



Step One

FORM A COMMUNITY PLANNING TEAM

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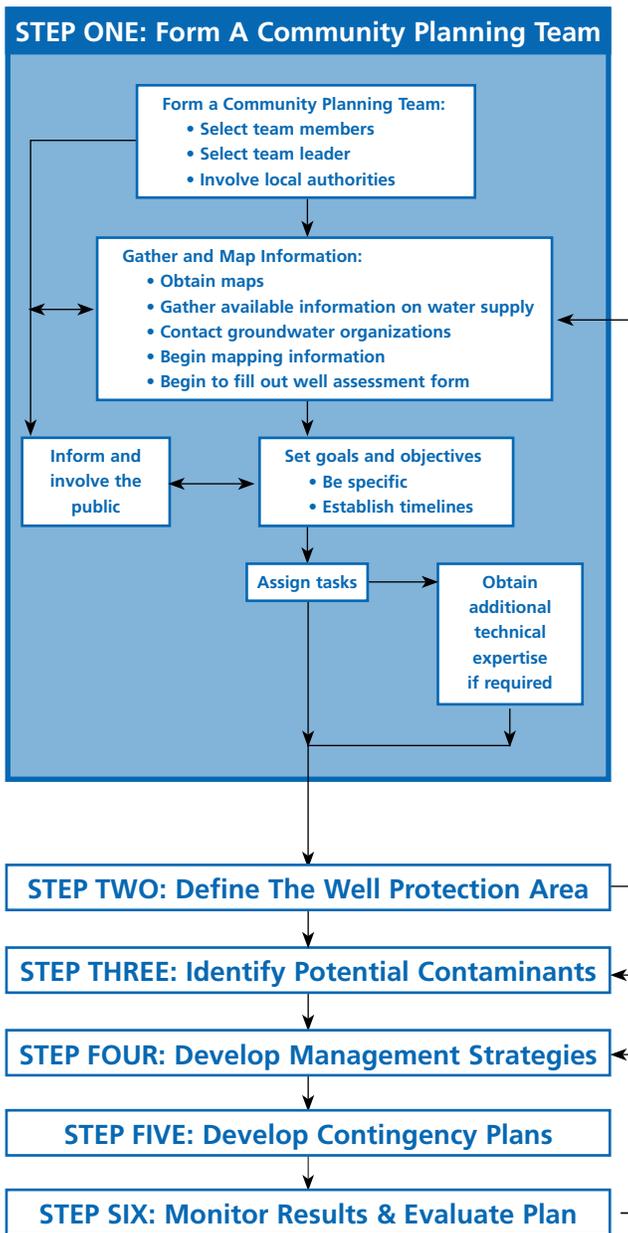
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Figure 1.1



More than 1,000,000 British Columbians rely on groundwater as their source of drinking water, and there are thousands of community well systems in British Columbia. A well protection plan allows communities to identify land use activities that may threaten the quality of their well water, and to develop a strategy to avoid or minimize these threats.

There are six steps to follow in developing a well protection plan:

1. Form a community planning team
2. Define the well protection area
3. Identify potential contaminants
4. Develop and implement management strategies
5. Develop contingency plans
6. Monitor results and evaluate the plan

These steps are described in the six booklets that make up the *Well Protection Toolkit*. Each booklet describes activities that lead to the development and implementation of a well protection plan. In each step, a fictional case study of the town of Pumphandle shows how one community took on this challenge.

Step One: Form a Community Planning Team

The first step is to bring together a “community planning team” that will guide the development of the well protection plan – making sure that all the right groups and individuals are involved in the activities. The team must then become familiar with their groundwater supply and the community resources available to help, and set their protection goals. They will then assign tasks to the team members, including the job of making sure that the public is fully informed.

Figure 1.1 shows the stages of Step One.

Form a Community Planning Team

OBJECTIVES

- To set up a planning team that includes water purveyors, community members and technical experts
- To coordinate efforts with other agencies
- To assess information needs and acquire information for the well protection process
- To develop goals and objectives for the well protection plan
- To develop an action plan and assign tasks

1.1 Select the Community Planning Team

The first step in developing a well protection plan is to bring together a group of people who have the interest and expertise to see the job through. This “community planning team” plays a major role in the ongoing success of well protection planning, as they are responsible for developing and implementing the plan. Involving people who are knowledgeable about the area, committed to the process and enthusiastic will help to ensure the plan’s success.

Members of the community planning team should be prepared for a long-term commitment to this process. Some tasks and projects may take months or even years to complete, and would benefit from continuity in team membership. The water purveyor, or owner of the community well and waterworks system, is often in the best position to initiate the well protection planning process and to provide the long term commitment to see a well protection plan from its beginning steps through to implementation.

To succeed, the development of the well protection plan must involve a wide range of community interests. Citizens, business owners, and community groups all have an interest in protecting their source

of drinking water, however some of these interests may conflict. It is important that the full range of interests be considered. The community planning team must work together to achieve a common set of goals and objectives.

VOLUNTEERS

In many situations, the community planning team will rely on the contribution of volunteers. Volunteers are not paid to participate on the team or in the development of the well protection plan. They are there because of an interest in protecting their source of drinking water. The volunteers on the team may be employed, requiring that team meetings be arranged in the evenings. The community planning team must consider their volunteers and their commitments when assigning tasks, setting time lines and scheduling meetings. Working together will get the job done!

Choose Representatives

The water purveyor is a key player in developing a well protection plan. He or she has the strongest interest in protecting the water supply, and may be in the best position to start the planning process. The water purveyor and the community can work side-by-side to meet the common goal of protecting the drinking water source.

How many people should be included? It depends on the size of your community, but six to eight members is a typical size (a larger group may slow the process). Include the people with an interest or a stake in the well protection area and those that can impact the aquifer and wells by their activities. You may choose to have a small core group, with additional members recruited for special projects.

Not everyone has to be a groundwater expert, but it is helpful to include some members with technical or planning expertise. Appendix 1.1 lists the types of people that might be invited, the experience they would bring and interests they represent.

Try to include a full range of community interests. Invite representatives from the business community and local environmental group. Are there special considerations for your area? An agricultural region,

for example, should include a representative from the farming community.

Draw up a list of potential team members. Invite them to join the team. Be sure that they understand what will be required of them, and that they are prepared to commit to the whole process. Once the “well protection area” has been defined (Step Two), you may wish to review the team’s membership to ensure that it represents the entire area.

Involve Local Authorities

The support of public officials is equally important. Include all agencies with control over the land-use practices that affect water quality, either as a member of the planning team or by keeping them regularly informed. Regional Health Authority staff (see Appendix 1.2) can provide valuable information and guidance on well protection planning, as well as technical support.

In larger communities, there is greater need for local government representation on the community planning team. Regulatory approaches may be needed to implement the well protection plan, requiring changes to by-laws or enforcement of regulations by the municipal or regional government.

Where there is an industrial base within the well protection area, business interests should be included. There is a potential for backlash from the business community should the well protection plan affect their operations, so be proactive and involve these interests from the outset.

Select a Team Leader

At your first meeting, select a team leader who will coordinate the team’s activities, chair the meetings and keep the process going. The water purveyor, another local official who is familiar with the community and local regulations, a well-respected individual, or a community leader are all possible choices. Select someone who can lead the team towards success.

Once you have a team and leader, meet to agree on a process, set out some preliminary ideas on how you will get started and figure out what information you will need. Goal and objective setting comes later, however, you need to start somewhere!

WATERSHED LESSONS

The US Environmental Protection Agency offers some excellent examples of how well-managed groups can contribute to success in its document *Top 10 Watershed Lessons Learned* (publication EPA840-F-97-001).

These “top ten” lessons apply equally to groundwater and well protection. You can read this document at:

www.epa.gov/owow/lessons

Keep Records

Developing a well protection plan will result in the collection and accumulation of records, maps, interviews, surveys, photographs and other documents. The team should secure a place to keep the records and find someone to be responsible for maintaining the records over the long term. It is possible for team members to come and go during the implementation and maintenance of the well protection plan, but not the records!

Form a Society

Consider forming a society - a legally identifiable entity (see sidebar). This can make it easier to apply for grants or loans to help fund the development and implementation of the well protection plan. Being a society will probably give you more “clout” when dealing with government, industry and individuals.

ON A LEGAL NOTE

The *Well Protection Toolkit* is written with the belief that the different interests in the well protection area can work together to meet the ultimate goal of protecting the groundwater.

In some cases, the water purveyor or local government may be challenged on their authority to pass new by-laws, or approve other initiatives that could limit certain activities in the well protection area. The community planning team should consider under what circumstances they would need legal advice, and how they would go about getting that advice.

FORMING A SOCIETY

The Ministry of Finance is responsible for societies. A one-time fee is required to set up as a society. This cost includes the search and registration of the name of the society, and approval of the constitution and by-laws. A society must consist of at least five people, and must file for status on a yearly basis. You may want to ask a lawyer to review your draft constitution and by-laws to ensure they are complete and appropriate.

For complete information on the process, contact the Corporate Registry at (250) 356-2893 or (604) 755-1044 or to find complete information, go to the www.fin.gov.bc.ca/registries/corppg/crsocieties.htm

This package will give the planning team everything that is required to form a society and will also provide you answers to most of your questions.

1.2 Gather and Map Background Information

After the planning team and a team leader have been selected, the work begins! It is important to gather some basic information before finalizing your goals and objectives, so that you know what you are dealing with. For example, the goals and objectives for wells located over a highly vulnerable aquifer will be different from those for wells located over a less vulnerable aquifer (see Step Two). You may have both types of aquifers in your well protection area.

Become Familiar with the Area

The first task is to obtain as much information as possible about your community well(s) and about the local groundwater resource. The planning team should become familiar with the hydrogeology,² the location of the well(s), the entire drinking water supply system and areas where development is planned. This knowledge will give you insight into the community's existing and future water supply needs and any water quality issues.

Groundwater organizations can provide educational materials and publications, informal networks and

¹ To save the costs of the phone call, go through your local Enquiry BC (the number is listed in the blue pages of the telephone directory) and they will connect you.

² The geology of the area in relation to the movement of groundwater and contaminants.

³ See Step Two, section 2.1.

assistance on well protection planning (see sidebar). Call to find out how they can help. The Regional Health Authority (Appendix 1.2) may also be able to provide technical advice and assistance.

GROUNDWATER ORGANIZATIONS

Groundwater Guardian Program

Communities participating in the Groundwater Guardian Program have access to groundwater educational materials and publications, an informal network of organizations interested in groundwater protection, assistance with planning and expertise:

P.O. Box 22558

Lincoln NE USA 68542-2558

Website: www.groundwater.org/gg/gg.html

Phone: (800) 858-4844

B.C. Ground Water Association

The B.C. Ground Water Association is a non-profit organization dedicated to the development, conservation and protection of the B.C. groundwater resource.

The Association comprises mostly water well drillers, pump contractors and suppliers, and professional hydrogeologists:

1708-197A Street

Langley, BC V2Z 1K2

Website: www.bcgwa.org

Phone: (604) 530-8934

Canadian Ground Water Association

The Canadian Ground Water Association (CGWA) is "The national voice of the ground water industry in Canada":

1600 Bedford Hwy Suite 100-409

Bedford, NS B4A 1E6

Website: www.bcgwa.org

Phone: (902) 845-1885

E-Mail: info@cgwa.org

Complete the Well Assessment Form

The well assessment form (Appendix 1.3) records basic information about the location of community wells, their construction and capacity, hydrogeology and capture zone,³ as well as providing an assessment of water quality and likelihood of contamination. It is a good way to compile the available information.

It is unlikely that the team will have all the information to fully complete the well assessment

form for each well at this early stage. However, starting to complete the form will help you to identify what information your group already has, and what is still missing. As other information is gathered during the plan development, it can be added to the well assessment form.

It is also important to have information on the aquifer in which the well is constructed. If the aquifer consists of sand and gravel, contaminants will reach the well by travelling slowly through the pore spaces between the sand and gravel particles. If the aquifer consists of fractured bedrock, contaminants reaching the well will travel more quickly along the fractures. If the aquifer is covered by a sufficiently thick layer of clay or till, the aquifer is somewhat protected from contaminants on the surface, and they are less likely to reach the well. Without such a protective layer, the aquifer and well water are much more vulnerable to contamination from human activities.

It is important to know the type of aquifer in your area so you can develop your plan accordingly.

Map the Information

Maps provide a picture of your community groundwater supply and areas of risk, and help to convey this information to others.

Start with a base map of the community. This should include information on the natural features of the area and show the locations of all the community wells and other water supply sources. Think about what scale(s) of map will best show the entire area of interest, and can also show a sufficient level of detailed information. Do you need the map in digital format (for computer use) or will a paper map be adequate? Appendix 1.4 provides a summary of some of the maps most commonly used. If you are using more than one map, remember that it is easier if they are all the same scale.

Once a base map has been prepared, overlay maps can be drawn up to show a variety of information (see sidebar). Add what data you can now, and make a note of additional information that needs to be gathered at a later date.

Review the Information

Once you have assembled all the available information, your team can review it and determine what information is missing. You may identify the need for some immediate actions. For example, if there is a poor sanitary surface seal on a well, one of the first action items could be to replace the surface seal.

Information to be Included on Maps

Note that information will be added to the maps as the well protection plan develops.

STEP ONE:

- Aquifer(s)
- Location of wells
- Watershed boundaries

STEP TWO:

- Capture zone/well protection areas
- Fish bearing streams (in the event that main flushing will discharge chlorinated water)
- Location of any confining layers
- Wetlands
- Water table contours
- Vulnerable aquifer areas / Recharge areas
- Flow directions

STEP THREE:

- Agricultural Land Reserve (ALR) lands
- Contaminated sites
- Official community plan map information
- High water-use industries and high risk sites
- Industrial areas
- Potential sources of contamination
- Sewer service areas and septic fields
- Zoning districts

STEP FIVE:

- Drainage infrastructure, such as ditches and sewers
- Waterworks system including the location of chlorinators, pumps, water lines (size, age, material), shut-off valves, pressure reducing valves, reservoirs, hydrants/standpipes, pressure zones
- Access routes, roads or trails to critical control points (e.g. shut-off valves)

STEP SIX:

- Location of water quality monitoring sites/ observation wells

ORGANIZING TO PROTECT

A community in the West Kootenays, with a population of 3,000 people, relies on community well water systems for its drinking water.

In the 1980s, one of the community wells was shut down because of contamination with gasoline from a leaky underground tank. In the early 1990s, the Ministry of Environment, Lands and Parks notified the local health unit and the four water districts that nitrate had been detected in the groundwater. These events raised concerns in the community about the safety of their water supply and in 1997, representatives from the four water districts, the city, the regional district and the local environmental health officer met to establish an Aquifer Protection Committee.

The committee drafted a mission statement and developed goals and objectives. They began collecting information on the aquifer and on land-use in the community and set up an Aquifer Resource Centre in the local public library. They then opened a bank account, applied for non-profit society status and established working groups that addressed public education needs, evaluated local bylaws that protect water quality, conducted a contaminant inventory survey, and looked into sources for possible funding.

In its first year, the committee spoke to many groups in the community about the need to protect their groundwater, had a booth at the Centennial Fair, and submitted articles to the local weekly paper about groundwater protection.

1.3 Set Goals and Objectives

Goals and objectives guide the development of the plan, and ensure that you focus on the most important activities.

Goals express the “desired state” of the project. Why do you need a well protection plan? Is it needed to protect the drinking water in the community? Is it needed to prevent further degradation of the groundwater supply? What do you want to achieve in the long term? Use these and other similar questions to set the goal(s).

Objectives set out how you are going to achieve your goals. They should be specific – how are they going to be achieved? Objectives should also be measurable – how can you tell if you have achieved what you set out to do? Some objectives are discarded once they are achieved; others may become an ongoing activity for the planning team.

A high-level, long-term goal, such as “developing and implementing a management plan to control high-risk activities within the capture zone,” cannot be achieved overnight and should be broken down into a more manageable set of objectives, for example:

- To become familiar with the hydrogeology and groundwater conditions of the community well supply and with the location of the community’s wells, the entire drinking water supply system and areas of future development;
- To gather all of the available information on the hydrogeologic nature of the aquifer(s); and
- To develop and maintain a groundwater monitoring program.

You may want to develop “indicators” to measure success. A measurable indicator could be the number of stakeholders and members of the public contacted and involved in the development of the well protection plan. Specific, achievable and measurable objectives will help you to evaluate the progress and success of the plan.

Obtain Funding

The community planning team will also need a financial plan. The financial plan can be developed as part of the overall strategy for developing a well protection plan. The community planning team must estimate the financial needs for developing and

implementing the plan, identify sources of funding and revise its estimates as the plan progresses and new information becomes available. The good news is that the money doesn't have to be raised and spent all at once. Funding sources can change – old ones disappear and new sources become available. Someone on the community planning team can be assigned to track sources of funding.

Don't wait to initiate a well protection plan until you feel you have sufficient funding. Start the plan now and tailor it to the funds that you have. The success of your modest protection plan may attract more funding from other sources. When larger amounts of funding becomes available in the future, your community will already have a plan and working process in place to take advantage of the funds. Remember, even a small amount of money can get you started! Developing relationships and trust within the community for the well protection planning process will take time; cultivate that relationship and trust now to get the community supporting groundwater protection, even though little funding may currently be available.

1.4 Assign Tasks

Once you know what you want to do, you will need to decide who will be doing the work, and when. An action plan outlining and assigning tasks and timeframes to individual team members will provide direction and help keep everyone focussed on the work to be done. For simpler tasks, the planning team can undertake all the work themselves. In larger and more complex situations, you may need the help of professionals.

The planning team should meet regularly, once or twice every month, at least initially, to maintain momentum and keep everyone informed. These meetings are an opportunity to monitor the activities, and evaluate and assess progress of the work that has been completed.

Initial goals and objectives are often revised or expanded as the well protection plan develops, conditions change and the team becomes more familiar with the process. Team members should recognize and accept that the well protection plan will

change over time. The well protection plan should be reviewed on a regular basis and changes should be made where necessary.

KEYS TO SUCCESSFUL PLANNING

- Set clear goals
- Break down long-term objectives into smaller tasks that can be handled easily by individuals on your team – don't try to achieve too much too soon
- Set feasible short-term objectives while maintaining sight of your goals
- Establish plans and timetables
- Engage in exciting activities
- Have a strong will to succeed
- Recognize and celebrate successes

1.5 Keep the Public Informed

It is important to inform the community at large of the progress in establishing a well protection plan. This helps educate people about the need to protect groundwater while generating support for the process itself. It also gives people an opportunity to be involved and to provide input. You are more likely to be successful if you have public support in monitoring and enforcing the well protection plan.

Mail-outs, advertisements, flyers, and community meetings are low-cost methods for reaching a broad spectrum of the community. Some methods are more effective than others. Responses to questionnaires given to the community can provide feedback and information related to the well protection plan, and can help the team determine what the groundwater issues are and where the sources of contamination may be. Informing the public of the groundwater activities can also be tied into other forums, such as service club meetings, existing newsletters, school assemblies and other community group meetings. Announcements in local newspapers, television and radio are also an effective means of getting the word out on the progress of the well protection plan.

You may choose to develop a communications or outreach plan, with the elements, budgets and responsibilities outlined. You could appoint a

STEP ONE

communications contact who speaks objectively on behalf of the team and issues. Consider a website; it could be useful for interactive consultation once public input is sought.

CHECKLIST FOR STEP ONE

The following is a basic checklist for action items to be completed during Step One of the well protection planning process:

ACTION ITEM	COMMENTS	COMPLETED
Identify potential members of the community planning team	Membership should be based on geographic as well as local government land areas and include a full range of community interests.	<input type="checkbox"/>
Form a community planning team	Ensure commitment from all members.	<input type="checkbox"/>
Select a team leader	The leader will chair meetings, facilitate dialogue and keep the process going.	<input type="checkbox"/>
Get maps & background information	Establish a base map. Gather information on community wells and aquifers. Identify missing information.	<input type="checkbox"/>
Start filling out well assessment form	Good starting point for information needs for the planning process.	<input type="checkbox"/>
Develop goals and objectives	Objectives should be measurable and have an associated schedule. Set a workplan.	<input type="checkbox"/>
Develop an action plan	Assign tasks to the community planning team to meet the goals.	<input type="checkbox"/>
Involve and inform the public	Announce the well protection plan to the public and invite participation and support.	<input type="checkbox"/>

Appendix 1.1 Potential Members and Resources for the Community Planning Team

REPRESENTATIVE	ROLE/JURISDICTION
Purveyor of the community well	Delivering potable water to customers in the community, emergency response
<p>LOCAL GOVERNMENT (municipalities and regional districts): Planners, Engineers Elected officials such as Mayors and councillors, Fire department personnel Personnel from water & wastewater treatment/landfill facilities Staff from Regional Health Authority (Public Health Engineers, Environmental Health Officers)</p>	Zoning by-laws through official community plans, emergency response Septic system permits, ensuring safe drinking water supply, permits for water system construction and operation
<p>PROVINCIAL GOVERNMENT STAFF FROM: Ministry of Environment</p>	Flood forecasting, handling, storage and disposal of manure, pesticide use, waste discharge, contaminated sites, technical advice on groundwater
Ministry of Agriculture and Lands	Advising on Best Management Practices for agricultural activities; water information database (GW with MOE)
Ministry of Community Services	Funding for water system infrastructures, planning grants, legislative advice
Ministry of Transportation	Maintenance of roads and highways, approvals of subdivisions
Ministry of Energy, Mines and Petroleum Resources	Permits and manages mining activities, issues tenures for metal and coal mining, and for oil and gas exploration and development
Ministry of Forests	Forest and range management
<p>HEALTH AUTHORITY STAFF</p>	Septic/sewerage systems, ensuring safe drinking water supply, permits for water system construction and operation
<p>FEDERAL GOVERNMENT STAFF FROM: Environment Canada</p>	Transboundary water issues, technical information on groundwater
Agriculture and Agri-Food Canada	Registration and approval of pesticide usage, research on Best Management Practices for agricultural activities
Health Canada and Indian and Northern Affairs Canada	Jurisdiction over native lands
<p>REPRESENTATIVES FROM INDUSTRY AND ASSOCIATIONS: Land developers, Local Chambers of Commerce Industrial organizations (e.g. forest or gasoline companies) and their associations Well water drillers Environmental consultants, Communication media Association of Professional Engineers and Geoscientists of B.C. Consulting Engineers of B.C. (or their member groups) B.C. Federation of Agriculture (or local producer groups) B.C. Ground Water Association, B.C. Water and Waste Association Aggregate Producers Association</p>	Individuals in your community who belong to these associations could be potential members of the community planning team
<p>PUBLIC: Public interest groups Community service groups such as the Rotary Club Environmental/conservation groups Home owners or neighbourhood associations Interested individuals</p>	Representation from the diverse interests of the community
<p>EDUCATORS: Local school teachers, Scientific researchers University and college professors Representatives from the school district</p>	Providers of expertise in education of the public and research on groundwater issues

Appendix 1.2 Listing of Regional Health Authorities and Ministry of Environment Contacts

HEALTH AUTHORITIES	PHONE NUMBER ⁴
Northern Health Authority	(250) 565-2649
Interior Health	(250) 862-4200
Vancouver Island Health Authority	(250) 370-8699
Vancouver Coastal Health	Toll Free 1-866-884-0888 Local (604) 875-4252
Fraser Health	Toll Free 1-877-935-5669 Local (604) 587-4600

MINISTRY OF ENVIRONMENT OFFICES	PHONE NUMBER
Groundwater Section (Victoria)	(250) 387-3205
Thompson & Cariboo (Kamloops)	(250) 371-6200
Lower Mainland (Surrey)	(604) 582-5200
Omineca Peace and Skeena Regions (Prince George)	(250) 565-6135
Vancouver Island (Nanaimo)	(250) 751-3100
Kootenay and Okanagan (Nelson)	(250) 354-6333
Kootenay and Okanagan (Penticton)	(250) 490-8200

⁴ To save the costs of the phone call, go through your local Enquiry BC (the number is listed in the blue pages of the telephone directory) and they will connect you

Appendix 1.3 Well Assessment Form



Ministry of Health

Ministry of Environment

WELL ASSESSMENT FORM
TO BE USED WITH THE WELL PROTECTION TOOLKIT.

IMPORTANT! Please complete one form for each ground water source used in your water system. Fill in available information. If missing information, it may be advisable to contact the Ministry of Environment, Regional Office, or the local driller who drilled the well, to assist. Photocopy this form as necessary.

PART I: WELL SYSTEM INFORMATION (Refer to Step 1)			
WATER SYSTEM LEGAL NAME		LEGAL DESCRIPTION OF WELL LOCATION	
WATER SYSTEM LEGAL ADDRESS			
LATITUDE / LONGITUDE	HOW WERE LOCATION COORDINATES DETERMINED? <input type="checkbox"/> GPS _____ (specify accuracy) <input type="checkbox"/> survey <input type="checkbox"/> digitized from _____ map (specify scale)		
UTM COORDINATES	HOW MANY OTHER WELLS MAKE UP THE WATER SYSTEM?	DOES THE WATER SYSTEM ALSO USE A SURFACE WATER SOURCE? (describe)	
NUMBER OF CONNECTIONS Maximum _____ Actual _____	POPULATION SERVED	WATER USE <input type="checkbox"/> domestic <input type="checkbox"/> irrigation <input type="checkbox"/> commercial <input type="checkbox"/> industrial _____ other (specify) _____	
Well Identification Plate No.	EMS NO.	WELL TAG NO.	
Contact your local Ministry of Environment office for the following information:			
Well Identification Plate No. = MOE's metal tag affixed to the well for on-site identification.		EMS NO. = MOE's site number for the water chemistry on their database.	BC WELL TAG NO. = MOE's computer number for the well.
Bulk supply <input type="checkbox"/> yes <input type="checkbox"/> no	Back-up supply <input type="checkbox"/> yes <input type="checkbox"/> no	Emergency supply <input type="checkbox"/> yes <input type="checkbox"/> no	Metered <input type="checkbox"/> yes <input type="checkbox"/> no
WELL OWNER / OPERATOR INFORMATION	WELL OPERATOR		WELL OPERATOR'S PHONE NO. ()
	WELL OPERATOR'S ADDRESS		
	WELL OWNER		WELL OWNER'S PHONE NO. ()
	WELL OWNER'S ADDRESS		
PART II: WELL CONSTRUCTION INFORMATION (Refer to Step 1)			
WELL-DRILLER'S NAME, COMPANY AND ADDRESS		POSTAL CODE	DATE WELL ORIGINALLY CONSTRUCTED YYYY MM DD
		WELL-DRILLER'S TELEPHONE NO. ()	DATE OF LAST RECONSTRUCTION YYYY MM DD
TYPE OF WELL <input type="checkbox"/> drilled <input type="checkbox"/> dug <input type="checkbox"/> other (specify) _____		METHOD OF DRILLING <input type="checkbox"/> rotary <input type="checkbox"/> cable tool <input type="checkbox"/> driven <input type="checkbox"/> jetted <input type="checkbox"/> other (specify) _____	
DEPTH OF WELL _____ m or _____ ft.		SCREEN LENGTH _____ m or _____ ft.	WELL LOG AVAILABLE? <input type="checkbox"/> yes (attach) <input type="checkbox"/> no
DIAMETER OF WELL _____ m or _____ in.	LOCATION OF WATER-BEARING FRACTION(S) (for bedrock wells):		DEPTH TO TOP OF SCREEN _____ m or _____ ft.
WELL CAPACITY _____ L/s or _____ Igpm	YIELD OF WATER-BEARING FRACTION(S) _____ L/s or _____ Igpm		
WELLHEAD ENCLOSURE <input type="checkbox"/> pump house <input type="checkbox"/> manhole <input type="checkbox"/> other (specify) _____ <input type="checkbox"/> none	SURFACE SANITARY SEAL grouted to _____ m or _____ ft. <input type="checkbox"/> no surface seal <input type="checkbox"/> pitless adapter		
AVERAGE PUMPING RATE _____ L/s or _____ Igpm	HOW WAS PUMPING RATE DETERMINED?	DEPTH OF INTAKE SETTING _____ m or _____ ft.	PUMP AGE
ANNUAL VOLUME OF WATER PUMPED _____ L or _____ Igal	HOW WAS VOLUME PUMPED DETERMINED?		
PUMPING CAPACITY _____ L/s or _____ Igpm	ANY CHANGES OR REPAIRS MADE TO THE PUMPING EQUIPMENT? (specify)		
TYPE OF STORAGE <input type="checkbox"/> tank(s) <input type="checkbox"/> reservoir <input type="checkbox"/> other (specify) _____	STORAGE CAPACITY _____ L or _____ Igal	COMMON INLET OR OUTLET? <input type="checkbox"/> yes <input type="checkbox"/> no	
ATTACHED INFORMATION <input type="checkbox"/> well log <input type="checkbox"/> drawings <input type="checkbox"/> reports <input type="checkbox"/> pump test data <input type="checkbox"/> water quality data		NOTE: If no well log is available, please attach any other records documenting well construction (i.e., "as built" drawings, engineering reports).	

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Appendix 1.3 Well Assessment Form (continued)

SOURCE-SPECIFIC WATER QUALITY RECORDS (Refer to Step 1)

Please indicate the occurrence of any test results in the last 10 years that meet the following conditions:

PARAMETER	RECURRING PROBLEMS	TEST RESULTS	EXCEEDENCES OF CDWQG ¹
<u>Bacteriological</u> Total/Faecal Coliforms Background Heterotrophic plate counts Iron and Sulphate Reducers			
<u>Disinfection by-products</u> Bromodichloromethane Dibromochloromethane Chloroform			
<u>Physical Parameters</u> pH, colour, alkalinity, specific conductance, hardness, total dissolved solids, total organic carbon, turbidity			
<u>Inorganic Parameters</u> Nitrates, fluoride, sulfate, sulphide, ammonia, chloride, nitrite, nitrogen (organic)			
<u>Metals*</u> Calcium, iron, magnesium, manganese, sodium			

¹ Canadian Drinking Water Quality Guidelines, 6th edition

* A metal scan is usually performed every 3 years at least, and includes aluminum, arsenic, barium, cadmium, chromium, copper, lead, molybdenum, nickel, phosphorus, silver and zinc.

Please sketch in the box below the location sampling point with respect to the well.

A large rectangular grid for sketching the location of a sampling point relative to a well. The grid consists of 20 columns and 15 rows of small squares, providing a coordinate system for the sketch.

Appendix 1.3 Well Assessment Form (continued)

PART V: WATER TREATMENT INFORMATION (Refer to Step 1)

IS THIS SOURCE TREATED? yes no | IF YES, TYPE OF TREATMENT
 disinfection filtration carbon filter air stripper water softener other (specify) _____

PURPOSE OF TREATMENT _____

IF SOURCE IS CHLORINATED, IS A CHLORINE RESIDUAL MAINTAINED? | Total Chlorine _____ ppm | Free Chlorine _____ ppm | WHAT IS THE RESIDUAL LEVEL OF TREATMENT? _____

IS THERE ANY WATER STORAGE IN THE SYSTEM? yes no | IS THE WATER TREATMENT BEFORE OR AFTER THE STORAGE UNIT? before after

WHAT IS THE TOTAL AND FREE CHLORINE IN THE DISTRIBUTION SYSTEM? | Total Chlorine _____ ppm | Free Chlorine _____ ppm | IS THERE ANY ADDITIONAL CHLORINE ADDED AFTER THE SOURCE (rechlorination)? | Total Chlorine _____ ppm | Free Chlorine _____ ppm

WHAT TYPE OF CHEMICALS ARE USED IN THIS PROCESS? (specify) _____ | WHERE ARE CHEMICALS STORED? _____

IS THERE PROPER STORAGE FOR THESE CHEMICALS? yes no | IF STORED IN PUMP HOUSE, HOW ARE CHEMICALS ISOLATED FROM THE WELL? _____

PART VI: MAPPING THE CAPTURE ZONE TO YOUR COMMUNITY WELL (Refer to Step 2)

A map (1:5000 to 1:20,000 are typical scales) will be needed to complete this section. Multiple wells in the same area can be plotted on one map.

CIRCULAR CAPTURE ZONE (refer to Appendix 2.1)		PARABOLIC CAPTURE ZONE (refer to Appendix 2.2)*	
*attach calculation sheets	RADIUS (m)	Downgradient distance _____ m	Width of capture zone _____ m
Arbitrary Fixed Radius		Is there a river, lake, pond, stream or other obvious surface water body within the 6-month time of travel boundary?	<input type="checkbox"/> yes (identify on map) <input type="checkbox"/> no
Calculated Fixed Radius	(1-year travel time)*	Is there a stormwater and/or wastewater facility, treatment lagoon or holding pond located within the 6-month time of travel boundary?	<input type="checkbox"/> yes (identify on map) <input type="checkbox"/> no
	(5-year travel time)*		
	(10-year travel time)*		

PART VII: SOURCE SURVEY (Refer to Step 3)

4 REGIONAL SOURCES OF RISK TO GROUND WATER
 Please indicate if any of the following potential sources of contamination within the capture zone.

ACTIVITY	T.O.T. NOT SPECIFIED	1-YEAR	5-YEAR	10-YEAR	COMMENTS
Chemical Storage (specify)					
Injection wells					
Abandoned wells					
Landfills, dumps, disposal areas					
Commercial/industrial sites					
Known hazardous materials clean-up site					
Household hazardous waste					
Population density > 2 houses per hectare					
On-site sewage treatment					
Wastewater treatment facility					
Sites used for land application of waste					
Golf course					
Dairy or beef farms					
Poultry barns					
Hobby farms					
Fields: vegetables, hay, fruit (specify)					
Mining operations					
Gravel pits					

** Mark and identify on map any of the potential sources listed above which are located within the capture zone boundary.

SEPTIC FIELD SETBACK _____ m or _____ ft. | GRADIENT TO SEPTIC FIELD upgrade downgrade same grade _____% _____% | DENSITY OF ON-SITE SEWAGE DISPOSAL SYSTEMS _____ COMMUNITY SYSTEM _____ SYSTEM PER LOT

Appendix 1.4 Selection of Base Maps

Local maps (generally 1:5,000 and larger) are usually available from regional or municipal governments. In most incorporated areas, the local source for mapping would be the municipality. Regional district offices also have cadastral or land-use zoning maps. “Cadastral” maps are parcel-based maps with legal information such as district lot and plan lot numbers. Road right-of-ways are usually included but topography and information on watercourses are usually not.

The format and scale vary from one community to another. In small communities, map scales typically vary from 1:1,000 to 1:2,500. Cities are mapped at scales from 1:2,500 to 1:5,000. Most maps will be available in paper copy, or in digital (computerized) format compatible with Geographical Information Systems (GIS). Some larger municipalities may also have some land-use maps available (especially those that use GIS).

Cadastral maps of 1:1,000 to 1:20,000 are usually good base maps.

If there is no mapping available locally, the B.C. Assessment Authority will have maps. B.C. Assessment Authority maps for communities throughout the province can be obtained through Island Blue Print in Victoria at: (250) 385-9786.

TRIM (Terrain Resource Information Management) maps are at a scale of 1:20,000. They show contours, watercourses and other water bodies, and are available for all areas of the province. TRIM maps are available through the Integrated Land and Resource Registry at www.ilrr.ca/

STEP ONE: Establishing A Community Planning Team

Pumphandle, British Columbia is a small town with 650 residents, located in a valley to the east of Vancouver. Most of the residents work in logging, agriculture, tourism and recreation.

Drinking water comes from three community wells (Figure CS 1.1):

- Aiken's Well, shown as Well A, is a shallow well dug into a spring. At the turn of the century, the property around the well belonged to Rolland Aiken. As the community of Pumphandle grew, the need for a community water supply increased. Rolland Aiken formed the Aiken Waterworks and the family continues to own and operate the waterworks to this day. Water from the well is supplied to the main subdivision in Pumphandle with 165 homes (500 residents), and a number of commercial users including a gas station and dry cleaner.
- The Blackwater Well, shown as Well B, supplies water to another 35 homes (100 residents), and the campground, hotel, schools and golf course.
- Charlie's Well, shown as Well C, provides water to a small new subdivision of 15 homes with approximately 50 residents.

Further up the valley, in areas to the south and west of Pumphandle, residents are served by individual wells and private intakes from the nearby mountain creeks.

Aiken Waterworks had samples taken from Aiken's Well for a complete chemical analysis. In the last few sampling rounds, results from the certified environmental laboratory showed an elevated nitrate concentration in the groundwater (nitrate-nitrogen levels of 7 mg/L). The maximum allowable concentration (MAC) for nitrate-nitrogen is 10 mg/L as set out in the Guidelines for Canadian Drinking Water Quality.

Andrew Aiken contacted Anne Jones, the local Drinking Water Officer, to see if she had any

information that could help him protect his well from increasing levels of nitrate in the water. She told him that the aquifer near Aiken's Well was vulnerable to contamination from land-use activities because it is not protected by any surface clay or till layers. She also sent him a copy of the *Well Protection Toolkit*, and suggested that he talk to the other water purveyors in the area to see if they would be interested in developing a well protection plan for the area.

Andrew Aiken met with the water purveyors from the other two community wells. They had also noticed elevated nitrates in their water supply, and agreed that a well protection plan was needed to protect the community's groundwater supply from further contamination. The water purveyors decided to use the *Well Protection Toolkit* as a guide to help them in developing their plan.

Form a Community Planning Team

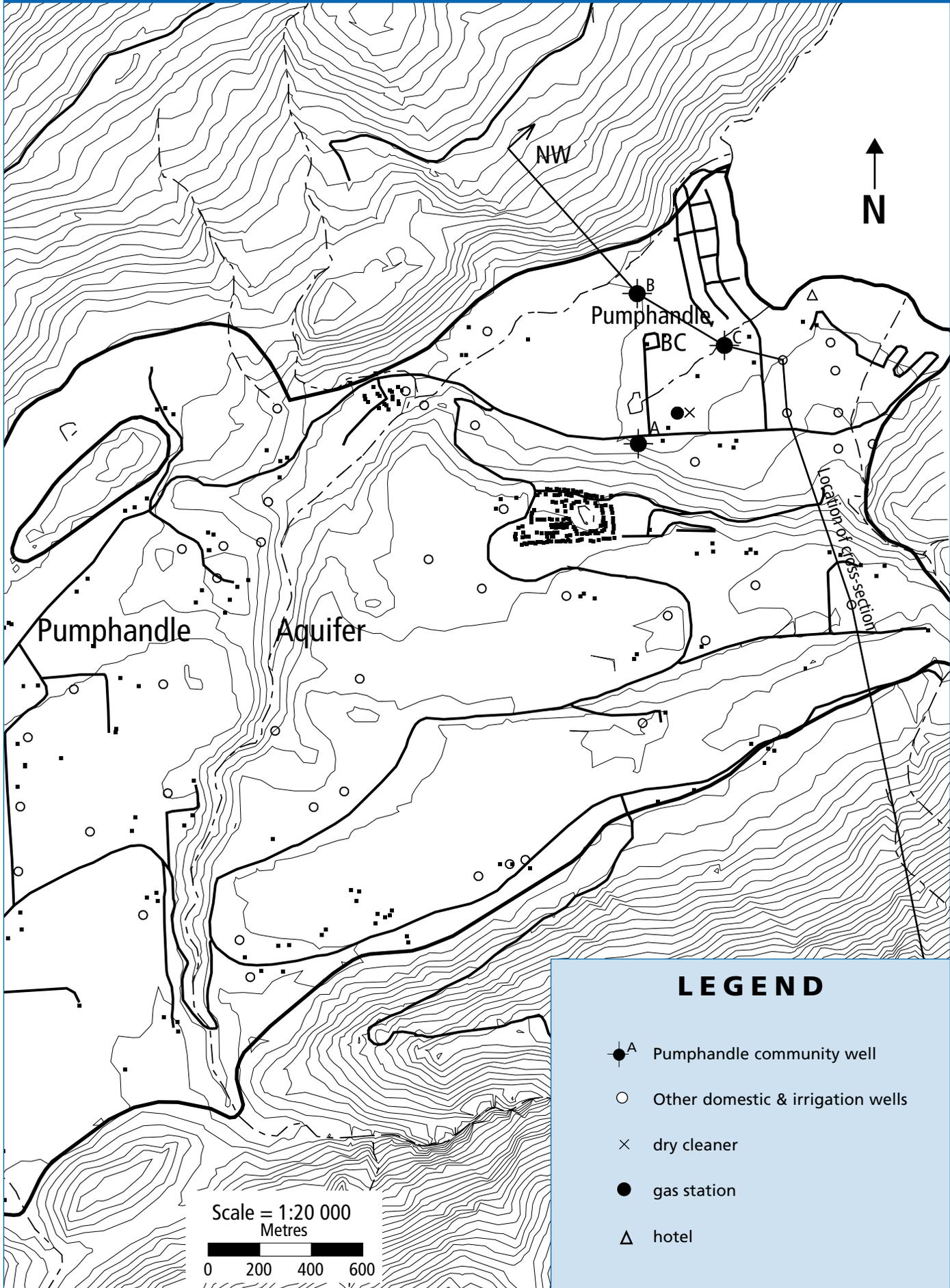
As a first step, the three purveyors prepared a list of individuals and agencies who might be interested in being part of a community planning team and in helping to develop a well protection plan for the entire community.

They called local farmers and the owners of the hotel, trailer campground, golf course, gas station and dry cleaner. The Regional District was asked to provide someone from the Engineering and Planning Department. The Pumphandle Valley Conservation Society was invited, as they could play an important role in raising public awareness of the issue.

Andrew Aiken called Anne Jones and invited her to join the planning team. Andrew also asked Anne if she would represent provincial government interests on the team. He thought that it would be easier for her to be the main contact with staff from other government agencies (such as Agriculture and Lands and Environment).

In total, eight people agreed to participate on the Pumphandle community planning team:

FIGURE CS 1.1 MAP OF THE PUMPHANDLE AQUIFER



- Andrew Aiken, purveyor for Aiken’s Well
- Jenny Lowden, purveyor for Blackwater Well
- Eric Kowski, purveyor for Charlie’s Well
- Ian Rutherford, P. Eng., Engineer for Valley Regional District
- Simon Lee, farmer
- Jocelyne Dufour, campground owner/operator
- Devon Alexander, Pumphandle Valley Conservation Society
- Anne Jones, Drinking Water Officer, Pumphandle Health Authority

Andrew Aiken was selected as the team leader. Each team member was given a copy of the *Well Protection Toolkit*. The team agreed to meet every two weeks for the first three months of the process so they could get a good start on the project. At the first “official” meeting, the Pumphandle community planning team would discuss what information was available about the existing wells and the community, and what else would be needed.

Gather and Map Information

The Pumphandle community planning team started by collecting and mapping information about the groundwater supply. They used a 1:20,000 TRIM⁵ map as a base map, which was the only digital mapping available for the area (Figure CS 1.1). More detailed 1:2,000 cadastral maps would be used during field studies. Anne Jones (the Drinking Water Officer), Ian Rutherford (District Engineer) and the three purveyors agreed to gather the initial information. They mapped:

- the location of the wells (community and private);
- land use activities (commercial, residential, agricultural, recreation, undeveloped); and
- the boundary of the aquifer (information obtained from the Ministry of Environment).

This information was recorded on the well assessment form. There was no available information on the amount of water used for private irrigation, so this would be collected during Step Three. Anne Jones and Ian Rutherford were unable to find

any results of a chemical analysis for pesticides for any of the three wells. They noted the need for a comprehensive agricultural chemical analysis for the wells. This information would provide baseline data, which could be compared with future results.

Set Goals and Objectives

In developing their terms of reference, the Pumphandle team set themselves two long-term goals:

1. To encourage public awareness of the need to protect groundwater; and
2. To develop and implement a well protection plan that will minimize the nitrate levels in the Pumphandle wells and aquifer.

Each long-term goal was broken down into several short-term objectives:

1. Encourage public awareness and education

- produce an information sheet on the well water supplies in Pumphandle;
- hold public information meetings;
- conduct a groundwater issues survey;
- place signs in strategic locations informing the public that they are in a designated well protection area;
- include groundwater information in the public school education programs; and
- raise money to assist with publication of educational materials.

2. Develop a well protection plan

- complete the well assessment form for each community well (Step One);
- delineate the well protection areas for all three community wells (Step Two);
- conduct a contaminants inventory for all of Pumphandle (Step Three);
- select and implement groundwater protection measures (Step Four);
- develop a contingency/emergency response plan (Step Five); and
- design and implement a monitoring program (Step Six).

⁵ Terrain Resource Information Management

Assign Tasks

The Pumphandle team divided the jobs of meeting these objectives (see Table CS 1.1). They decided that future meetings would be held on a monthly basis and that progress reports on each of the goals would be presented at these meetings.

TABLE CS 1.1: PUMPHANDLE TEAM RESPONSIBILITIES

TASKS	PURVEYORS	DISTRICT ENGINEER	FARMER	CAMPGROUND OWNER	CONSERVATION SOCIETY	DRINKING WATER OFFICER
1. Complete the well assessment form	•	•				•
2. Conduct a groundwater issues survey					•	
3. Delineate the capture zones for all three wells	•	•				
4. Conduct a contaminants survey		•			•	•
5. Select and implement groundwater protection measures	•	•	•	•	•	•
6. Produce an information sheet on the well water supplies and aquifer in Pumphandle	•				•	•
7. Fund raising to assist with publication of educational materials			•	•	•	
8. Hold public information meetings	•	•				•
9. Include groundwater in the public education programs					•	•
10. Place signs in strategic locations			•	•		•
11. Develop a spill contingency/emergency response plan	•		•	•		•
12. Design and implement a water quality monitoring program	•	•			•	•

