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# Groundswell

Community Based Groundwater Monitoring

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## Project Kit

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Jennifer West, MSc. PGeo.  
Groundwater Coordinator  
Ecology Action Centre

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RBC  
Blue Water  
Project™



Ecology Action Centre

The logo for the Government of Nova Scotia, featuring a stylized blue and white flag above the text 'NOVA SCOTIA' in blue.

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This kit is meant to be a complete package to enable a coordinator to start up the Groundswell project, train volunteers, install loggers, and manage and process data.

Groundswell was established successfully in Nova Scotia, Canada, in 2010 and continues to be a leading example of community based groundwater monitoring. Funding restrictions kept the project from expanding, but volunteers continue to collect data and upload to a shared website. If you would like more information on this project, please contact the Ecology Action Centre in Halifax, Nova Scotia, at (902) 442-5046.

## What is the Groundswell Model?

In most regions across North America, groundwater is the primary source of drinking water for citizens, and is a key component of the water cycle. Groundwater monitoring is essential to understanding, protecting and managing drinking water. Many provincial and state governments monitor groundwater using drilled wells, but their networks are limited in density distribution (Ontario has more than 400 wells, but these largely cover the south of the province and are sparse in Northern communities), and water quality analyses (water quality samples are collected every one, two or five years, in Nova Scotia and Ontario, for example). Increasing the number of groundwater monitoring wells, and the frequency of sampling, is imperative to protecting and managing drinking water at the local level.

Expanding existing networks would provide information about groundwater resources in more areas of the province. In particular, some regions are facing development or industry issues and are in dire need of information about their aquifers. The cost of adding observation wells in every community, installing and maintaining dataloggers in each well, and visiting them regularly, is prohibitive to most governments.

Groundswell is a model of community-based groundwater monitoring. This model is cost effective, easy to administer, and can be adopted by community groups, non-government organizations or other groups. Data provided by this model is scientifically sound and accessible, and can help provide information for local water conservation plans.

The goal of this kit is to help a potential coordinator implement this program in a new area.

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## How the Model Works

The Groundswell model is flexible enough to suit the capacity of most organizations. The network can be as small as one well, or have dozens of wells across a large area. A part time coordinator could spend a few hours each month maintaining the wells and sharing data, while a full time coordinator could easily be kept challenged by a larger network. The largest amount of work supports finding new wells, and it helps to be connected to a groundwater-related field. Networking is the best way to find new wells - calling your friends and colleagues and discussing the project and the characteristics of new wells. In general, the project runs as follows:

### The project coordinator

- finds appropriate monitoring wells (recently drilled, unused/not pumped, water wells or monitoring wells);
- finds local volunteers willing to look after a nearby monitoring well;
- installs data loggers;
- trains volunteers to upload data and collect a manual water level measurement;
- receives data files from volunteers and performs simple processing on the files; and
- uploads data to a public website to share water level trends.

### Project volunteers

- visit their well several times each year;
- make sure the equipment is working properly and the well is intact;
- collect a water level measurement;
- upload data onto a laptop; and
- send the data files to the coordinator.



“The network can be as small as one well, or have dozens of wells across a large area.”



## Project Coordinator

The goals of the coordinator are

- (1) find new wells,
- (2) train new volunteers, and
- (3) facilitate data sharing online.

The project coordinator can develop their local network of monitoring wells at a pace that suits their capacity. This individual uses networking and word of mouth to find new wells. Calling and meeting with experts in the groundwater and environmental fields is the first step in finding wells. Word of mouth helps people to understand the project, and understand the characteristics of potential well sites. Networking is the most important task of the project coordinator: speaking with citizens and experts who care about water resources and water stewardship.

Once a well is found, the coordinator and well owner agree on monitoring activities and the owner signs a waiver on property access and monitoring activities (*Example Waiver* is a document that is included in the online Groundswell Kit). A data logger is programmed for the site and installed in the well. The logger remains in the well and collects continuous water level measurements, for example every hour of every day.

The next phase of the project involves finding local community group or organization that will visit the site periodically. This can be a watershed protection group, high school environment club, municipal government employee, or a local citizen not connected to any organization. This person will be trained to (1) open the well cap, (2) collect a single water level measurement using a water level recorder, (3) upload the digital data from the data loggers and, (4) send this data to the coordinator. The total time for this monitoring event is less than 15 minutes, and occurs as their capacity allows



Project Coordinator training volunteers at a well site

Site Info and Location Map	Annual Water Levels	Historic Water Levels	Data File (.xls)
<a href="#">South Uniacke</a>	<a href="#">GS101-2011</a>	<a href="#">GS101</a>	<a href="#">GS101</a>
<a href="#">Fall River</a>	<a href="#">GS102-2012</a>	<a href="#">GS102</a>	<a href="#">GS102</a>
<a href="#">Waverley</a>	<a href="#">GS103-2012</a>	<a href="#">GS103</a>	<a href="#">GS103</a>
<a href="#">Beaver Bank</a>	GS104-2011	GS104	GS104
<a href="#">Glen Arbour</a>	<a href="#">GS105-2012</a>	<a href="#">GS105</a>	<a href="#">GS105</a>
<a href="#">Milford Station</a>	<a href="#">GS106-2012</a>	<a href="#">GS106</a>	<a href="#">GS106</a>
<a href="#">NSCC Leeds St</a>	GS107-2012	GS107	GS107
<a href="#">New Ross</a>	GS108-2012	GS108	GS108

“Word of mouth helps people to understand the project, and understand the characteristics of potential well sites.”

(as little as once per year, as often as four times per year).

The coordinator collects the data and uses software associated with the logger, combined with a simple spreadsheet, to process the data. The final data is posted on a shared website for the local project, with graphs and raw data available for download by the public.

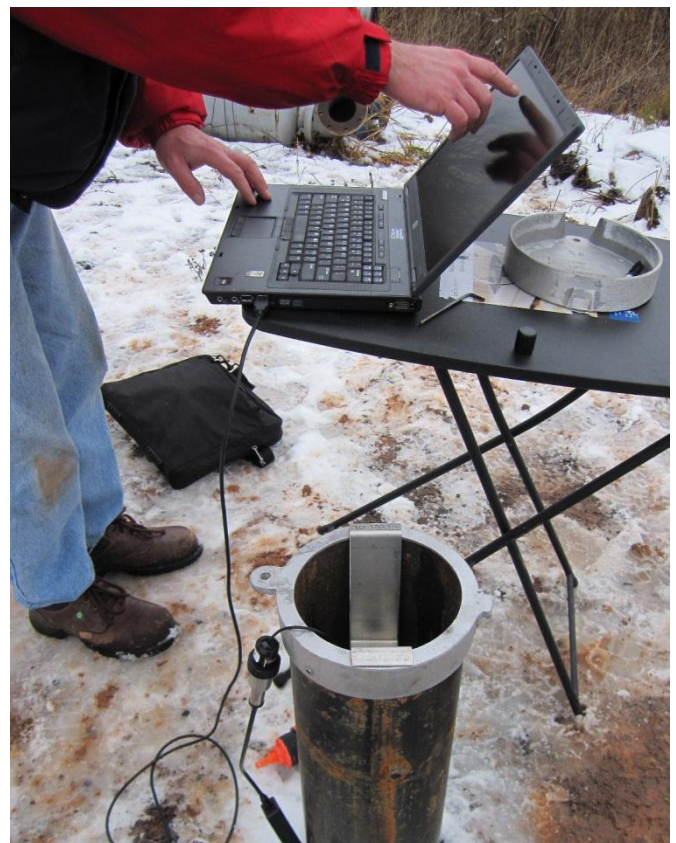
The final responsibility of the project coordinator is fundraising for the cost of the logger. In some cases, funding may be provided to cover the cost of the equipment, but in other cases, the coordinator must find donors or funders to support the purchase of loggers for each new site. The loggers range in price from \$300 to \$600, and water level recorders are approximately \$500. These items seem to be appealing to funders and donors, compared to support for salary or capacity building (*Example Funding Proposal* is a document that is included in the online Groundswell Kit).

### Project Volunteer

The volunteer is a key aspect of this model, because they visit the well, collect data, and alert the coordinator of any change to the site, well or logger. Without their input, gaps in data could be prolonged, and compromise the integrity of the information. For example, in 2011 in Nova Scotia, a volunteer alerted the coordinator that their well had been damaged during the winter by a snow plow, and the well was quickly repaired and restored, with only a short gap in data. Provincial or state groundwater monitoring staff often visit a well once or twice per year, allowing for large gaps of time without groundwater level data. Continuous data is very important in analysing long term groundwater data, and these gaps should be minimized.

Volunteers can schedule their site visits to fit

“The total time for this monitoring event is less than 15 minutes.”



their schedule since the data is being continuously collected by the loggers. For example, they can schedule to visit the site on their way out of town, but if it is raining they can choose to visit the site the following day or week. Volunteers need to keep good records of site visits and data as a backup for the project coordinator. In the event that volunteers are not available, the coordinator should be available to complete occasional monitoring events.

### Identifying New Sites

Each coordinator brings their unique experience and professional networks to this aspect of the project. Some groups that are a good place to start might include

- Government department responsible for groundwater monitoring or drinking water
- Government department responsible for the protection or stewardship of natural resources
- Academic groups (universities, colleges) studying groundwater or drinking water
- Environmental consultants covering property assessments or clean-ups
- Stewardship organizations involved in groundwater or surface water
- Municipal government representatives concerned about drinking water or water resource management and protection

Finding contacts within these groups is a great place to start and to make the next level of contacts.

When calling or speaking with people, it might help to have a list of points about the project and about the types of wells you are looking for. Keep records of who you call, and who needs to be called again at a later date.





## Identifying Community Volunteers

Community groups and environmental groups are the best place to look for Groundswell volunteers. In most cases, these groups have volunteers who crave more hands on work, or young people looking for experience in the environmental field. In other cases, such as rural communities, volunteers might include the property owner, municipal councillor, teacher, angler, consultant or other. Be clear about the commitments required to participate in the program

- Regular site visits which take up to 15 minutes, ideally 3 months apart
- Access to a laptop (may be provided) for data uploads
- Access to internet to send the data
- Active communication in case you need to contact them about the project, or they need to contact you about the well

Provide the volunteers with a package of the manual (*Example Manual* is provided in the Groundswell Kit), and contact information. Offer to join them on the first monitoring event, or be available by phone for troubleshooting.



“In most cases, these groups have volunteers who crave more hands on work, or young people looking for experience in the environmental field.”

## Installing Loggers

This guide will help you when you are installing levelloggers and barologgers at a site. Be sure to record measurements in a log book and add it to a digital file upon returning to your office. This checklist assumes that you have set up your loggers prior to arriving at the site, and they are set to begin collecting data after installation is complete.

### Installation Checklist:

#### Must Bring:

- Laptop, software and drivers uploaded
- Padlock and key
- Water level recorder
- Datalogger and barologger
- 2m optical cable for barologger
- 10m optical cable for levellogger
- Zipties
- Field form
- Manual and quickstart guides
- Camera (still and/or video)
- Kneeling pad
- Clippers
- Logger hanger

**Also Bring (from home):** Charged laptop and cell phone, ratchet set, camera.

Contacts and numbers for property owners:

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1. Open the well, being careful to keep all parts together so they are not lost.
2. Uncoil and lay out the levellogger and barologger on the ground beside the well.
3. Loop the cable of the barologger so that it is around 1 m long. Tie off the loops these extra loops with a ziptie.
4. Feed the loggers through the logger hanger and secure the cable to the hanger with 5-10 zipties (one can never be too careful)
5. Measure the precise distance from the hanger to the sensor on each logger, record this and make sure it is uploaded into the Groundswell Spreadsheet
6. Secure the hanger onto the well THEN insert the loggers into the well
7. Collect and record a water level measurement. If possible, record the depth of well (turn the probe off and let out the WLR spool).
8. Clean up
9. Take photos for manual

Before leaving the site, double check everything on this list.

This document, *Logger Installation*, is available in the Groundswell Kit.

## Training New Volunteers

This guide will take the coordinator through the important information which must be passed on to volunteers. Volunteers will gain an understanding of the project, and the value of following steps carefully and keeping good notes. (The document *Example Field Form* is also available in the Groundswell Kit)

### On-Site General Training Checklist:

#### Must Bring:

- Laptop with software and drivers uploaded
- Well cap
- Lock and key
- Water level recorder
- Datalogger and barologger and cords
- Field form
- Manual and quickstart guides
- Camera

Contacts and numbers for property owners: \_\_\_\_\_

Contacts and numbers for participants: \_\_\_\_\_

#### Schedule:

##### 1. Opening the Well

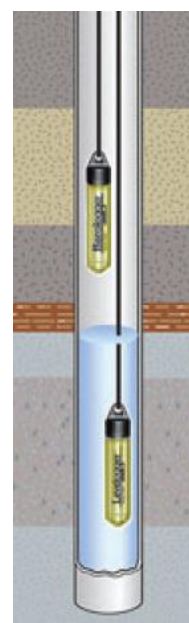
- Discuss accessing the well, provide contact information of property owners, make sure they are aware of your site visits.
- Discuss the construction of the well, and any specific details about the well (unused pump, extra casing, etc).
- Allow volunteers to open the well (take photos and videos).
- Review the information found in the manual (contact persons for help, maps, before you head out, and uploading steps). Encourage notes on the manual (reminders, site specifics, etc)

##### 2. Manual Water Level Measurement

- Review operation and care of the WLR
- Review and fill out the field form
- Following the steps in the manual, take a water level measurement, and record the value on the Field Form
- Put away the WLR

##### 3. Uploading Data

- Review the configuration of the loggers in the well (see attached)
- Set up laptop station
- Follow directions in manual, allowing volunteers to lead
- After upload, review monitoring data graphs



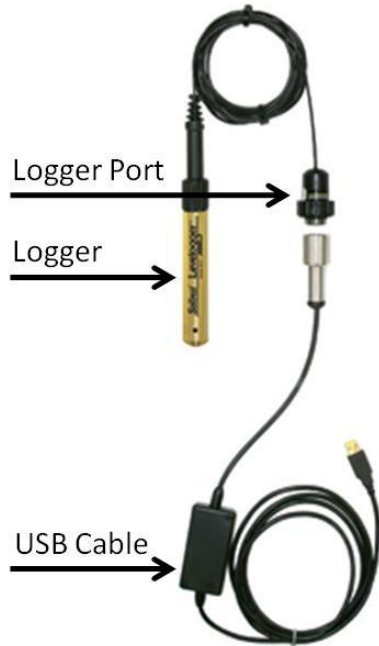
#### 4. Cleaning up

- Disconnect from loggers, follow instructions for compensation
- Reassemble logger and well caps, clean up site
- Discuss future monitoring schedule (how often), sharing and storing of data (keep safe, don't stockpile)

This document, *Volunteer Training*, is available in the Groundswell Kit.

## Components

Datalogger



Water Level Recorder



Note: dataloggers are **never removed from the well**. They have already been installed, so you don't have to take them to or from the site. You will not see the logger because it is suspended in the well. You will only see the logger port, sticking out of the top of the well after it is opened.

Keeping records is extremely important in community based monitoring. This document should be brought into the field for monitoring events, and be filled out in detail. (This document, *Example Field Form*, is available in the Groundswell Kit)

# Groundwater Level Recording Field Form

Groundswell ID: \_\_\_\_\_ Date: \_\_\_\_\_

Time (24 hour): \_\_\_\_\_ Weather: \_\_\_\_\_

Data Downloaded File name: \_\_\_\_\_

Water Level Recorder Measurement: \_\_\_\_\_

Comments:

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Technician Name(s): \_\_\_\_\_