water crossings for roads and trails and controlling the release of deleterious substances into water frequented by fish.

Depending on the activities in the watershed, other regulations may also apply. The [\*Heating Oil Storage Tank System Regulations\*](#), under the *Environmental Protection Act*, provide for the protection of water quality by regulating heating oil storage tanks. Although many cabins are heated by wood, cabin owners using oil as a source of heat would have to abide by these regulations. Cabin owners must also possess a *License to Occupy Crown land*, under the [\*Lands Act\*](#). Anyone wishing to construct a cabin on Crown land must obtain this permit. Finally, cabin owners must also follow the [\*Sanitation Regulations\*](#) under the [\*Public Health Act\*](#). These regulations state the required standards for sewage disposal at a cabin site (i.e. 30 meters from surface water).

[\*ATV Regulations\*](#) under the [\*Motorized Snow Vehicle and All-Terrain Vehicle Use Act\*](#) restrict ATV use in wetland areas including bogs, barrens and marshes. These regulations protect wetlands which provide habitat for many species of plants and animals, reduce flood levels in rivers, and supply environmental, social and tourism benefits.

Excavation, mining or quarrying activities in the watershed are regulated under the [\*Minerals Act\*](#), the [\*Mining Act\*](#), and the [\*Quarry Materials Act\*](#). Forestry operations fall under the [\*Forestry Act\*](#), and although this act has associated regulations, there are non-regulatory guidelines that apply more to watershed management (covered in the next section). There are no regulations specific to agriculture development; however, twenty Agriculture Development Areas (ADAs) have been identified across the province. ADAs are sites with the best potential for a viable agricultural industry. Only two of these areas – St. John's and Wooddale – have been designated under the *Lands Act*. Information on the location of other ADAs is available from the nearest agriculture office (see Appendix 3).

The [\*Urban and Rural Planning Act\*](#) may have relevance under the designation of other kinds of protected areas. For example, in the Steady Brook watershed, a parcel of land surrounding Marble Mountain was declared a protected area, to conserve natural amenities of the area and develop those amenities for public use. Restrictions on the use of these

other protected areas could affect what activities are permissible in the watershed.

### 5.3.2 Non-Regulatory - Best Management Practices

Non-regulatory approaches are mainly guidelines and best management practices. There are a few guidelines that could be relevant to your watershed already exist.

The Department of Environment and Conservation has developed a series of guidelines to assist in the preparation of development plans for various industrial uses within PPWSAs (mineral exploration, forest harvesting, aggregate extraction and agriculture)

<http://www.nr.gov.nl.ca/forestry/publications/appendix4.pdf> .

In 1998, the Department of Natural Resources produced Environmental Protection Guidelines for Ecologically Based Forest Resource Management (Stand Level Operations).

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20watershed%20plan.pdf> . These guidelines apply to forestry operations in all areas of Newfoundland and Labrador, and cover timber harvesting, forest access roads, silvicultural practices, regeneration, and forest protection. They also contain a separate section containing more stringent procedures for forestry operations in PPWSAs. The Forestry Branch has indicated that these guidelines will be updated in the future, so the Committee should obtain a copy of the revised guidelines when they are completed.

The Mines and Energy Branch of the Department of Natural Resources have developed *Environmental Guidelines for Construction and Mineral Exploration Companies* for mineral exploration. These guidelines outline procedures for all aspects of access roads, mineral exploration, blasting, drilling and trenching, and abandonment and rehabilitation. They can be viewed online at: [www.nr.gov.nl.ca/mines&en/mqrights/environment.pdf](http://www.nr.gov.nl.ca/mines&en/mqrights/environment.pdf).

Non-regulatory guidelines exist for various types of agricultural industries. [\*Environmental Farm Practices Guidelines for Producers in Newfoundland and Labrador\*](#) is available for horticultural, poultry and livestock producers. These guidelines cover topics such as manure handling and

storage, disposal of dead animals and other farm waste, preventing water pollution, and handling and storage of pesticides and fertilizers.

The Wildlife Division has developed a briefing protocol on the issue of removing beavers during outbreaks of Giardiasis or “beaver fever”. Removal of beaver dams (and beaver) as the source of contamination from near water supply intake areas, is recommended by the provincial Water Resources Management Division (DOE, 2001). However, the position of Wildlife Division is not to allow indiscriminate removal of beaver in town watersheds, for reasons stated in the briefing. They do agree with the removal of “any beaver in close proximity of the intake” where Giardia is confirmed, and “a sample of beavers or other wildlife... can be removed for testing purposes only” where Giardia is suspected.

## **5.4 Recommended Strategies**

### **5.4.1 Regulatory**

The [\*Municipalities Act\*](#) gives power to municipalities to make regulations to protect their source of drinking water, even if the watershed falls outside of municipal boundaries. However, most municipalities do not have the authority to make regulations prohibiting activities that have been proven to be of no threat to water quality. St John’s and Corner Brook are the only exceptions. Regulations that might be required would include the designation of the watershed development zones determined in the sensitivity analysis, and other issues of a serious nature that would best be solved through a regulatory approach. In the *Steady Brook Watershed Management Plan*, it was recommended that regulations take the form of a series of watershed directives. It was recommended these directives be implemented once Town Council has approved the plan, and amended as need arises. In the future, new directives can be added as required.

In the Steady Brook project, three directives were recommended. The first was the designation of 4 watershed management zones. The criteria for each zone (distance from the intake, waterbody buffers, and slope) were outlined, and the activities prohibited or permitted in each of the zones stated. However, some of the prohibited activities could not be

controlled (natural occurrences) and others could only be influenced or controlled to some degree. A discussion of these activities was included.

All permitted activities in a watershed must adhere to the *Policy for Land and Water Related Developments in Protected Public Water Supply Areas*. In addition, all new or expanded existing activities, development and operations in a PPWSA can only be carried out after the issuance of a permit in writing from the Minister. The Department of Environment and Conservation defines development as “the carrying out of any activity or operation on, over, or under land or water for social or economic benefits, or the making of any change in the use or the intensity of use of any land, water, building or premises”. Some activities, however, require more regulations, guidelines or permits, in addition to those mentioned above, and these are included in the following table.

Table 5.2. Additional regulations, guidelines or permits required for specific activities.

<b>Activity</b>	<b>Regulations / Guidelines</b>	<b>Source Agency</b>	<b>Permit Required</b>	<b>Source Agency</b>
Cabin Development <sup>1</sup>	Heating Oil Storage Tank System Regulation Sanitation Regulations	Dept. of Environ. & Conservation  Dept. of Health & Community Services	“License to Occupy”  “Environmental Assessment Approval”	Dept. of Environ. & Conservation, Crown Land Administration Division
Wildlife <sup>1</sup>	Giardiasis Briefing Note	Dept. of Environ. & Conservation, Environmental Assessment Division	N/A	
Motorized Vehicle Use <sup>1</sup>	Motorized Snow Vehicle & All-Terrain Vehicles Regulations	Dept. of Natural Resources,  Dept. of Government Services	Registration of Vehicle	Dept. of Government Services
Camping and Recreation <sup>1</sup>	None		None	
Domestic	Domestic Cutting	Department of	“Domestic Cutting	Department of

<b>Activity</b>	<b>Regulations / Guidelines</b>	<b>Source Agency</b>	<b>Permit Required</b>	<b>Source Agency</b>
Cutting	Regulations	Natural Resources	Regulations and Permit"	Natural Resources
Commercial Harvesting, Forest Road Construction and Use	Environmental Protection Guidelines for Ecologically Based Forest Resource Management  Policy for the Management of Fish Habitat	Dept. of Natural Resources, Forestry Branch  Fisheries and Oceans Canada	"Environmental Assessment Approval"  "Approval for Water Crossing"	Dept. of Environ. & Conservation, Environmental Assessment Division  Fisheries and Oceans Canada
Silviculture	Environmental Protection Guidelines for Ecologically Based Forest Resource Mgmt.	Dept. of Natural Resources, Forestry Branch	"Environmental Assessment Approval"	Dept. of Environ. & Conservation, Environmental Assessment Division
Utility Line Structure and Vegetation Maintenance	Policy for Treated Utility Poles in Water Supply Areas	Dept. of Environ. & Conservation, Environmental Assessment Division	"Environmental Assessment Approval"	Dept. of Environ. & Conservation, Environmental Assessment Division
Mineral Exploration	Environmental Guidelines for Construction and Mineral Exploration Companies	Dept. of Natural Resources, Mines & Energy Branch	"Environmental Assessment Approval"	Dept. of Environ. & Conservation, Environmental Assessment Division
Quarrying and Mining	Environmental Guidelines for Construction and Mineral Exploration Companies  Policy for the Management of Fish Habitat	Dept. of Natural Resources, Mines & Energy Branch  Fisheries and Oceans Canada	"Environmental Assessment Approval"  "Approval for Water Crossing"	Dept. of Environ. & Conservation, Environmental Assessment Division  Fisheries and Oceans Canada
Utility Line CCA Poles	Policy for Treated Utility Poles in	Dept. of Environ. &	"Environmental Assessment	Dept. of Environ. & Conservation,

<b>Activity</b>	<b>Regulations / Guidelines</b>	<b>Source Agency</b>	<b>Permit Required</b>	<b>Source Agency</b>
	Water Supply Areas	Conservation, Environmental Assessment Division	Approval"	Environmental Assessment Division
Fighting Forest Fires	Guidelines on the Use of Water Bombers in PPWSA	Department of Environment and Conservation, Water Resources Management Division	N/A	

<sup>1</sup> In the Steady Brook Watershed Management Plan, these activities were assessed high risk, but their prohibition would be impossible to enforce.

- o Activity: Fighting Forest Fires
- o Guidelines: Guidelines on the Use of Water Bombers in PPWSA
- o Source Agency: Department of Environment and Conservation, Water Resources Management Division
- o Permit: N/A

The second Steady Brook Watershed Directive dealt with existing, grandfathered cabins within the PPWSA, to ensure cabin pit privies are 30 metres (in accordance with the Sanitation Regulations) from a to-be-determined high water mark, and to lobby that *Licenses to Occupy* in PPWSAs be valid only for the life of the present owner. The third Steady Brook Watershed Directive required additional requirements for harvesting in the watershed, such as the size of clearcuts, the percent of the total watershed cut, and winter or mid-summer harvesting. Check the *Steady Brook Watershed Management Plan*, p. 67-72, for the details of these directives and how they were written.

#### 5.4.2 Non-Regulatory - Best Management Practices

In addition to regulations or directives passed by the municipal council, the Watershed Management Advisory Committee can also develop, or encourage other agencies to develop, guidelines or best management practices (BMPs) that will further assist in the protection of their drinking water supply. The Committee needs to look at all of the activities in the

watershed, and determine which ones require new or additional guidelines. The Committee should also consider if the level of any activities will change (particularly increase) in the future and the probability of new activities starting in the future. The Committee should also consider that guidelines could include promoting activities that would have a positive effect on the watershed, not just restricting activities in order to prevent negative effects. **For permitted activities, these new regulations, guidelines and BMPs can be incorporated as terms and conditions in permits issued to proponents governing development activities in PPWSAs.**

The Steady Brook Watershed Management Planning Committee found a number of activities that needed new or additional guidelines and BMPs. Some of them are listed below as examples, as they pertain to the Steady Brook watershed. Many of these recommendations will apply to watersheds across the province. The complete set of recommendations can be read in the *Steady Brook Watershed Management Plan*.

#### **5.4.3 Snowmobiling**

Snowmobiling is a major non-industrial use of the watershed, and other than regulations concerning vehicle registration and trail permits, very little if any policy exists concerning their conduct on trails, particularly in PPWSAs. The Monitoring Committee should work with the Western SnoRiders Club to develop guidelines for snowmobiling in protected public water supply areas, to be distributed to anyone purchasing a trail sticker. These could be used in PPWSAs all across the province.

#### **5.4.4 Forestry / Utility**

Best Management Practices for forestry operations in Zone 2 (High Slope Management Areas) must be developed to include the following:

- Harvesting on slopes only up to 35%
- Winter or mid-summer harvesting and road construction operations;
- Cut-to-length harvesting practices;
- Use of 8-wheel forwarding equipment.

#### **5.4.5 Mineral Exploration, Mining and Quarrying**

Although mineral or quarry developments do not exist at present, Steady Brook watershed has the potential to host deposits of industrial minerals, and the potential for quarries. The potential for damage from these activities is unknown and may largely depend on the scale of the



operation. Guidelines do currently exist for mineral exploration. However, before these activities are approved for operation, more stringent best management practices should be developed and resources found to ensure their enforcement.

#### **5.4.6 Outdoor Adventure Tourism**

The recent announcement of a new resort in Steady Brook indicates the popularity of the area as a tourism destination, and one of the biggest draws to western Newfoundland is "outdoor adventure". This could mean increased pressure on the Steady Brook watershed as a venue for adventure tourism. To prepare for this development, guidelines should be prepared to control such activities within the watershed.

Before recommending approval to the Town Council for any activity, commercial or recreational, the Monitoring Committee must be satisfied that regulations, best management practices and the enforcement are sufficient to protect water quality.

#### **5.4.7 Contingency Plan**

A management plan for a water supply source needs to include a contingency plan to deal with environmental emergencies in the watershed, regardless of the level of development. Environmental emergencies can be natural events such as forest fires or floods or they can be human related, such as industrial or transportation-related accidents. A contingency plan should mitigate the damage to life, property and the environment.

A contingency plan should name equipment, materials, procedures and personnel required to respond quickly to an environmental emergency that could threaten the supply of drinking water. Notification procedures, response protocols and methods of containment should also be identified in the plan. Information about the water supply system, such as the location of isolating valves and capacity of the water treatment facilities, is also important. In addition to preparing for environmental emergencies in the watershed, the plan should also include a strategy to supply drinking water in the event of a prolonged shutdown. Finally, provisions for an annual review and update by the participating agencies should complete the plan.

The Watershed Management Advisory Committee should develop a contingency plan for the watershed with the assistance of the players that would be involved. Government agencies are required for their technical expertise in assessing the problem and determining an appropriate clean-up plan. Local groups are required to implement the plan quickly in a coordinated effort. The Emergency Measures Division of the Department of Provincial and Municipal Affairs, the Water Resources Division of the Department of Environment and Conservation, and the municipal Fire Department all need to work with the Watershed Management Advisory Committee to develop an effective plan. A contingency plan for the watershed should be incorporated into the Emergency Measures Plan for the municipality.

## **5.5 Education and Stewardship**

Educating users of the watershed about source water, water quality, water pollution issues, and strategies to protect water resources is the third watershed management tool. Once watershed users have a better understanding of the water quality issues, they often develop a sense of ownership or stewardship of the watershed. Educating users about their impact on the watershed will foster changes in behavior much more than any laws or regulatory requirements. Individuals need to be aware of the effect of their actions on the watershed in order to understand how they can protect the quality of their water. Also, by taking ownership of the watershed, they will be effective monitors of all uses of the watershed.

In order to have an effective education program, it is necessary to identify the individuals and groups that impact the watershed. The information would identify the audiences to target under each potential contaminant. Generally, the audiences can be defined as industrial or non-industrial. With respect to companies seeking approval for industrial developments in the watershed, their education is already accomplished through the regulations and guidelines they are required to follow. However non-industrial users, such as residents, cabin owners, domestic cutters, tourism operators and ATV and snowmobile operators, are audiences that have not been educated about their role in water quality. There are few specific regulations guiding the activities of non-industrial users in the watershed, yet in the Steady Brook project, 60% of their activities were ranked medium to high in both risk assessment methods (Tables 8 and 10 in the [\*Steady Brook Watershed\*](#)

[Management Plan](#)). Educating these users should lessen the risk of contamination of the watershed.

In addition to identifying audiences, [Table 1](#) also indicates the messages that need to be conveyed to each user. In the Steady Brook watershed example, non-industrial users could have been the cause of five of the six potential contaminants identified including: pathogenic microbes (human wastes), fuel contamination, sedimentation, nutrients, and chlorination by-products. The users need to be informed of what contaminants can be caused by their activities and how these contaminants affect water quality. It should be emphasized that if the users live in your municipality, then these potential issues in water quality are also their potential health issues. The user's role in contributing to these contaminants should also be explained, i.e. what activities can cause what contaminants. Inform the users how they can continue to enjoy their activities in a way that does not contaminate the watershed.

There are a number of ways to deliver this message to the non-industrial users, and each user group may require a different method. Probably the most effective way to reach residents is to distribute a brochure to all households. Residents would make up many of the campers, domestic cutters and ATV users. The same brochure could be hand delivered to the cabin owners and tourism operators, giving the opportunity for one-on-one education. Snowmobile users could be addressed at a general meeting of the local snowmobile club, with a request to hand out copies of the brochures with all trail stickers sold. Guidelines to address these issues can be found in existing brochures from other provinces and states (Appendix 10).

Additional signage at all entry points to the watershed would also remind people that they are in a protected public water supply area and that their actions could impact on drinking water quality. Meetings or information sessions with specific groups could be arranged if the need dictates.

## **5.6 Monitoring and Reporting**

To ensure the watershed management plan is being followed as designed, and that the plan is effective in protecting drinking water quality, a monitoring program is necessary. A drinking water monitoring program is made up of two parts, water quality monitoring and watershed monitoring.

Water quality monitoring is the testing of source water for chemical and physical parameters, and tap water only for chemical, physical, and microbiological parameters. Watershed monitoring entails visual inspections of the watershed, to observe developments, activities and natural phenomenon of concern.

Water quality monitoring can determine what components of the source, treatment or distribution system need improvement. It can detect a system failure, so boil water advisories or other precautionary notices can be given. Water quality reports allow consumers to feel confident that their drinking water is being monitored for health and safety.

Newfoundland and Labrador is one of only two provinces in Canada that has assumed responsibility for drinking water quality monitoring, and reporting of data to the public. In the remaining provinces, this is the responsibility of municipal governments. Chapter 2 of this guide describes the water quality monitoring process in Newfoundland and Labrador, and the government departments responsible for each aspect. More information is available in the publication [Source to Tap - Water Supplies in Newfoundland and Labrador](#), issued by the Department of Environment.

Watershed monitoring is a major component of a watershed management plan. Regular monitoring of the watershed may identify activities that are not in compliance with acceptable uses, regulations or best management practices. It may also detect issues that are not being addressed, or being addressed inadequately. The responsibility for watershed monitoring is shared between the municipality and the government resource departments. The government resource departments monitor for compliance with regulations and best management practices. The municipality monitors general activity in the watershed, and compliance with acceptable uses and required permits. Information that should be recorded during routine inspections by the municipality monitor includes:

- Activities or developments observed;
- Whether permits required for developments are in the possession of the operator/developer;
- Natural phenomenon of concern (e.g., beavers, water levels);
- Roads or trails causing erosion;
- Actions of individuals or groups that threaten water quality.

Information of this sort can be recorded in a [Watershed Monitoring Report](#), (Appendix 9) such as was developed during the Steady Brook project (see Appendix I in the *Steady Brook Watershed Management Plan*). This will allow the municipality and the Watershed Management Advisory Committee to keep up to date on the progress of activities in the watershed. It will also serve as a record of the date activities and concerns are detected.

Frequency of inspections will depend on the amount of activity (industrial or recreational) in the watershed. In the Steady Brook watershed, it was recommended that the town Watershed Monitor should continue on the existing schedule of once per month, with more frequent visits, during periods of greater use or development activities.

Monitoring of water quality and monitoring of the watershed are both necessary to ensure the regulations and guidelines in the Management Strategies section are being followed. The Department of Environment and Conservation recommends the following monitoring activities outlined in the table below.

*Table 5.3. Monitoring activities for watersheds.*

Monitoring Activities	Agency Responsible
Compliance with acceptable uses within the Watershed Development Zones. This requires monitoring of all activities to ensure they are permitted activities within the zone they are occurring.	Municipal Monitor
Unauthorized development within the Watershed Development Zones. This requires ensuring that permitted activities that are occurring have received a permit to do so, where applicable.	Municipal Monitor
Approved developments working within their regulations. This monitoring requires that developments that have received approval from the Dept. of Environment and Conservation are complying with the applicable regulations.	Resource Departments of government, in consultation with the Department of Environment and Conservation.  The Municipality should also monitor developments, in consultation with the resource departments.
Chemical and physical parameters for source and	Department of Environment and

Monitoring Activities	Agency Responsible
tap water.	Conservation
Microbiological parameters of tap water	Department of Government Services

In the event of any unauthorized development activity in the watershed, or activity contrary to the terms and conditions of permits allowing activity, enforcement action should adhere to the following general steps:

1. Municipal Monitor informs the violator what regulation/policy is being broken and requests the activity be stopped immediately. The municipality should notify the Department of Environment and Conservation of the infraction.
2. If the illegal activity is not stopped, then the Watershed Management Specialist with the Department of Environment and Conservation sends notice to the violator, requesting the activity be stopped immediately.
3. If the illegal activity is still not stopped, then the Minister of the Department of Environment and Conservation sends notice to the violator requesting the activity be stopped immediately.
4. If the illegal activity continues after repeated notice from the Department of Environment and Conservation, legal action may be taken in accordance with the *Water Resource Act*.

According to the Department of Environment and Conservation, there is no set mechanism for enforcement of violations of the Water Resources Act, and the above steps are generalized. Each infraction tends to play out on a case-by-case basis.

The Watershed Management Advisory Committee should produce a watershed report card annually, to compile information about the quality of the water over the previous year. The Watershed Management Specialist will have to assist in completing the report card. The [Watershed Annual Report Card](#) (Appendix J, *Steady Brook Watershed Management Plan*

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20watershed%20plan.pdf>.) would include such information as:

- Annual Water Quality Index (WQI) value
- Number of contaminant exceedances
- Number of aesthetic exceedances
- Number of boil water advisories issued
- Number of permits for development activities in PPWSA issued
- Number of flooding incidences

The annual report card should be reviewed by the Watershed Management Advisory Committee, and compared to previous report cards from Year 2 on. The Committee can then assess if any activities require additional monitoring or if any user group requires information about their impact on water quality. The annual report card should be submitted to the municipal council and made available to residents.

## **5.7 Public Consultation**

All of the components of a watershed management plan have been covered at this point. The watershed has been described in terms of location, physical characteristics, and natural and historic resources. Watershed uses have been determined, with the help of residents and other users, and the jurisdiction of watershed protection and use have been clarified. Next, potential contaminants resulting from all possible uses were identified, and a risk assessment was conducted on these contaminants and their causes, in order to create a priority ranking for addressing issues. And using all of the information above, a sensitivity analysis was conducted to divide the watershed into areas suitable for different levels of development activity (development zones). The goals and objectives of the management plan have been determined, and management strategies developed to ensure these objectives are met. A monitoring and reporting program has been outlined to make sure the watershed management plan will be followed, and that the plan is effective in protecting drinking water quality.

The next step is to consult with the public. One method used to consult the public is a public meeting in which people from the community meet to consider a particular question(s). The main purpose of this public consultation is to allow public input into the planning process, in the

development of a watershed management plan meant to protect their drinking water. It's an opportunity to inform the public about the proposed watershed development zones and management strategies developed by the Committee, and to encourage their feedback. Public consultation is also an opportunity to educate the public about the importance of watershed protection, about watershed issues, and about the public's role in watershed protection. Through the public consultation process, the public should view the development of the watershed management plan as a transparent process. Public consultation can also be helpful in obtaining support and understanding of the plan. The more people that know and believe in the plan, the more effective the plan will be.

When notifying residents and other users of the watershed about the public consultation, it is recommended you distribute (mail) a brochure to all households, outlining the major points of the proposed watershed management plan. This gives people a chance to study the information before the consultation, and it might encourage more people to attend, knowing exactly what it will be about. The Steady Brook Watershed Management Planning Committee distributed a one-page brochure to all residents and cabin owners when the public consultation was announced.

This brochure

([http://www.env.gov.nl.ca/env/Env/waterres/Template\\_SW.asp#mark](http://www.env.gov.nl.ca/env/Env/waterres/Template_SW.asp#mark)) was developed by the Department of Environment, and could be adapted for other municipalities.

Public consultation can take the form of an open house or a public meeting, whichever the Committee thinks would be most successful. An open house would have a series of displays depicting all aspects included in the management plan, from watershed characteristics to the monitoring program. General information about water quality issues, and how the public's activities in the watershed could affect water quality, should also be displayed. A member of the Committee should be on hand at each display to answer any questions that may arise. A public meeting could take the form of a presentation, where aspects of the plan are presented to everyone at once, and questions are addressed in a group setting. The Committee should consider the need for an objective facilitator to run the meeting, to keep the participants on task and to direct questions to the appropriate people. Again,



as many members as possible should attend, to show support, hear the concerns and help answer questions.

After the public consultation, the Committee should meet to discuss the concerns raised, and determine how they should be dealt with. Necessary changes can then be incorporated into the plan, based on these decisions, bringing the plan closer to completion.

## **6.0 IMPLEMENTATION, REVIEW AND AMENDMENTS**

Once all the components of the watershed management plan have been compiled into a single document, and the results of the public consultation taken into consideration, two components are required before the plan is presented to Council for approval. An action plan to implement the recommendations of the plan must be developed. This plan would provide the Committee and Council, with a timeline at which the strategies of the plan should be implemented and outline the agencies responsible for implementation. The Committee should also set a schedule for periodic review of the plan, and for making any necessary amendments.

### **6.1 Implementation**

At this point, the Committee needs to flesh out an action plan to implement the recommendations made. The action plan should contain a summary of the recommendations made, a time frame for their implementation, any resources required, and the group responsible for implementing the recommendation. During the implementation of the plan, the Watershed Management Advisory Committee should meet as often as is necessary to implement the management plan. Following that, the Committee should meet as often as is required to monitor activities in the watershed and review development proposals. It is recommended that the Committee meet at least three times per year.

The following table, adapted from the *Steady Brook Watershed Management Plan*, illustrates a simple action plan developed to implement recommendations.

Table 6.1. Action plan to implement Steady Brook watershed management plan recommendations.

Action Items	Time Frame	Resources Required (Material or Monetary)	Group(s) Responsible for Implementation
Pass Steady Brook Watershed Directives as Municipal Regulations	Year 1	Steady Brook Watershed Management Plan	Steady Brook Town Council
Continue to implement water quality monitoring program	From Year 1 on		Water Resources Management Division
Implement watershed monitoring program as outlined in the section Monitoring and Reporting		Watershed Monitoring Report	Steady Brook Watershed Monitor
Develop annual watershed report card	From Year 1 on	Watershed Monitoring Report	Watershed Management Specialist
Review annual watershed report card to assess effectiveness of management plan			Steady Brook Watershed Monitoring Committee
Determine high-water mark during spring run-off			Steady Brook Watershed Monitor
Ensure pit privies are 30 metres from determined high-water mark	Year 1		
Educate cabin owners about risks of human wastes close to waterbodies		Educational brochure for non-industrial users	Steady Brook Watershed Monitoring Committee
Continue to lobby government for existing <i>Licenses to Occupy</i> in PPWSAs to apply only for the life of the present owner	Immed.		Steady Brook Town Council
Revise <i>Environmental Protection Guidelines for Ecologically Based Forest Resource Management</i>			NL Federation of Municipalities Department of Natural Resources, Forestry Branch
Obtain a revised copy of <i>Environmental Protection Guidelines for Ecologically Based Forest Resource Management</i> as soon as they are completed.	When Available		Steady Brook Watershed Monitoring Committee

Action Items	Time Frame	Resources Required (Material or Monetary)	Group(s) Responsible for Implementation
<p>Revise <i>Guidelines for Preparing Development Plans for Operations within the Protected Public Water Supply Area.</i></p>			<p>Water Resources Management Division</p>
<p>Obtain a revised copy of the <i>Guidelines for Preparing Development Plans for Operations within the Protected Public Water Supply Area.</i></p>	<p>When Available</p>		<p>Steady Brook Watershed Monitoring Committee</p>
<p>Request clarification of activities permitted in the various land use zones within the Marble Mountain Protected Area.</p>	<p>Year 1</p>	<p>Marble Mountain Master Plan Update</p>	<p>Steady Brook Watershed Monitoring Committee Marble Mountain Development Corporation</p>
<p>Demand the same or a greater level of compliance that occurred during harvesting in the Corner Brook watershed, if permission is granted to harvest in Steady Brook watershed.</p>	<p>When Applicable</p>	<p>Compliance levels instituted in the Corner Brook Watershed</p>	<p>Steady Brook Watershed Monitoring Committee, Corner Brook Pulp and Paper Ltd.</p>
<p>Work with the Western SnoRiders to develop guidelines for snowmobiling in Protected Public Water Supply Areas, and produce brochure for distribution.</p>	<p>Year 1</p>	<p>Funding required for printing brochure</p>	<p>Steady Brook Watershed Monitoring Committee, Water Resources Management Division, Western SnoRiders</p>
<p>Develop a watershed contingency plan, including a strategy for the supply of drinking water in the event of a prolonged shutdown.</p>	<p>Year 1</p>	<p>Steady Brook Emergency Measures Plan</p>	<p>Steady Brook Watershed Monitoring Committee, Steady Brook Fire Dept., Emergency Measures Div., Water Resources Management Division</p>
<p>Develop a brochure directed at non-industrial users of the watershed, to inform them of their role in protecting the watershed.</p>	<p>Year 1</p>	<p>Funding required for printing brochure</p>	<p>Steady Brook Watershed Monitoring Committee</p>
<p>Assess the location, number and condition of existing PPWSA signs in the watershed. If necessary, repair existing signs and erect additional ones as required.</p>	<p>Year 1</p>	<p>Funding may be required to produce additional signs</p>	<p>Steady Brook Watershed Monitor</p>

Action Items	Time Frame	Resources Required (Material or Monetary)	Group(s) Responsible for Implementation
Develop more stringent guidelines for quarry and mineral operations in the watershed.	Year 2		Natural Resources, Mines Branch Water Resources Management Division, Steady Brook Watershed Monitoring Committee
Lobby for appropriate frequency of monitoring by the Mines and Energy Division of the Dept. of Natural Resources	Year 2		Steady Brook Town Council
Develop best management practices for outdoor adventure tourism operations in the watershed and include appropriate monitoring activities.	Year 2		Dept. of Tourism, Culture & Recreation, Outdoor Adventure Operators, Water Resources Division

## 6.2 Review and Amendments

The Watershed Management Advisory Committee should schedule a review of the watershed management plan, at least every 5 years, to determine the effectiveness of the management strategies in protecting the quality of the drinking water. On an annual basis, the Committee will review the Annual Report Card discussed in the last chapter, and compare it to report cards of previous years. This process should be used to evaluate the effectiveness of the plan during the periodic review.

Any necessary amendments should be made at the time of the review. However, amendments required between reviews should be made as soon as they are identified. All recommendations for amendments must go through the Watershed Management Advisory Committee, as well as the municipal council.

## 6.3 Council Approval

The final step in this process is to receive approval of the watershed management plan from the municipal council. The Watershed Management Advisory Committee should request a special meeting with Council, or, at the very least, a sufficient period of time during a regular Council meeting, to

review the plan with them. Council will have had members on the Watershed Management Advisory Committee since its inception, and these members should have been updating the Council on issues and decisions as they occurred. As such, Council should already have a general idea of the strategies recommended in the plan, although this may not be the case. The Committee should be prepared to thoroughly review the plan with Council.

A copy of the plan should be given to each Council member, and a presentation made at the meeting, to guide them through the various sections. The whole process involved in the development of the plan should be explained, with particular emphasis on the input from stakeholders, residents, and other interested public. An overhead or slide show presentation would be an effective way to present the plan. If possible, all members of the Committee should attend this meeting, to indicate the support of the entire Committee, and to answer questions that may concern them.

Council may request changes to the plan before they will approve it. These changes should be discussed by the Watershed Management Advisory Committee, to determine if the Committee is in agreement with Council. If they are in agreement, necessary changes should be made, and submitted to Council. If the Committee does not agree with the proposed changes, they should explain their reservations to Council, justifying their position. However, ultimately, Council has the final word.

Once the plan has been approved by Council, the Watershed Management Advisory Committee may begin implementation per the action plan.

## APPENDIX 1: GLOSSARY

**Best management practices** – Practices followed in the development of resources that prevent or reduce harm to the environment.

**Boil water advisory** – An advisory issued to protect the health of the public from drinking water of questionable quality.

**Chemical parameters** – Parameters such as nitrates, arsenic, iron, and lead.

**Contaminant** - A substance that makes another substance impure or unclean by contact or mixing.

**Development plan** – With respect to Protected Public Water Supply Areas, a plan for carrying out an activity or operation on, over or under land or water for social or economic benefits, or the making of any change in the use or the intensity of use of any land, water building or premises.

**Environmental Protection Guidelines** – Guidelines for resources utilization in Protected Public Water Supply Areas, for compliance by proponents or developers, which have been developed by departments and agencies responsible for resources management.

**Groundwater** – Water originating from dug or drilled wells.

**Haloacetic Acids (HAA)** - By-products of chlorination, they can occur in chlorinated water as a result of reaction between organic materials in the water and chlorine added as a disinfectant. At certain levels they pose a significant risk for the development of cancer and possibly reproductive and developmental effects.

**Hydrology** - The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

**Management zones** – Zones within the watershed, designating areas of permitted, restricted and prohibited activities. These zones are determined by slope, watershed buffers and distance from the intake.

**Microbiological Parameters** – Water samples are tested for microorganisms such as coliforms, *Escherichia coli*, as they cause or indicate the presence of bacteria that can cause disease and severe illness.

**Organic matter** – Matter that is derived from living organisms, such as plant material.

**Pathogens** - Agents that causes disease, especially a living microorganism such as a bacterium or fungus

**Physical parameters** – Parameters such as alkalinity, color, pH, and turbidity.

**Pollutant** - Something that pollutes or contaminates air, soil, or water.

**Protected Public Water Supply Areas (PPWSA)** – An area surrounding a public water supply source (surfaces or groundwater) which is regulated by the Department of Environment and Conservation under the *Water Resources Act*.

**Qualitative** - relating to or involving comparisons based on qualities.

**Risk assessment** – The process of evaluating the adverse effects caused by a substance, activity, lifestyle or natural phenomenon.

**Stewardship** –Taking responsibility for an area to ensure its sustainability.

**Subjective** - perceived reality rather than actual; modified by individual bias.

**Surface water** – Water originating from lakes, ponds, reservoirs, rivers and streams.

**Sustainable development** - Any development that can be maintained over time without damaging the environment.

**Trihalomethanes (THM)** – By-products of chlorination, they can occur in chlorinated water as a result of reaction between organic materials in the water and chlorine added as a disinfectant. At certain levels they pose a significant risk for the development of cancer and possibly reproductive and developmental effects.

**Turbidity** – The cloudiness of water.

**Watershed** – The area which drains into a stream, lake or body of water above a certain point; also called a drainage or catchment area.

**Watershed management plan** – For the purposes of this guide, a plan that manages the resources in a watershed, with the protection of drinking water quality of primary importance.

**Water supply intake** – The location where drinking water is extracted or withdrawn from the water supply source to the system which will deliver it to consumers.



## APPENDIX 2: EXAMPLE OF A TERMS OF REFERENCE

### PETER'S RIVER WATERSHED MANAGEMENT COMMITTEE

#### 1. BACKGROUND

Peter's River is the source of public water supply for the Towns of Botwood and Peterview and serves a population of approximately 5000. The river drains an approximate area of 198 Km<sup>2</sup> with varied land uses. Most of the basin (52 %) is forested, with 2,855 ha of merchantable timber and 7,600 ha of burn over, much of which is regenerating naturally, or has been replanted. The Wooddale Agricultural Development Area, including the Wooddale Tree Nursery, covers nearly 23 % of the basin. Bogs and marshes account for 15.5 %, while surface waters cover less than 1 %. Other land uses in the basin include, gravel pits and quarries, linear developments, an airstrip, blueberry farms, urban and rural development, and other miscellaneous facilities and operations.

The basin is designated as a protected public water supply area under Section 10 of the *Environment Act, SN 1995, c E-13.1*. According to this Section the operator of the water supply system is responsible to protect the source water quality. In recent years, the Department of Environment and the Towns of Botwood and Peterview have received an increasing number of requests for development activities in the basin and the Towns are concerned that extensive and uncontrolled development of the basin may result in source water quality impairment. These concerns were further reinforced by the Giardia outbreak in the area in 1991. In order to have an effective control on existing and potential development activities and to ensure that developers comply with the environmental protection guidelines, the Town of Botwood, in its letter of February 5, 1993, requested the Minister to appoint a Watershed Monitoring Committee for the basin. The Committee has been functioning since April 12, 1994.

#### 2. PURPOSE

The main purpose of the Peter's River Watershed Management Committee is to provide scientific and technical assistance to the developers and concerned

parties to minimize the environmental impacts of the development, and to ensure that approved undertakings are carried out in an environmentally acceptable manner. Through stakeholder involvement all participant members have an opportunity to review existing operations, and proposed developments and activities, in light of their representative organization's mandate. Recommendations from the Committee to the Town Council and/or the Department of Environment and Conservation are based on consensus and should be consistent with any Watershed Management Plan. It is understood that the Minister of Environment and Conservation has the final say in any new development or activity.

### 3. RESPONSIBILITIES

The specific responsibilities of the Committee will include but not be limited to :

- Undertake an inventory of the existing land and water use activities in the Peter's River Basin.
- Assess the compatibility of the existing and proposed developments and associated operations in light of legislation and guidelines developed by the Department of Environment relating to the protection of water supply areas and source water quality.
- Review proposed developments, and if the development is acceptable in principal, require the proponent to submit an ***Application for Environmental Approval for a Development Activity in a Protected Water Supply Area***. If appropriate recommend registration of the proposal under the ***Environmental Assessment Act***.
- Review ***Applications for Environmental Approval for a Development Activity in a Protected Water Supply Area***, submitted by developers/proponents in terms of adequacy, completeness and proposed environmental protection measures, and make recommendations to the Department of Environment regarding the refusal or acceptance of the application.
- Recommend any changes to environmental protection measures necessary to minimise adverse impacts, and recommend terms and conditions to be included in any Certificates of Approval to be issued under Section 10 of the ***Environment Act***.

- Develop and implement an appropriate surveillance and monitoring program to ensure compliance with Certificates of Approval, and the environmental protection measures. If the terms and conditions of a Certificate of Approval are violated, make recommendations to the Department of Environment pertaining to the cancellation of the Certificate of Approval, or the initiation of legal action as appropriate.
- Develop procedures and guidelines to monitor water quality of forest harvesting, agricultural operations, gravel pit and quarry operations or any other approved activity or development to be undertaken in the area.
- Specify inspection and impact assessment procedures, field surveys and water quality monitoring procedures to include site selections, sample collections and handling, analysis and reporting.
- Prepare reports summarizing the data and information collected, including necessary interpretation to identify and understand present and anticipated effects of forest harvesting, gravel pit and quarry operations, agricultural development, and other development activities on water quality.
- Recommend appropriate changes to the inspection and monitoring procedures as required in order to efficiently and adequately address the needs and objectives of the monitoring program.
- Assess the environmental impacts of existing activities and recommend appropriate actions where warranted, to minimize undesirable effects on water quality.
- Implement provisions of a Watershed Emergency Response Program in case of fuel or chemical spills, or any other emergency in the water supply area.
- Undertake measures to increase public awareness about the protected water supply area through ensuring adequate sign posting, public notices, newspaper ads, and other means as appropriate.
- Participate in any mediation and negotiation in the case of disagreement between a developer/proponent, the Towns, and the Department of Environment with the objective of resolving all conflicts.

#### 4. **MEMBERSHIP**

Committee membership shall consist of, but not be limited to representatives of the following agencies:

- Town of Botwood
- Town of Peterview
- Department of Environment
- Health and Community Services - Central
- Department of Forest Resources and Agrifoods (Agrifoods Branch)
- Department of Forest Resources and Agrifoods (Forestry and Wildlife Branch)
- Department of Mines & Energy
- Wooddale Agricultural Society
- Abitibi Consolidated Inc.
- Other permanent representatives may be added as needed with the consensus of the Committee
- Individuals or groups may be invited to attend one or more meetings to facilitate or address specific issues or problems

#### 5. **MEETINGS**

- An official of the Town of Botwood will chair the Committee and maintain and distribute prior to the subsequent meeting, the minutes of all meetings, and other relevant correspondence.
- Meetings shall be scheduled at the call of the Chair as needed, in consultation with the Committee members. Meetings shall be held at least three (3) times per year. There will be no meetings unless the Chair and Watershed Management Specialist are present.

- A quorum of 50 % + 1 shall be present for a meeting to convene.
- To avoid any Conflict of Interest, any Committee member who has any personal or financial interest in any Application or proposal, may be asked to leave the room during discussion of the Application or proposal.
- Recommendations from the Committee to the Town Council and/or Department of Environment and Conservation are based on consensus. If agreement is not initially achieved, mediation and negotiation will take place until all Committee members present reach some form of agreement and consensus on that issue. If consensus cannot be reached, the matter will be voted upon with a majority vote 50% +1 being carried. The number of votes per organization shall be outlined in the membership section.
- In the event that some application, proposal or issue is urgent, and it is not possible to schedule a regular meeting, the Chair may utilize other forms of communication (telephone, FAX, e-mail) to get a consensus of a majority (50 % + 1) of the members. Any such consensus is subject to ratification at the next regular meeting.
- The Mayor of Botwood is the only official public spokesperson of the Committee. The Mayor will be briefed by the Chair of the Committee prior to any public comment. Media will not be permitted to attend meetings of the Committee.
- These Terms of Reference will be reviewed periodically to determine if additional amendments are required.

### APPENDIX 3: CONTACT INFORMATION

Department	Location	Phone (709)	Fax (709)	E-mail
Western Newfoundland Model Forest	Forestry Centre, Corner Brook	637-7300	634-0255	wnmf@wnmf.com
<b>Government of Newfoundland &amp; Labrador</b> <b>Department of Environment &amp; Conservation</b> <b>Water Resources Regional Offices</b>				
Headquarters and Eastern Regional Office	Confederation Bldg, St. John's	729-4817	729-0323	water@gov.nl.ca
Western/Labrador Regional Office	Noton Bldg., Corner Brook	637-2542	637-2541	pauladawe@gov.nl.ca
Central Regional Office	Provincial Bldg, Grand Falls-Windsor	292-4280	292-4365	
Inland Fish and Wildlife Division	117 Riverside Drive, Corner Brook	637-2007	637-2033	robperry@gov.nl.ca
<b>Department of Government Services</b> <b>Government Services Centres</b>				
St. John's	5 Mews Place	729-3699	729-2071	
Clareville	2 Masonic Terrace	466-4060	466-4070	
Corner Brook	Norton Bldg.	637-2204	637-2681	
Gander	McCurdy Complex	256-1420	256-1438	
Grand Bank	Buffett Bldg.	832-1672	832-1792	
Grand Falls-Windsor	9 Queensway	292-4206	292-4528	
Happy Valley-Goose Bay	Thomas Bldg.	896-5428	896-4340	
Harbour Grace	Rockwood Realty Bldg.	945-3014	945-3114	

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Lewisporte	Porte Bldg.	535-0262	535- 0284	
Port-aux-Basques	Port aux Basques	695-2835		
St. Anthony	Viking Mall	454-8833	454-3206	
Stephenville	35 Alabama Drive	643-8650	643-8654	
<b>Department of Municipal Affairs</b>				
<b>Regional Offices</b>				
Eastern Regional Office	54 Manitoba Drive Clareville	729-5334	729-4475	dannoseworthy@gov.nl.ca
Central Regional Office	McCurdy Complex, Gander	256-1054	256-1060	hyramboland@gov.nl.ca
Western Regional Office	63 Broadway Corner Brook	637-2332	637-2548	danielhynes@gov.nl.ca
St. John's Regional Office	Confederation Building St. John's	729-5677		
Labrador Regional Office	Elizabeth Goudie Building Happy Valley- Goose Bay	896-2941	896-8847	bobmacaulay@gov.nl.ca
<b>Department of Natural Resources</b>				
<b>Agrifoods Offices</b>				
Bishop's Falls Office	Bishop's Falls,	258-5334	258-5873	
Carbonear Office	Carlyle Building Carbonear	945-3007	945-3006	
Clareville Office	Clareville	466-2558	466-3802	
Corner Brook Office	Fortis Building	637-2081 /2077/2046	637-2591 /2586	
Gander Office	Gander Public Building	256-1043	256-1044	
Glenwood Office	Glenwood	486-0205	256-1044	
Holyrood Office	Holyrood	229-3511	229-2304	

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Labrador Office	Elizabeth Goudie Building	896-3405	896-3747	
McKay's Office	Development Association Building	645-2711	645-2554	
Pynn's Brook Office	Pasadena	686-2702 /5225	686-2491	
St. John's Office	Provincial Agriculture Building	729-2640 /2639	729-0205	
<b>Department of Natural Resources</b>				
<b>Forestry Branch Offices</b>				
Eastern Regional Office	Gander	256-1450	256-1459	
Labrador Regional Office	Happy Valley-Goose Bay	896-3405	896-3734	
Western Regional Office	Massey Drive	637-2409	639-1377	
<b>Department of Natural Resources</b>				
<b>Mines and Energy Offices</b>				
Labrador West (Regional Office)	Wabush	282-3949	282-2099	glendacarey@gov.nl.ca
Goose Bay (Field Office)	(Otter Creek) Happy Valley-Goose Bay	896-5162	896-3838	waynetuttle@gov.nl.ca
Pasadena (Core Library)	Pasadena	686-2054	686-2733	stewartcochrane@gov.nl.ca
Geological Survey Division	St. John's	729-6541	729-3493	frankblackwood@gov.nl.ca
Mineral Lands Division	St. John's	729-6425	729-6782	kenandrews@gov.nl.ca
<b>Department of Tourism, Culture and Recreation</b>				
<b>Culture and Heritage Division</b>				
Provincial Archaeology Office		729-2462	729-0870	marthadrake@gov.nl.ca
<b>Department of Transportation and Works</b>				



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<b>Roads Division</b>				
Avalon Region	White Hills	729-2382	729-0219	
Central Region	Provincial Building Duggan's Road Grand Falls - Windsor	292-4309	292-4364	
Eastern Region	Manitoba Drive	466-4132	466-3927	
Western Region	Deer Lake	635-4126	635-5818	
Labrador Region	Happy Valley - Goose Bay	896-7840	896-5513	
<b>Government Of Canada Fisheries and Oceans Canada Newfoundland and Labrador Region</b>				
Central Office	Grand Falls-Windsor	292-5197	292-5203	kingl@dfo-mpo.gc.ca
Labrador Area Office	Goose Bay	896-6151	896-8419	simmsk@dfo-mpo.gc.ca
Western Newfoundland & Southern	Corner Brook	637- 4349	637-4445	sooley@dfo-mpo.gc.ca
Eastern & Southern Area Office	Mount Pearl	772-7345/5597	772-2659	orourkej@dfo-mpo.gc.ca fleet@dfo-mpo.gc.ca
St John's Office	St. John's	772- 243	772-5562	
<b>Other Agencies Pulp and Paper Companies</b>				
Abitibi Consolidated Inc.	Grand Falls-Windsor	292-3229		
Corner Brook Pulp and Paper Ltd.	Corner Brook	637-3371	637-3469	mchurchill@cb.kruger.com
<b>Utilities</b>				
Newfoundland and Labrador Hydro, Head Office	St. John's	737-1859		
Newfoundland Power		1-800-663-2802		

<b>Tourism &amp; Recreation</b>				
Newfoundland and Labrador Snowmobile Federation	Deer Lake	635-4395 /1-877-635-4395	635-4396	
Newfoundland and Labrador Outfitters Association	Deer Lake	686-6350	686-2081	info@nloa.ca

## **APPENDIX 4: STEADY BROOK WATERSHED USE SURVEY**

### **Part A - Use of the Watershed**

The survey seeks to determine the public's interaction with the watershed. Circle any of the following interactions that apply to the respondent.

- A. recreation - any activity in the watershed that takes place for pleasure. (example: snowmobiling, camping, walking etc.)
- B. subsistence - the food, shelter and energy required to support life. (example: moose hunting, snaring, berries, etc.)
- C. economic - any activity in the watershed that takes place for monetary reasons. (example: outfitting, etc.)
- D. ecological and geological - values that relate to living organisms and their interaction with the environment, (example: rare plants, etc.) or values that pertain to the earth's crust and strata (example: unique geology, etc.)
- E. archeological - values that are associated with the material remains of ancient civilizations or cultures (example: historical sites, cultural artifacts, etc.)

### **Part B - What, Where and How Often?**

This section of the survey addresses specific public interactions through the use of a table with 5 columns. Once the table is completed, respondents will be asked to identify their interactions on a map.

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1	2	3	4	5
Interaction	What season?	<i>Frequency*</i> (A, B, C or D)	Where does the interaction take place?	MAP ID
ANIMAL WATCH				37
ARCHEOLOGICAL /HISTORICAL				26
ATV USE				4
BEAR HUNT				32
BERRY PICKING				23
BIRD HUNTING				29
BIRD WATCHING				1
BOATING				13
CAMPING				19
CANOEING				21
CROSS COUNTRY SKIING				60
DOG SLEDDING				11
DUCK HUNTING				27
FISHING				39
FUELWOOD CUTTING				2
GEOLOGY				20
HIKING				18
HORSEBACK RIDING				12
HUNTING				30
ICE CLIMBING				6
LEGAL CABINS (CROWN)				55
MOOSE HUNT (DRIVING)				34
MOOSE HUNT (HELICOPTER)				35
MOUNTAIN BIKING				59
RARE PLANTS				22
ROCK CLIMBING				7
ROCK GATHERING				5
SAILING				14
SALMON FISHING				57
SAWLOG CUTTING				61
SIGHT SEEING				24
SKIING				50
SNARING				28

\* **A:** once per year; **B:** 2 to 5 times per year; **C:** 6 to 10 times per year; **D:** more than 10 times per year.

1	2	3	4	5
Interaction	What season?	<i>Frequency*</i> (A, B, C or D)	Where does the interaction take place?	MAP ID
SNOWMOBILING				56
SNOWSHOEING				8
TRAPPING				31
TROUT FISHING				58
WIND SURFING				16
WOOD GATHERING (CRAFTS AND WOODWORKING)				3

### Mapping of Interactions

#### Part C - Aspatial Values

The respondent should be asked the four questions. These questions are designed to gather information that cannot be spatially defined.

1. Do you feel that you have had an adequate opportunity to comment on how water quality should be protected and resources utilized in the Steady Brook watershed? \_\_\_\_\_

2. How reliant is your activity upon forest access roads? Rate it on a scale of 1 to 5. A "1" on the scale would indicate that your activity is not at all dependent on forest access roads, where as a "5" would indicate that your activity is totally dependent on forest access roads.

\_\_\_\_\_

3. Were you aware that the Department of Environment permits certain development activities (e.g. utilities, quarries, trails, forest harvesting) in specified areas on protected watersheds, and has developed guidelines for these activities? \_\_\_\_\_

4. Do you have any suggestions for ways to allow for different (and possibly conflicting) uses of the watershed?

\_\_\_\_\_

\_\_\_\_\_

A Municipality's Guide to the Development of a Watershed Management Plan

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Comments: \_\_\_\_\_

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Although signing this survey would help us for future reference, it is not compulsory.

\_\_\_\_\_

Print Name

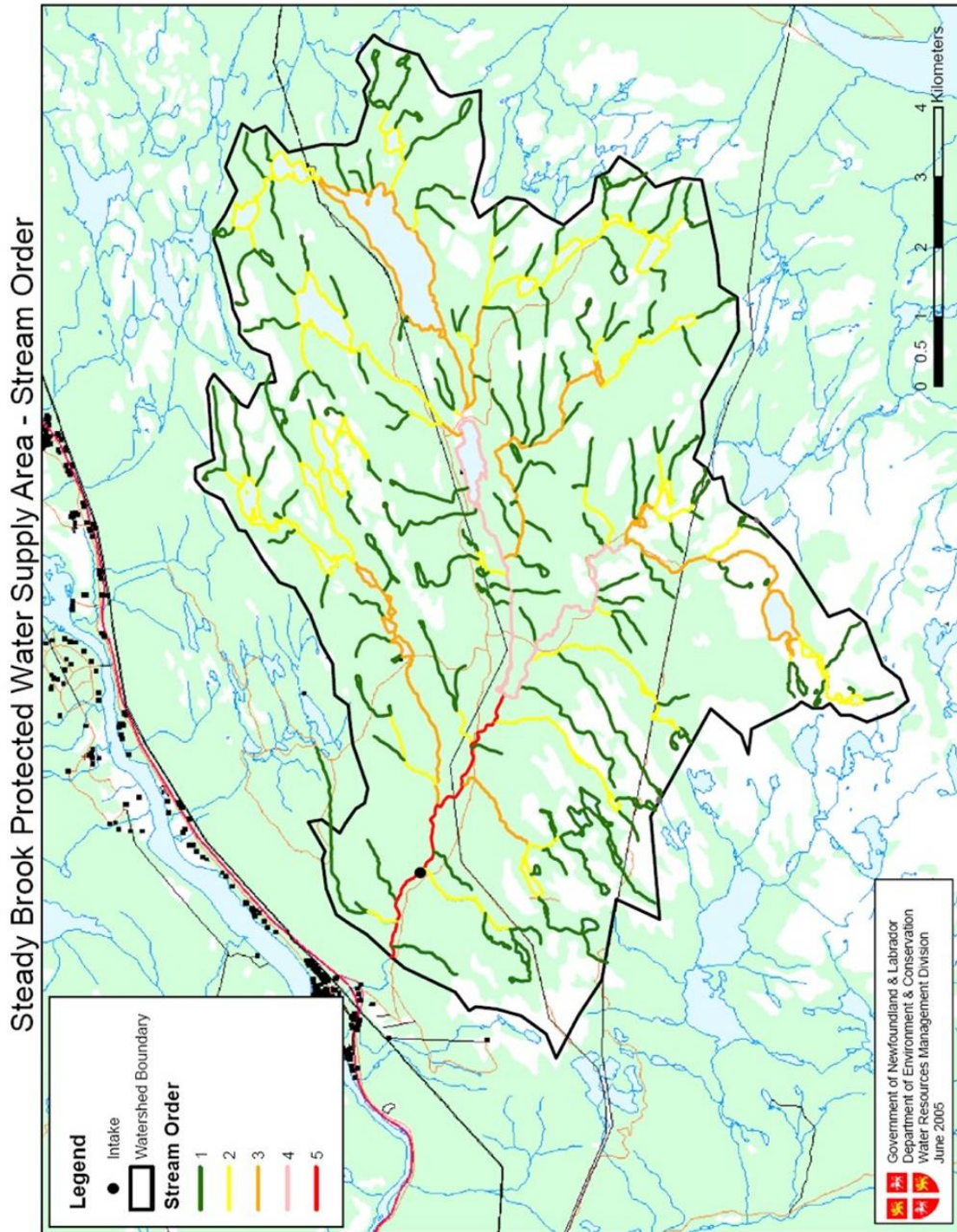
\_\_\_\_\_

Sign

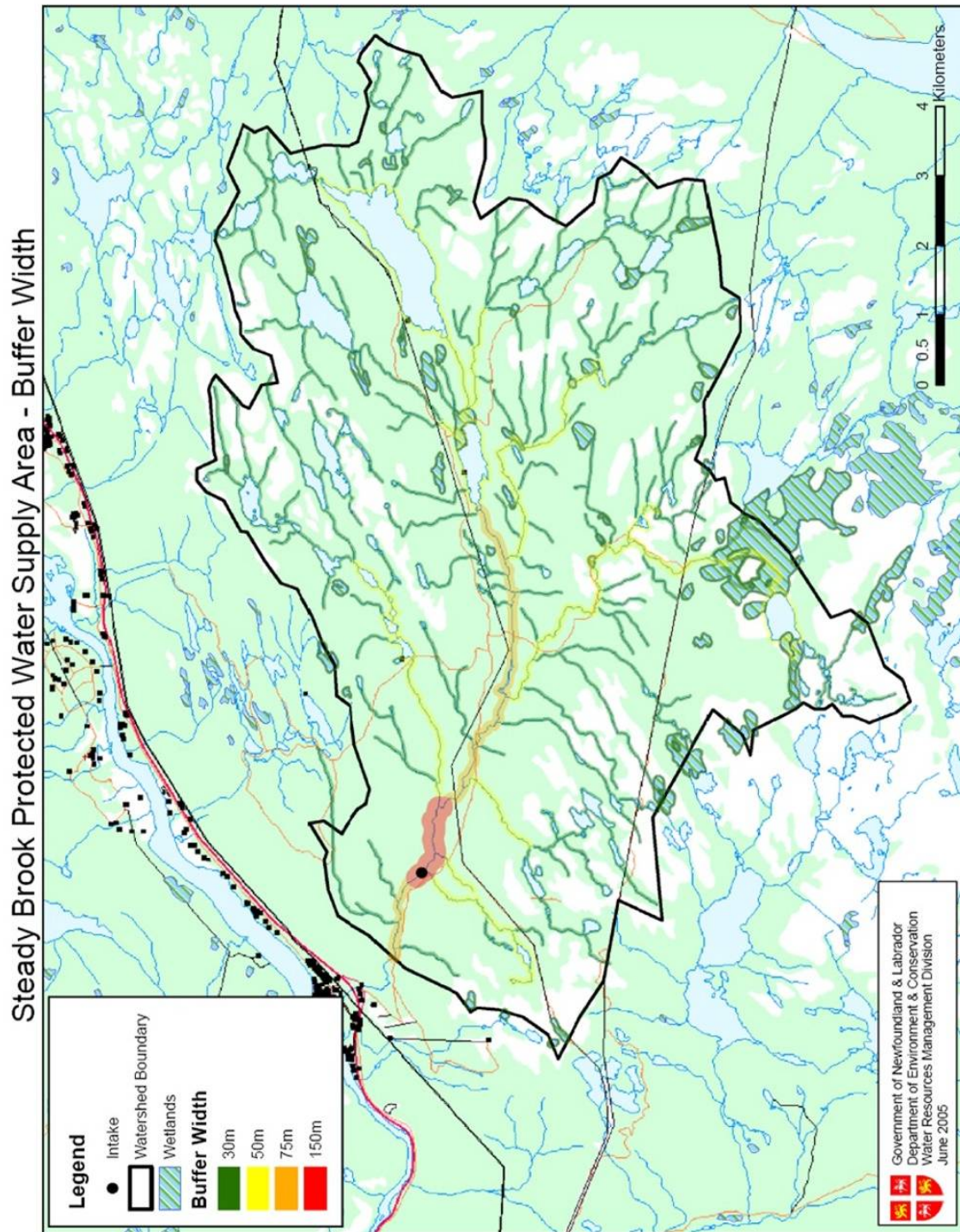
\_\_\_\_\_

Date

## APPENDIX 5: MAP OF STREAM ORDERS

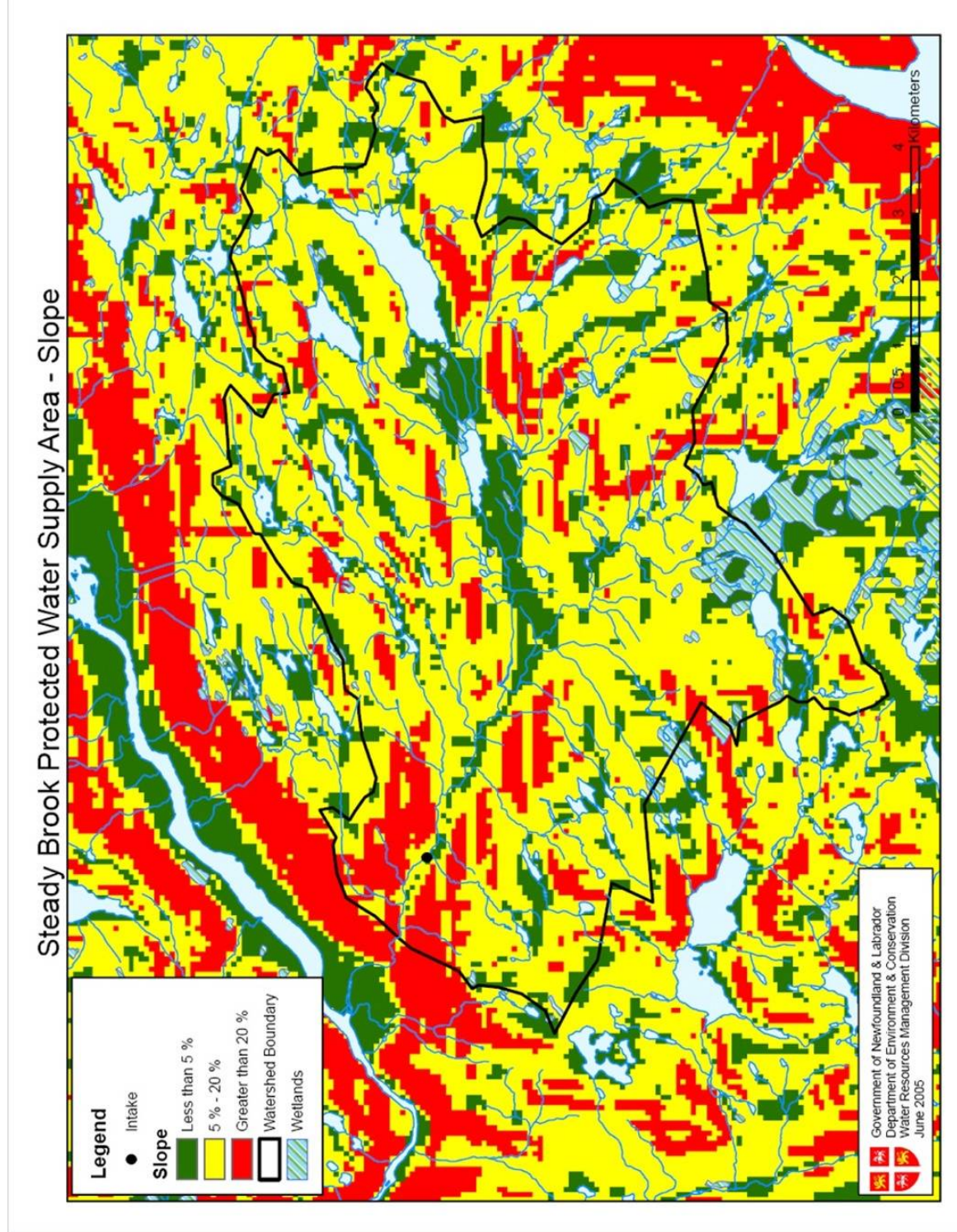


## APPENDIX 6: MAP OF BUFFER WIDTHS

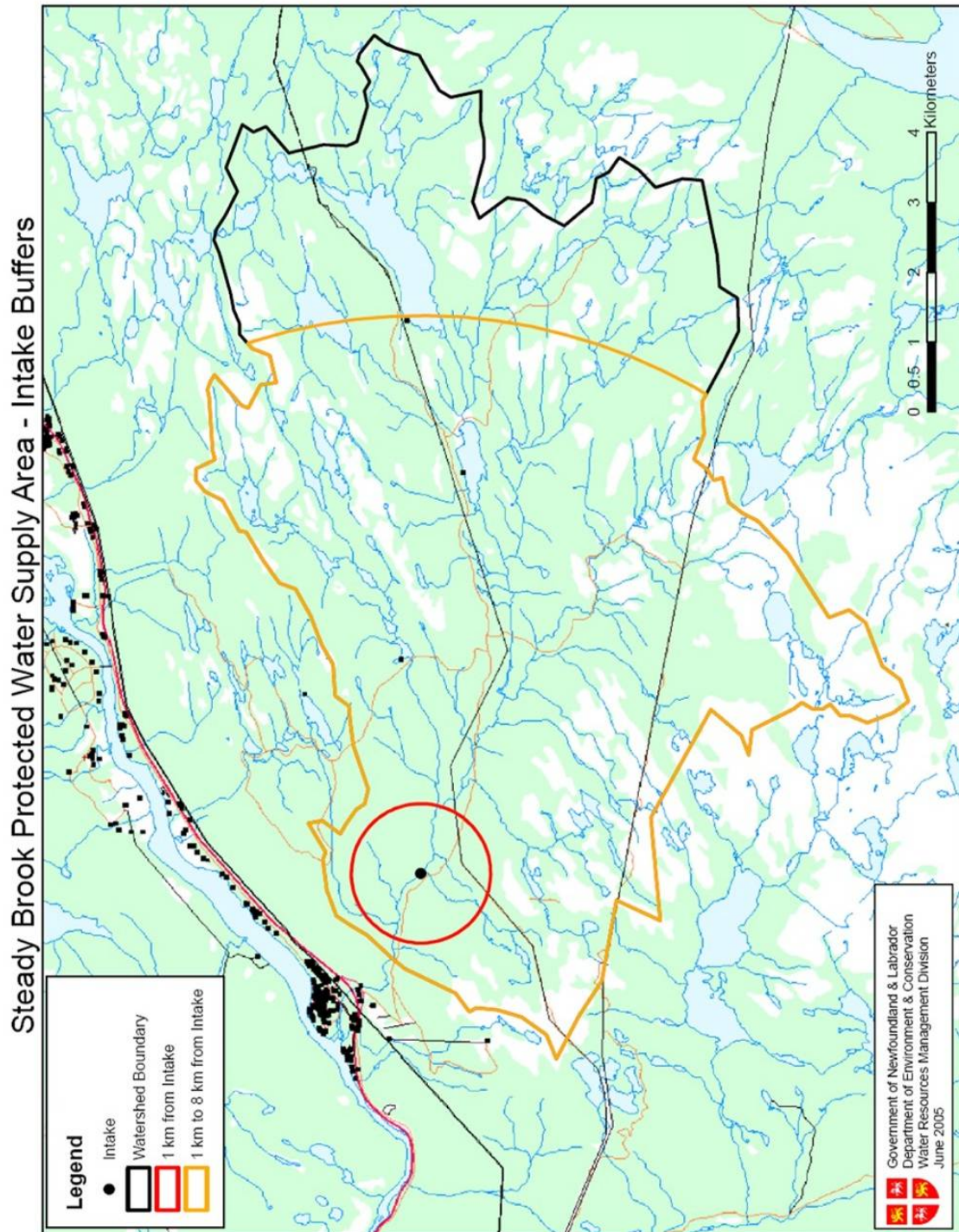




## APPENDIX 7: MAP OF SLOPE



## APPENDIX 8: MAP OF INTAKE BUFFERS



## APPENDIX 9: MONITORING REPORT

### Steady Brook Watershed Monthly Monitoring Report

Month \_\_\_\_\_

Activities / developments observed:

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Applicable permit in possession of operator:

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Natural phenomenon of concern noted (e.g. beaver, water levels):

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Any roads or trails causing erosion?:

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Potential threats to water quality observed?:

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Other comments/observations:

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---

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Photo #'s \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_

## APPENDIX 10: ADDITIONAL INFORMATION

### CHAPTER 1: INTRODUCTION

Additional resources of a general nature are available on these websites are:

*Management of Protected Public Water Supply Areas* – This document describes the process of designating a Protected Public Water Supply Area (PPWSA), the approval required for any development activity in a PPWSA, monitoring requirements, and the responsibilities of the Department of Environment and Conservation and the Municipal Authority.

[http://www.env.gov.nl.ca/env/Env/waterres/Surfacewater/Watershed\\_Protection/Designation\\_Process\\_Booklet\\_Mar26\\_2004.pdf](http://www.env.gov.nl.ca/env/Env/waterres/Surfacewater/Watershed_Protection/Designation_Process_Booklet_Mar26_2004.pdf)

*Steady Brook Watershed Management Plan* – This is the plan that resulted from the pilot project conducted with the Town of Steady Brook.

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20watershed%20plan.pdf>.

### CHAPTER 2: ESTABLISH ADVISORY COMMITTEE

Municipalities may view documents resulting from the Steady Brook pilot project for watershed management planning. The *Steady Brook Watershed Management Plan* can be viewed on the Western Newfoundland Model Forest website at:

<http://www.wnmf.com/main/whatsnew/sb%20watershed/steady%20brook%20watershed%20plan.pdf>.

### CHAPTER 3: CHARACTERIZE THE WATERSHED

#### **References**

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DEL, 1992. Water Resources Atlas of Newfoundland. Dept. of Environment and Lands, Water Resources Division, Gov't. of Newfoundland and Labrador. 79p.

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#### CHAPTER 4: IDENTIFY POTENTIAL CONTAMINANTS AND CONDUCT RISK ASSESSMENT

##### ***References***

ACRES, 1995. Integrated watershed management plan for Peter's River basin. Canada-Newfoundland Agreement Respecting Water Resource Management.

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Walter, M.L., M.A. Kamrin, and D.J. Katz. 2000. A Journalist's handbook on environmental risk assessment. FACSNET Reporting Tool.

[www.facsnet.org/tools/ref\\_tutor/risk/ch1whatis.php3](http://www.facsnet.org/tools/ref_tutor/risk/ch1whatis.php3)

## CHAPTER 5: DEVELOPE A WATERSHED MANAGEMENT PLAN

### ***Literature Cited***

DOE, 2001. Source to tap: water supplies in Newfoundland and Labrador. Newfoundland and Labrador Dept. of Environment. 132p

Klapproth, J.C., and J.E. Johnson. 2000. Understanding the science behind riparian forest buffers: Effects on water quality. Virginia State University, Virginia Cooperative Extension Publication No. 420-151.

USFS, 2003. Riparian forest buffer widths. Chesapeake Bay Watershed Forestry Program. United States Forest Service – Northeastern Area State and Private Forestry. 3p.

### ***References***

Examples of brochures developed to educate users about watersheds, shorelines and wilderness areas can be found on the websites below. These brochures are from a variety of jurisdictions, and cover subjects that may not apply to your situation, but they can provide ideas for areas to cover and how to address these areas.

Keep It Wild – A Guide for Low Impact Recreation in Nova Scotia's Wilderness Areas:

[http://www.gov.ns.ca/enla/protectedareas/docs/KeepItWild\\_recreation.pdf](http://www.gov.ns.ca/enla/protectedareas/docs/KeepItWild_recreation.pdf)

Green Home and Cottage – A quick reference guide to 'green living' for shoreline property owners: <http://www.gnb.ca/0009/0013-e.pdf>

Limiting Impact of Recreation on Water Quality:

<http://www.extension.umn.edu/distribution/naturalresources/components/D6946e.html>