

October 14, 2020

Brookline, NH Planning Board PO Box 360, 1 Main Street Brookline, NH 03033-0360

Brookline NH Water and Well Committee

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Chris Duncan (Planning Board Representative)

RE: Brookline NH Water & Well Committee Report

Introduction:

From 2017 through 2019 twelve residential homes were constructed along the southern portion of Russell Hill Road in Brookline, New Hampshire. A private water supply well, drilled into bedrock, was also installed for each of these homes. In 2019, several of the newly-constructed homes experienced a number of issues with their water supply, including a decrease in yield in their wells. No available stored water was observed in the well following lowering of submersible pumps at two homes within this development. In some instances, pumps could not be lowered further because of pump or drop pipe limitations, or because the static water level had dropped below the base of the well.

During this time, development of a lot at the north end of West Hill Road had also been proposed to the Planning Board and additional homes on the west side of Russell Hill Road were in various stages of construction. These additional Russell Hill Road homes were adjacent to those homes experiencing water well issues on Russell Hill Road. Concerns were raised that newly-drilled wells associated with these development may negatively influence, via fracture connectivity, existing private water supply wells.

The Brookline Water and Well Committee (WWC) was formed in early 2020 because of reports of private water wells in this region of Brookline experiencing these issues. During the February 20, 2020 planning board meeting, the above members were appointed to the WWC to further investigate the occurrence of well issues and to consider new rules and ordinances related to water supply in Brookline.

It should be noted that abnormally dry conditions in New Hampshire were recorded in June 2020 which affected private water wells outside of Russell Hill and West Hill Road developments referenced above. As of October 13, 2020, dry conditions have progressed into an extreme drought (Stage D3) encompassing 22 percent of the state, while the majority of the state remains in a state of severe drought (Stage D2; US Drought Monitor, 2020). These drought conditions have further elevated the importance of the WWC's mission and have partially influenced the selection and language of the proposed ordinances contained in this report.

Based upon WWC members' research, discussions with state agencies, planning commissions, hydrogeologists, and local vendors, the WWC has proposed two ordinances. The WWC believes these ordinances will provide a degree of assurance that newly-constructed, private water supplies, will maintain a sustainable yield. Each of the proposed ordinances below is preceded by background and followed by supporting information. This report concludes with a number of items that should be

considered under future water-related committees in Brookline.

Proposed Ordinance No. 1

In response to concerns of the new development on the north end of West Hill Road potentially exacerbating existing water supply issues on Russell Hill Road, concerned stakeholders requested a hydrogeologic study of the area to further determine the potential effects of the new developments. The November 19, 2019 Nobis Engineering, Inc. (Nobis) report details the results of this study (Nobis, 2019).

The Nobis report was reviewed with multiple consultants and vendors to determine the usefulness of similar studies in evaluating an adequate water supply for future, proposed developments. In general, those interviewed were proponents of a high-level hydrogeologic study for this purpose. No one interviewed stated such a study would guarantee a long-term source without potential for running dry.

The below proposed ordinance was discussed with the Nashua Regional Planning Commission (NRPC). The NRPC suggested that the ordinance be incorporated into the Brookline subdivision regulations. This would require consideration of the ordinance during site plan or subdivision review by the Brookline Planning Board.

As a result of these discussions, the below ordinance has been proposed to the Brookline Planning Board.

A baseline hydrogeological study is to be required for a proposed development of more than one residence. This study is to conclude the likelihood of a long-term yield of a private water supply for future residences. The following items are to be included as part of the study:

- *a review of surficial and bedrock geologic maps at minimum scale of 1:24,000 as available; ● review of well yields within a 500-foot radius of the proposed development boundary if no more than two lots are proposed. If greater than two lots are proposed, the well survey radius shall extend to 1,000 feet;*
- *a fracture trace study (ie, a photo-lineament study) at a representative scale; and, ● a professional opinion by a licensed professional geologist registered in the state of New Hampshire on the likelihood of an adequate water supply for each proposed residence.*

Some towns have requested hydrogeological studies for proposed developments. These have typically been paid for by the developer. These towns are Bedford, Bow, and Kingston, New Hampshire (PlanLink, 2019). Research by WWC did not locate any New Hampshire town where a baseline hydrogeological study was part of a town ordinance or rule.

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On September 10, 2020, David Macclean, PG of GeoInsight, Inc. was interviewed as part of the WWC research into the proposed ordinances. Mr. Macclean suggested that the term, “hydrogeologic study” be defined so that a specific minimum standard is established for studies performed under the ordinance. On September 14, 2020, another environmental consultant was also interviewed who suggested the term, hydrogeological study, be defined for similar reasons. A definition has not yet been provided, however, the items to be included in the study are included in the proposed ordinance.

Proposed Ordinance 2

Research conducted by the WWC noted that a number of private supply wells drilled in town from 2010 to 2019 had exceptionally low measured yields during their installation. It was also noted that the State of New Hampshire does not regulate minimum yields of private water supply wells (NHDES, 2019; Attachment 1). Minimum yield guidance only exists as recommendation documents from the New Hampshire Water Well Board (5 gallons per minutes for two hours or total capacity of 600 GPM in a two hour period) and the New Hampshire Water Well Association (4 GPM for four hours).

In the absence of state regulations, several towns have enacted ordinances to require that during well construction, minimum yields be assured based upon the above guidance. The towns of Pelham, Windham, and Hempstead, New Hampshire are examples of towns that have established yield standards for newly-drilled wells.

The NRPC recommended that any yield testing standards adopted by the town be enacted as a zoning ordinance. A yield test would be required prior to the issuance of a certificate of occupancy and could be monitored and/or approved by the town building inspector. Including yield testing as a zoning ordinance would apply to all lots regardless of whether subdivision is proposed.

During research, the WWC also noted instances of dried wells where the well depth could have permitted lowering of the pump into the lower static water level. However, pump lowering would not be effective due to the existing pump or piping limitations. Piping and pump sizing are also addressed in the proposed ordinance.

As a result of the above research, the WWC proposes the following ordinance which is based upon those established by the Town of Pelham Board of Health (Attachment 2):

The probability for a long-term sustainable yield from a single private well should be further qualified by establishing yield standards to meet or exceed those established by the NH Water Well Association.

All wells shall be pump tested regardless of depth to determine sustained yield. The sustained yield shall be not less than four (4) gallons per minute over a four (4) hour period. In all cases the pump test shall be completed using a submersible pump. Groundwater level measurements shall be recorded immediately before the start of the pump test for static groundwater level, and at least once every thirty (30) minutes during the pump test. In addition, the static groundwater level shall be measured within twenty-four (24) hours after the pump test and shall demonstrate water level recovery after the pump test to at least ninety percent (90%) of the pretest level. All results from pump testing must be certified by the tester (ie, New Hampshire-Licensed Well Driller under RSA 482-

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B) and so evidenced on the State of New Hampshire Well Completion Report to be provided to the building department.

No Certificate of Occupancy will be issued until all the provisions of these regulations have been met, or contingencies have been made, or duly waived by the Board of Health.

Well pump sizing, drop tube construction, and storage tank capacity must be appropriate for the well drilled, anticipated occupancy and use of the residence, and take into consideration periods of moderate to severe drought. As such, the depth of the pump should be equidistant between the static water level and the bottom of the well.

Members of the WWC had discussions with Roger Skillings of Skillings and Sons, and representatives of

NH Water Well Association, and Capital Well Clean Water Center, Inc. As noted above, it was confirmed by these representatives that several towns had established ordinances where, prior to receiving an occupancy permit, the well must undergo a yield test to ensure the water yield is adequate.

The proposed well pump sizing, pump depth setting and piping language is included in the ordinance to encourage builders to consider periods of drought and future development when setting internal well components and piping. In one instance, a well was drilled to a depth of approximately 1,500 feet below grade and the pump was installed and set at 200 feet. The static water level subsequently dropped from 118 feet to 440 feet BGS. The homeowner then had to repeatedly hire a contractor to lower the pump as the static water level continuously dropped naturally (Machado, 2020). This could have been prevented if the pump was originally set at a depth that took into consideration periods of drought or, at a minimum, the maximum allowed pump depth based upon piping and pump capacity.

Additional Items

The following items were discussed throughout the WWC's tenure but were not researched. These items should be considered under future WWC committees.

- Consider applying for federal or state grants that would support town-wide hydrogeological studies and/or cost and feasibility study of a public water supply for the town;
- Continue to engage with the Nashua Regional Planning Commission to develop GIS maps that reflect town areas of high or low risk relative to water supply;
- Initiate a survey via the town website to track private water well issues. Data will be tracked by the Brookline Conservation Committee to monitor areas of concern;
- Complete a town-wide hydrogeological study;
- Define the hydrogeological study;
- Irrigation ordinances (ie; consider restricting systems in areas where historical well problems have been identified in the past. Alternatively, consider requiring that new or existing homes wishing to install an irrigation system should demonstrate that their current well is adequate or provide documentation that shows another well for irrigation use has been dug, or current well has been upgraded to handle the additional burden;
- Installation or monitoring of existing bedrock wells to assess regional drought conditions;
- Consider creating a groundwater aquifer protection district;

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- Consider language for a shared well serving two or more residential homes;
- Consider language is present that ensures well radius (75 feet) is within property boundary;
- Add language to town master plan to include protection of water resources.

Closing Comments

It is recommended that a WWC continue to be commissioned in order to research the above additional items and provide a point of contact to discuss other well water-related information to the Planning Board.

References:

Nobis Engineering, Inc. Letter Report: Hydrogeologic Overview and Well Interference Assessment,

November 2019.

PlanLink, 2019; Responses to questions posed by the Brookline Planning Board in September and November 2019.

Machado, 2020; Personal discussions with Brookline, NH resident experiencing water well issues. US

Drought Monitor, 2020; <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?NH>

Attachments:

1. 2019 NHDES Document WD-DWGB-1-8; Recommended Minimum Water Supply Capacity for Private Wells
2. 2013 (Ammended) Town of Pelham-Board of Health: Residential/Commercial Water Supply Regulations – Well Ordinance for New Construction.

ENVIRONMENTAL Fact Sheet



29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-DWGB-1-8 2019 Recommended Minimum Water Supply Capacity for Private Wells

One of the most important factors to consider when planning to purchase or build a home is the adequacy of the water supply. The amount of water available to the home can be as important as the quality of the water. How much water is adequate for a private domestic supply is a commonly asked question of NHDES and the Water Well Board. Please note that the State of New Hampshire does not regulate how much water a private well shall yield. Some towns have adopted ordinances requiring

private wells produce a specific amount of water prior to issuing occupancy or building permits; check with your local authority to find out more.

Available water supply is a function of both the recovery rate and the storage volume of the well. These two factors contribute to the actual capacity of the supply particularly if the well recovery rate is low. A standard 6-inch diameter drilled well can store 1½ gallons of water per foot of well depth. The actual volume of water in storage will depend on the water level in the well and the pump setting depth.

The Water Well Board suggests that a minimum water supply capacity for domestic internal household use should be at least 600 gallons of water within a two-hour period once each day. This is equivalent to a flow rate of 5 gallons per minute (gpm) for two hours. Alternatively, the New Hampshire Water Well Association recommends a flow rate of 4 gpm for a period of four hours as an optimum water supply capacity for a private domestic supply. This volume is equivalent to 960 gallons of water within a four hour period. Some homeowners may find these amounts to be less than desirable depending on the size of the family and/or if outdoor use is a requirement.

The following tables were developed to assist readers to interpret the recommendations above. In both tables, the overall yield is the sum of the aquifer yield to the well and the available well storage. The tables presume a pump setting of 20 feet above the bottom of the well and a static water level of 20 feet below the ground surface. However, a pump can be set anywhere in the well and the static water level changes over time.

Contact a licensed water well contractor or licensed pump installer for information about pumping tests and available options for increasing the capacity of inadequate supplies. Also see fact sheet WD-DWGB 1-13 “Determining the Reliable Capacity of a Private Water Supply Well and Pumping System” for more information.

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Recommended Minimum Capacity

The values in Table 1 provide a yield of 600 gallons of water to the home during a period of two hours of pumping.

Table 1. Supply 600 gallons in Two Hours

Sustained Well Yield (gpm)	Required Well Depth (ft)
0.5	400
1	360
1.5	320
2	280
2.5	240
3	200
3.5	160
4	120
4.5	80
5	---

Recommended Optimum Capacity

The values in Table 2 provide a yield of 960 gallons of water to the home during a period of four hours of pumping.

Table 2. Supply 960 gallons in Four Hours

Sustained Well Yield (gpm)	Required Well Depth (ft)
0.5	600
1	520
1.5	440
2	360
2.5	280
3	200
3.5	120
4	---

For More Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwginfo@des.nh.gov or visit our website at www.des.nh.gov.

Note: This fact sheet is accurate as of September 2019. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

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TOWN OF PELHAM

Office of the Selectmen

Town Hall Tel: (603) 635-8233 6 Village Green Fax: (603) 635-8274 Pelham, NH 03076 selectmen@pelham-nh.com

BOARD OF HEALTH RESIDENTIAL/COMMERCIAL WATER SUPPLY REGULATIONS – WELL ORDINANCE FOR NEW CONSTRUCTION

**Adopted May 16, 2000
Amended February 20, 2001
Amended June 5, 2001
Amended August 6, 2013**

The Board of Health of the Town of Pelham, N.H., acting under RSA 147, has, in the interest of and for the preservation of the public health, and to provide for adequate and safe wells, duly made and adopted, on May 16, 2000 and revised August 6, 2013 the following regulations:

SECTION 1: Definitions

1. WELL: Includes any pit, pipe, excavation, casing, drill hole or other source of water to be used for any purpose of supplying potable water within the Town of Pelham, NH.
2. WATER SYSTEM: Includes pipes, valves, fittings, tanks, pumps, motors, switches, controls and appurtenances installed or used for the purpose of storage, distribution, filtration, treatment or purification of water for any use whether or not inside a building.
3. DWELLING UNIT: One (1) or more rooms arranged for living and sleeping purposes with cooking and sanitary facilities for the use of one (1) or more individuals living as a single housekeeping unit.
4. NEW CONSTRUCTION: A new residential dwelling or commercial structure which has not been granted a Certificate of Occupancy. This excludes the expansion or replacement of existing residential or commercial structures erected prior to August 6, 2013.

SECTION 2: Wells

1. No well shall be installed for new construction until a building permit has been issued by the Health Officer or Deputy Health Officer. The fee for this permit shall be \$25.00.
2. The well contractor licensed under RSA 482-B shall observe reasonable sanitary measures and precautions in the performance of his/her work in order to prevent pollution or contamination of the well.

3. For new construction, there shall be a separate well for each individual parcel except in the case of water systems operating under a New Hampshire State Public Utilities Commission franchise, private water systems owned by a homeowner's association or wells serving commercial structures.
4. All wells for new construction shall be set back a minimum of seventy-five (75) feet from all septic tanks and leaching fields. Additionally, all wells for new construction shall be set back fifty (50) feet from the nearest edge of all existing traveled ways or rights-of-way and a minimum of seventy-five (75) feet from all lot lines (to avoid property encroachment) unless a Standard Release Form for Protective Well Radii has been executed and recorded by the owner of the well. The distance from a well to a septic tank may be reduced to fifty (50) feet if the sewer line meets a SDR rating of 26 or better, and the septic tank is sealed and grouted to prevent infiltration and exfiltration.
5. Burial of tree stumps, brush, and or construction materials shall not be located within the protective well radius.

SECTION 3: Capacities

1. Every well must supply adequate water for the purpose for which it is intended.
2. All wells shall be pump tested regardless of depth to determine sustained yield. The sustained yield shall be not less than four (4) gallons per minute over a four (4) hour period. In all cases the pump test shall be completed using a submersible pump. Groundwater level measurements shall be recorded immediately before the start of the pump test for static groundwater level, and at least once every thirty (30) minutes during the pump test. In addition, the static groundwater level shall be measured within twenty-four (24) hours after the pump test and shall demonstrate water level recovery after the pump test to at least ninety percent (90%) of the pretest level. All results from pump testing must be certified by the tester and so evidenced on the well data sheet provided to the building department.
3. Every well that has been deepened or hydro-fractured to increase its sustained yield after being drilled and / or initially tested shall be pump tested in accordance with section 2 above after the deepening or hydro-fracture effort to meet pump test requirements of this section.

SECTION 4: Water system

All wells to be used as a water source shall be designed, constructed, and satisfy all requirements set forth in pertinent State of New Hampshire, Department of Environmental Services Drinking Water and Groundwater Bureau and the New Hampshire Water Well Board, regulations as they exist, may be established, or may be amended in the future.

SECTION 5: Certificate of Occupancy

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*Town of Pelham
Water Supply Regulation – Well Ordinance
Amended 8-6-13*

1. No Certificate of Occupancy will be issued until all the provisions of these regulations have been met or duly waived by the Board of Health in accordance with Section 6 of this ordinance.
2. A completed well data report including drilling logs must be submitted by the well driller or his agent not later than the time of requesting a Certificate of Occupancy.
3. Collection and analysis of a water sample shall be conducted by a NH Certified Well Testing Lab. No Certificate of Occupancy will be issued until a water test has been received by the Planning Department. This test shall include, but not be limited to, the following:

Test

Primary Testing (Health)

Bacteria

Nitrate & Nitrite
Arsenic
Gross Alpha
Uranium
Radon*
VOC Screen (Volatile Organic Compounds)**

Secondary Testing (Aesthetic and Other)

Iron
Fluoride
Copper
Manganese
Chlorides
Turbidity
Sodium
PH
Lead
Hardness

* Radon shall meet the NH DES recommended level of 2000 picoliters / liter.

** Please note that it takes approximately two weeks to get test results so plan accordingly. If the VOC Screen is positive, further testing shall be done to determine the type of contaminant and concentration.

4. All contaminates identified under Primary Testing in Section 3, shall be mitigated to the prevailing NH DES Maximum Contaminant Level (MCL), or with respect to Radon, NH DES' recommended level by the installation of a point of entry water treatment system prior to the issuance of a Certificate of Occupancy. A water quality test demonstrating effective mitigation to the above referenced standard shall be provided to the Planning Department prior to Issuance of a Certificate of Occupancy. Backwash from water treatment systems shall not be discharged into the dwelling's sewage disposal system unless the design is sized to accommodate the additional flow.

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***Town of Pelham
Water Supply Regulation – Well Ordinance
Amended 8-6-13***

5. The required testing and these regulations cannot be construed as a guarantee by the Town of Pelham or its agents that the water system will function satisfactorily or that all possible water quality problems have been identified and mitigated.

SECTION 6: Waivers by the Pelham Board of Health

1. The Board of Health, on the advice of the Health Officer or duly appointed Deputy and in the event of hardship, may waive any requirement of this ordinance except: Section 2, paragraph 1 (permit fee), paragraph 2 (contractor taking reasonable precautions), and Section 5 (certificate of occupancy).

2. In considering waivers the Board of Health shall consider, as a minimum:

- A. Whether the waiver adequately protects public health
- B. Whether the waiver adequately protects consumer safety
- C. Other extenuating circumstances

3. The Board of Health can impose conditions upon waivers, including but not limited to:

- A. Alternate means of mitigation, such as point-of-use devices in instances where point-of entry treatment would be unreasonably expensive to install or maintain;
- B. Consumer notices
- C. Conditions to be recorded in a deed and noted on the permit.

SECTION 7: Enforcement

Any person violating the provisions of this regulation shall be guilty of a violation.

SECTION 8: Conflict with Other Ordinances

Where the requirements of State and Local Regulations differ, the more stringent shall apply.

SECTION 9: Severability

The invalidity of any provision of this ordinance shall not affect the validity of any other provisions.