Groundwater Data for New Hampshire

Stephen Roy, Brandon Kernen, Diana Morgan, Christine Bowman

NHDES Drinking Water and Groundwater Bureau Source Water Protection Section

March 2014
Where Does NH get its Drinking Water From?

Sources of Drinking Water in New Hampshire

- Public Groundwater Supplies 20%
- Private Groundwater Supplies 40%
- Potentially ~90% Bedrock Wells

~2,400 PWSs in NH
~750 CWSs in NH

~2,400 bedrock wells
~600 strat-drift wells

An Act establishing a committee to study water resources.

### Purpose - To Study:
- Water Resources
- Desalination
- Future Municipal Water Needs

#### SB 162 – 2005 Summary Report:
Identified 12 primary water ‘information need’ projects; ranked projects:
- **High Priority for All**
- **High Priority**
- **Important**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Importance</th>
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<tr>
<td>Identify Ground Waters Areas of Concern from a Water-quality Standpoint by Linking Water Quality Information to Location</td>
<td>Put a unique identifier on new wells when they are drilled and have labs ask for this information so that results can be linked to a location. Estimate locations for existing wells with water quality data using procedures developed by NHGS. Ground water is increasingly being used as a source of water supply for community water systems and private residences. However, a host of naturally and manmade contaminants have been found to occur in New Hampshire, potentially putting users of this water at risk from a health perspective. At the same time, ground water samples are being taken from wells all over the state on a daily basis. If the results were linked to a location the state could be proactive in identifying and addressing areas susceptible to both ambient (e.g. arsenic, radon, etc) and man-made contaminants (e.g. MTBE), including emerging contaminants.</td>
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<tr>
<td>Ambien Well Network - Ambient water level data</td>
<td>Expand the current well network of shallow wells to include monitoring of bedrock water levels and instrument all wells for real time presentation of water level data.</td>
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<tr>
<td>GIS Data Layers - For a variety of water related analyses</td>
<td>Obtain 2 high-resolution data layers of importance to a variety of regulatory and policy decision making: Land Use Cover and Land Elevation. The occurrence, movement and quality of water resources are highly dependent upon land use, land cover and the slope of the ground. These data layers will allow regulators and scientists to better quantify impacts to the quality and quantity of water in our watersheds.</td>
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<tr>
<td>Development of a well network to monitor ambient ground water quality trends and causes (Note: linking water quality to well data as described in the second row above would greatly assist in this effort). Establishing this network allows for the collection of data over time to establish areas of water quality.</td>
<td></td>
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</table>
Senate Bill 155 [2003]: Commission to Study Issues Relative to Groundwater Withdrawals

The “Groundwater Commission”
(2003 – 2010)

Addressed Seven Study Issues:

1. Review Groundwater Withdrawal Permitting Process
2. Clarification of Groundwater Quantity Law and Legislative Authorities
3. Review Establishment of a Hierarchy of Groundwater Users
4. Review Fee on Commercial Consumptive Use of Groundwater
5. Protecting Groundwater Quality to Ensure Availability
6. **Identify Groundwater Management Data Needs**
7. Appropriate Roles for Municipalities in Permitting and Regulating Groundwater Withdrawals [2008]
FINAL REPORT OF THE GROUNDWATER COMMISSION

Chapter 305, New Hampshire Laws of 2003
Chapter 287, New Hampshire Laws of 2005

November 2010

See: www.nhgroundwater.com for commission report(s)
SB 155 – Groundwater Commission

Issue No. 6: **Groundwater Management Data Needs - Report**

1. Identify and review statewide summaries of current data and data needs analysis and review the Seacoast Groundwater Availability Study.

2. What data is needed to effectively manage groundwater resources? Do we have it? If not, how do we obtain it?

3. Is the existing monitoring network consisting of 26 overburden wells and 13 bedrock wells measured monthly for water level data sufficient? If not, why?

4. Is there a need for ambient groundwater quality data?

5. Should the current stream gage network be maintained and or expanded? How should stream gauging be funded and who should complete the work?

6. Is there a need to link water quality data to location and, if so, is well tagging the way to do it?
Expansion and enhancement of the statewide groundwater level monitoring network is priority data needed to effectively manage groundwater resources in NH.
SB 155 – Groundwater Commission
Issue No. 6: Groundwater Management Data Needs - Report

- Breaks state into 3 districts by:
  - Water Use
  - Population Density
  - Water supply well density
  - CWS density
- Prioritizes High Intensity Use areas
- Establishes total number of sites, distribution, site type, installation, instrumentation, cap/ops budget.
Early Groundwater Level Monitoring Network

Majority of wells were ‘adopted’ from USGS Stratified Drift mapping project in early 1990s

Majority of monitoring completed by NHGS staff
One-time appropriation to NHGS added nine bedrock wells at five locations on state lands (2009)

Through DWGB, added:

i. Twenty wells in Hubbard Brook (USFS)
ii. Six wells in Seacoast Region [Great Bay area]
iii. Six wells in SE New Hampshire

Current Groundwater Level Monitoring Network

- 68 Locations
  - 36 BRW, 32 OVB
- Visited Monthly
- Monitored by:
  - NHGS staff
  - DWGB staff
  - Volunteers

- One-time appropriation to NHGS added nine bedrock wells at five locations on state lands (2009)
- Through DWGB, added:
  i. Twenty wells in Hubbard Brook (USFS)
  ii. Six wells in Seacoast Region [Great Bay area]
  iii. Six wells in SE New Hampshire
- All historic monthly data
- County-based scalable map
- ‘Quick view’ normalized color scheme
- ‘Point and Click’ downloadable data
- Data stored in the NWIS system
Current Groundwater Level Monitoring Network
– *Increased Data Resolution*

- DWGB / NHCP grant to instrument Seacoast wells: Water Level / Conductivity loggers.
- DWGB Emergency Planning Grant from HSEM (2010) to update NH Drought Management Plan and equip more wells with pressure transducers.

- Local/regional land use impacts
- Locations for long term monitoring
- Identify Drought Indicator network
- Track conditions of stressed basins
**Large Groundwater Withdrawal Permitting Program**

- LGWP program started 1998
- Applies to all withdrawals >57,600 gpd
- 31 permits issued
  - 57 sites with gw level data
  - 23 sites pending gw levels

**LGWP PROCESS REQUIRES:**
- Geologic Conceptual Model
- Long-term Pumping Test
- Groundwater Level Monitoring pre-, syn-, and post-pumping test
- Impact assessment on other water users (supply wells) and water-related natural features
- Permit with long-term monitoring conditions

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**Large Groundwater Withdrawal Permit - Groundwater Level Monitoring**

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<td>Permittee</td>
<td>Town of Epping Water and Sewer Department</td>
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<td>Station Name</td>
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<td>Local Aquifer</td>
<td>Bedrock</td>
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<td>Well Depth</td>
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<td>Top of Casing Altitude</td>
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[Graph showing groundwater level monitoring data with a trend line and trigger levels.]
NHDES – Environmental Monitoring Database (EMD)

- Online database with integrated query
- Stores high resolution datalogger files for DWGB monitoring points and LGWP sites
- Searchable, multiparameter index, retrieves data in Excel or sep. variable format, delivers results by email.
- Spatially referenced so linked to DES’ Onestop GIS online.
- Pretty darn handy

Groundwater Level Projects in EMD:
NHGWMN
LGWP Monitoring Data

Groundwater Quality Data

PWS Chemical Compliance Database largest WQ source in bureau

- ~1970 - Program started
- ~1974 SDWA
- ~1977 Bureau formed
- ~300+ systems
- Mid 1980s elec. Data storage
- 1980s – 2010
  Elec. Data storage protocol varies.
  - 2011 Elec data storage submission mandate

- Very Large database
- Receives data every day
- Raw data not accessible from outside, pdf only
- FOIA request data only
- Coordinated queries with:
  Laurie.Cullerot@des.nh.gov

Substantial Chem. Compliance Monitoring Requirements

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<th>Frequency</th>
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2009 – Bureau starts a file system optimization / paperwork reduction project
Groundwater Quality Data – Legacy Data II

Pumping Test Water Quality Data
Groundwater Quality Data – Legacy Data II

Pumping Test Water Quality Data

Maximum Drawdown Observed During Pumping Test = 13.96 feet

Pre-pumping Water Level = 174.15 feet above MSL

- IOCs
- VOCs’
- SVOCS
- Rads
- Bio

Cumulative Time Since Pumping Test Began (days)
Criteria for data entry

I. Raw Water Samples Only
II. Known Location
III. Inorganics only

Total: 3,722 stations (sites)

Two EMD Projects:
- OLDH2OCHEM
- PTCHEM
Groundwater Quality Data – Legacy Data

Example: Town of Windham
Groundwater Quality Data – Legacy Data

Example: Town of Windham – PWS wells
Groundwater Quality Data – Legacy Data

Example: Town of Windham – PWS wells + PT chem
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Groundwater Data

Lots of other Groundwater Data Sources……

- **Hazardous Waste Bureau**: Site files – Water quality, field screening, water level data - Onestop electronic documents; select program presence in EMD; paper files.
- **Water User Registration Program**: Water use data by source and destination – Onestop tabular data.
- **Well Construction Records**: Well completion details, limited formation data – Onestop electronic reports; paper files.
- **NHGS**: Geologs data, well, water level, water quality, hydrograpy, surficial material, bedrock mapping products – Some data available through Granit, electronic data available for request.
- **Granit**: various GIS data.
- **USGS**: Streamflow data, hydrogeo reports, aquifer studies, modeling studies, water resource favorability studies, water use studies, special groundwater contamination studies – formats vary
- **USDA, USFS, NOAA, etc.**