Appendix A

Drinking Water Information from Existing Documents: notes and excerpts

Drinking Water Information from Existing Documents

PVPC reviewed 11 documents and prepared the following notes and excerpts that help to characterize groundwater supply at the Dry Brook Well and articulate future plans related to drinking water supply by the Town of South Hadley.

1. 2004 – USGS Delineation of Areas Contributing Water to the Dry Brook Public Supply Well, South Hadley, MA

- This USGS analysis had its genesis in the effort to better understand the factors needed to properly delineate areas contributing water to public supply wells located in *confined aquifers* in Massachusetts. (MassDEP had already used a number of available methods to delineate areas contributing water to public supply wells for *unconfined aquifers* composed of sand and gravel, but understanding of confined aquifers had not been adequately addressed by these methods). The Dry Brook well was delineated as an example of this approach for a confined aquifer.

- At lower pumping rate (40.0 ft^3/minute) greatest sources of water to the Dry Brook Well are recharge in the Dry Brook Hill area (90%) and infiltration of CT River water in an area beyond the extent of the confining bed, where aquifer is in hydraulic connection with the river (10%).

- At a high pumping rate (122.2 ft^3/minute), about half (49%) of the well's water originated from "recharge and boundary flow," and half originated from infiltration of water from the CT River (51%).

- Extent of area contributing at higher pumping rate did not substantially change.

- The USGS analysis shows that the size of these recharge areas did change most when the recharge rate was modified. 25% decrease in recharge produced increase in the extent of the area by about 200 feet further south and east across Dry Brook Hill. 25% increase in recharge produced a decrease in the extent of the area by about 200 feet in the south and east sides of Dry Brook Hill. Most of the increased recharge will enter the aquifer from the area of Dry Brook Hill because this is where the soils are most permeable.

- Because of steep slopes and thin soil cover, much of the precipitation occurring on the Holyoke and Mount Tom Ranges runs off quickly during and immediately after precipitation. On Dry Brook Hill, however, much of the precipitation infiltrates through the sandy soils on the higher elevations of the hill. Lacustrine silts and clays (varves) that impede infiltration occur along the flanks and lower elevations of the hill, creating surface runoff during precipitation.

- Glacial deposits overlie the bedrock surface and range from a few feet to more than 250 feet thick in the study area.

- Dry Brook observed to have lots of gains and losses in flow along its length. All flow was lost at the point where Dry Brook reaches Route 47 on day of observation. Observations of gains and losses along Dry Brook indicate a significant interaction between surface and ground water along Dry Brook, most of the lower reach of Dry Brook is underlain by varved lacustrine sediments, which are exposed in the streambed just north of Route 47. Most likely much of the water that infiltrates along the lower reach of Dry Brook flows laterally through the alluvial materials in the streambed as underflow to discharge to the Connecticut River at the confluence. It is also possible, however, that some water from Dry Brook infiltrates to and through the fractured bedrock and lacustrine sediments to recharge the sand and gravel aquifer at depth.
- Elmer Brook flows along the eastern flank of Dry Brook Hill and drains 4.0 mi^2 at its confluence with Bachelor Brook. Streamflow measurements indicate that Elmer Brook did not gain or lose much water under the hydrologic conditions on that date along the reach that runs from north to south along the east side of Dry Brook Hill. Elmer Brook will gain substantial amounts of water from surface runoff during rainfall because the lacustrine sediments exposed in the streambed and in the hillside above the brook will limit infiltration. These sediments also likely cause the small change in streamflow because they transmit and discharge small amounts of ground water during periods between rainfall events, and much of that flow would be lost as evapotranspiration to the heavy vegetation on the slopes above the brook.
- Bachelor Brook is the largest stream in the study area. It flows along the southern flank of Dry Brook Hill and drains about 32 mi^2.

- Ground-water levels vary seasonally, with highest levels in the late spring and lowest levels in early fall. This pattern of ground-water levels is caused by increased recharge rates during the period from late fall through spring when evapotranspiration rates are lowest. The seasonal variation in ground-water level can be seen in data from a nearby USGS observation well completed in a glacial outwash aquifer in Granby, MA (fig. 9; Socolow and others, 2002).

- The stage of the Connecticut River also affects ground-water levels in the study area. The continuous measurement of water levels in well SUW-81 near the river, and the variations in stage of the Connecticut River at the Montague station about 22 mi upstream of the Dry Brook area. The stage of the Connecticut River adjacent to Dry Brook Hill would be expected to follow the rise and fall in river stage at the Montague station with a 1- to 2-day time lag in stage response….The good correlation between these two hydrographs indicates a hydraulic connection between the ground-water system under Dry Brook Hill and the river.

2. 2003 - Source Water Assessment and Protection (SWAP) Report for South Hadley Fire District No. 2 (November 2003) Massachusetts Department of Environmental Protection.

South Hadley Fire District No. 2 serves the northern section of Town and receives its water from one groundwater source, Dry Brook Well. Dry Brook Well is located along the Connecticut River near the Hadley town line. The District is proposing to install a well within 50 feet of the existing well as a mechanical backup to Well #1.

The well (1275001-04G) is an artesian, gravel packed well that is approximately 112 feet deep. The well utilizes water from a confined to semi-confined, sand and gravel aquifer located within a buried, bedrock valley. The bedrock valley, is comprised primarily of sedimentary (sandstone) and volcanic (basalt) rocks of the Hartford Basin, that was somewhat deepened by advancing glaciers and were later filled in with sand and gravel from the receding glaciers and overlain by silt and clay from glacial Lake Hitchcock some 18,000 years before present. Recent alluvial deposits cover the entire valley area. The glacial feature located immediately south of the Dry Brook Well is a delta (sand and gravel) formed when stalled ice melted and discharged meltwater and sediment into Lake Hitchcock. The confining clay layer is primarily contiguous in the immediate vicinity of the well but is known to pinch out south of the well and to the west.

The well is located in an aquifer with a high vulnerability to contamination due to the absence of hydrogeologic barriers (i.e. clay) throughout the Zone II that can prevent contaminant migration. A hydrogeologic barrier does exist in the immediate vicinity of the well and in portions of the Zone II. The hydrogeologic barrier that does exist provides some protection relative to impeding the downward migration of contaminants from areas overlying the barrier.

Key land uses and protection issues include:
Non-conforming Zone 1
Sand and gravel mining
Residential land uses (septic systems, household hazardous materials, heating oil storage, stormwater)
Underground storage tanks (at least 1 UST located in Zone II area)
Manure spreading
Comprehensive wellhead protection planning

3. October 23, 2019 - O'Reilly, Talbot & Okun Hydrogeological Assessment Study for North Pole Estates Subdivision

Restates much of what found in 2004 USGS study, but following is new:

Initial Dry Brook Well established in 1960s and a 2nd well added after 2003 as a back up. Current withdrawal authorization is 0.68 million gallons per day (248,200,000 gallons per year).

In 2018, pumped approximately 157,204,000 gallons of water from Dry Brook Supply Wells, equivalent to 300 gallons per minute or 0.43 million gallons per day.

Site Geology and Hydrogeology - The surficial geology beneath the Site are described as thick stratified deposits of sand and gravel with relatively high permeability (A USGS geologic cross-section is included as Figure 4). The bedrock surface undulates and the Site is shown situated between two deep buried bedrock valleys, the Dry Brook valley to the north and the Elmer Brook valley to the South. The bedrock surface elevation beneath the subject Site ranges from about -50 to +100 feet relative to sea level.

Dry Brook Well Construction and Geology - Dry Brook wells (PWS ID # 1275001-04G and -05G) are located approximately 500 feet north from the nearest Site boundary. The Dry Brook supply wells extend to a depth of approximately 114 feet below the ground surface, tapping a coarse sand and gravel aquifer unit that fills the buried valley with the well screens set between 100 to 113 feet below the ground surface. At the wells, the aquifer sand and gravel unit is located below approximately 20 feet of sandy flood plain alluvium, then approximately 80 feet of layered lake bottom deposits of very fine sand, silt and clay. The deepest parts of the buried valleys are located in softer sandstone, consisting of the East Berlin bedrock sandstone/shale beneath Dry Brook and the Portland sandstone/shale beneath Elmer Brook. Less permeable volcanic bedrock (Holyoke Basalt to the West and Granby Basalt to the east). The Granby basalt below the Dry Brook Hill/quarry study area forms a buried hill between the two buried valleys.

Yield, Performance and Current Production - The District No.2 water department supplies water to the northern half of the town, while District No. 1 (which gets its water from the Quabbin Reservoir) supplies the southern half of the town. Currently, in the event of an emergency or shortage, there are approximately seven interconnections between the District No. 1 and District No. 2 water supply lines.

District No. 1 and District No. 2 have a Water Management Act Registration of for a total authorized system withdrawal of 0.68 million gallons per day (including all wells and surface water sources in the town combined). The South Hadley District No.2 Water Department operates the Dry Brook wells. Aquifer tests have successfully been performed on the supply wells at rates up to 1,080 gpm. The USGS study discussed above relied on data collected from a 10-day aquifer test performed at a withdrawal rate of 914 gallons per minute. The simulations run by the USGS indicated that the area, which contributes water to the Dry Brook wells, actually increases in size around Dry Brook Hill at lower pumping rates (300 gallons per minute).

The USGS simulations indicate that at higher pumping rates, infiltration from the Connecticut River contributes a greater percentage of water to well withdrawals.
In 2018, approximately 157,204,000 gallons of water was pumped from the Dry Brook supply wells. For comparison, the 2018 yield is equivalent to an average pumping rate of approximately 300 gallons per minute or 0.43 million gallons per day. However, in most instances, the pumps run sporadically to meet demand with actual instantaneous pumping rates in the range of 900 gallons per minute.

4. June 11, 2020 - Letter to South Hadley Planning Board from Mount Holyoke College Professor of Geology Al Werner on Dry Brook Hill

Professor Warner writes to express concerns about the proposed North Pole Estates development. He notes that over the term of his 32-year career, he has conducted research on the Dry Brook Aquifer with students, consulted with the town and worked with USGS to understand recharge in the Dry Brook Aquifer. He writes in support of the comments and responses by Weston and Sampson. He makes the following points:

- His research and the detailed study by the USGS clearly demonstrate that Dry Brook Hill is hydraulically connected to the Dry Brook Aquifer.
- The recharge modelling is highly dependent on pumping rates – as the town's need for water increases in future years pumping rates will likely increase and recharge from Dry Brook Hill will likewise increase.
- There are many other human-related contaminants that are important to consider. …Further, medical effluent from septic systems (estrogen from birth control pills, antibiotics, and even microplastics, etc.) are new threats to water quality.
- The Title 5 regulations exist to ensure that septic systems function properly, do not over-lad the surface aquifers and that there won't be adverse interaction between domestic septic systems and domestic wells. Title 5 is not meant to determine the impact that development-scale septic systems will have on a recharge area for a municipal water supply.
- The proposed development describes a storm water run off plan whereby runoff will be collected and directed into an infiltration basin. Of course, this system will work well as a way to deal with surface runoff because Dry Brook Hill is a sand and gravel recharge area and infiltration rates are extraordinarily high. But this is precisely the problem, this runoff water (and whatever it has picks up along the way) will for all intents and purposes will be part of the aquifer recharge.
- The Dry Brook aquifer has been a reliable water supply for over a half century because its primary recharge area Dry Brook Hill has remained largely undeveloped.

Development on (or in) a recharge area introduces chemicals that can and will adversely change water quality—it is not IF but WHEN.

5. March 2, 2021 - Summary of Supplemental Hydrogeologic Analyses – McLane Environmental

This supplemental hydrogelogic analysis by McLane Environmental was completed in response to concerns raised by Weston & Sampson's third party review of the Hydrogeologic Assessment Study. Concerns raised involved potential impacts to groundwater and the Dry Brook Wellfield and as such requested that certain hydrogeologic analyses be performed to address those concerns.
McLane Environmental (at the request of Chicopee Concrete), in turn, performed a series of hypothetical modeling analyses, using commercially available modeling software. Following are the assessments and results of each as reported in this memo.

1) possible future impacts to the Dry Brook Supply Well from a potential petroleum spill during grading and construction

REMFUEL Model Results:
REMFuel modeling results for <u>low</u> dispersivity conditions (Scenarios 1-2) show concentrations less than the Massachusetts Maximum Contaminant Levels (MA MCLs) for all constituents except for benzene at the Dry Brook Supply Well. The highest benzene peak concentration for this hypothetical scenario occurs under Scenario 2 at approximately 44.6 µg/L (Figure 4b in memo); Scenario 1 produces similar results with a benzene peak concentration of approximately 42.9 µg/L (Figure 4a in memo).
REMFuel modeling results for <u>high</u> dispersivity conditions (Scenarios 3-4) show concentrations below the MA MCL at the Dry Brook Supply Well for all constituents. Scenarios 3 and 4 produce similar results with Scenario 3 predicting a peak benzene concentration of 0.361 µg/L (Figure 4c in memo) and Scenario 4 predicting a peak benzene concentration of 0.364 µg/L (Figure 4d in memo).

2) potential nitrate impacts caused by residential septic systems and lawns

MassDEP Nitrogen Loading Model Results:
The results of the MassDEP nitrogen loading model analysis indicate that existing nitrate sources within the Dry Brook Supply Well Zone II Area that were considered in the model (including single-family residential homes and pastureland) may result in an estimated nitrate concentration of 0.84 mg/L at the Dry Brook Supply Well. This value is generally consistent with nitrate concentrations that have been detected in the Dry Brook Supply Well, which have reportedly ranged from approximately 0.5 to 1.2 mg/L. which 7 additional single-family homes are added, the estimated nitrate concentration at the Dry Brook Supply Well increases to 0.88 mg/L (an increase of 0.04 mg/L, or approximately 5%). This concentration is well below the MCL of 10 mg/L for nitrate. Modeling results further indicate that when accounting for a future buildout scenario in

3) potential impacts associated with snow removal and road salting within the proposed Development
4) potential impacts associated with the discharge of household chemicals to septic systems

SEVIEW Model Results
SEVIEW analyses indicate that Release Scenarios 1 and 3 for PFAS and toluene do not impact the Dry Brook Supply well for either 5 ft or 200 ft of longitudinal dispersivity (Figures 7a-d in memo).

Breakthrough curves for sodium indicate possible increased levels of sodium at the Dry Brook Supply Well but not enough to exceed the Massachusetts guidelines for residents on low sodium diets of 20 mg/L for either 5 ft or 200 ft of longitudinal dispersivity (Figures 7e-f in memo).

5) future changes to groundwater flow from increased impervious surfaces and altered groundwater recharge

AnAqSim Model Results
AnAqSim modeling analyses indicate that the changes in recharge from the proposed North Pole Estates subdivision will likely have only minor impacts on water levels beneath Dry Brook Hill. The expected water table mounding under average conditions is only 6 inches, largely because of the highly permeable sand and gravel that makes up Dry Brook Hill. A similar increase in water levels of about 2.5 inches is also predicted around the Dry Brook Supply Well, indicating that there will likely be more available water as a result of the proposed development (Figures 11a-b in memo). With a 25 percent reduction in recharge (i.e. the drought scenario), the water levels throughout the model decreased when compared to the non-drought predevelopment scenario, with water levels dropping the least near the Connecticut River and on Dry Brook Hill, where septic recharge remained constant at 440 gpd (Figures 12a-b in memo). Additionally, the area of capture for the Dry Brook Supply Well is expected to decrease in size when pumping at the maximum permitted rate of 472 gpm under both the post development non-drought and drought scenarios (Figures 11 and 12 in memo). These decreased capture areas are the result of increased recharge from septic systems at Dry Brook Hill that shifts the dividing line, between where groundwater discharges to either the Connecticut River or the Dry Brook Supply Well, slightly to the north.

6. March 8, 2021 – Comments and Observations by Stephen P. Garabedian, PhD, on the "Summary of Supplemental Hydrogeologic Analyses Proposed North Pole Estates Subdivision by McLane Environmental for Chicopee Concrete Services

Dr. Garabedian identifies several flaws in the McLane Environmental modelling:

- The above statement that the benzene plume would be diluted by non-contaminated water was not supported by a calculation of the potential dilution rate, nor an estimate made of the concentration of the supply well discharge as the benzene plume was entering the well. This was not an oversight as the REMFuel model is a one-dimensional transport model, and this reveals an inherent flaw in the modeling approach used in this study, which is that the flow around Dry Brook supply well approximates two-dimensional radially convergent flow. The modeling results in the report therefore don't answer the question: "What are the concentrations in the well water if the contaminant (benzene) plume does get to the supply well?" and it fails to fulfill the first study objective noted above.
- Further notable study results are that the peak of the hypothetical benzene plume after 1400 feet of transport is shown in figure 4b as 2.1 years (v = 664 ft/y). The conservative constituent transport time, using the values in report table 1, is 1.5 years (v = 929 ft/y). The difference between these two estimates is due to the retardation of the benzene caused by the estimated adsorption of the benzene to the aquifer materials (retardation factor = 1.4). Both transport times are indicative of the very rapid movement of potential contaminants through the aquifer. In addition, note that the plume remains above the 5 ug/l MCL for about 6 months in figure 4b. It should be noted that the velocity of the groundwater would be much greater as it gets closer to the supply well due to the converging flow inherent in radial flow to a pumping well.
- To provide some perspective on the potential of benzene as a contaminant, it should be noted that the plume simulated above was generated by a release of 95 gallons of diesel fuel containing 0.78 Kg of benzene. A calculation of how much water can be contaminated by 0.78 Kg of benzene to the MCL of 5 µg/L is 156 million liters of water, or 41 million gallons of water, the equivalent of pumping the Dry Brook supply well continuously for 95 days at 300 gpm.
- It should also be noted that although the above REMFuel simulations are characterized in the report as "worst-case" scenarios, it is entirely possible that a fully loaded fuel delivery truck could spill much more fuel than 95 gallons. Many fuel trucks contain thousands of gallons of fuel, and a potential spill of 2000- 3000 gallons would be a more likely "worst-case" scenario. In the case of a 3000 gallon spill the mass of the "worst-case" contaminant, benzene, would be increased 30-fold to about 25 Kg. This size of spill would create a much larger plume, a much greater concentration of the contaminant, and a much greater likelihood of a longer-term loss of Dry Brook supply well as a source of potable water.

7. March 17, 2021 – Weston & Sampson Summary of Peer Review of McLane Environmental Groundwater Modeling Efforts for the Proposed North Pole Estates Project

Following are key points from Weston & Sampson's summary of its review of McLane Enviornmental's analysis described in Document #5 above.

…all of the models used by McLane in its efforts were considered appropriate for addressing the Weston & Sampson concerns regarding the projection of potential impacts on quantity and quality for the aquifer and Dry Brook Well Field which could occur as a result of the proposed Development.

the respective focus of each model incorporated the possible movement (vertically above the groundwater surface and laterally) and final concentration that could occur at the Well Field. The "typical" contaminants and hypothetical releases assumed were: sodium (related to road salting and impact on the proposed stormwater management infrastructure); benzene (as the primary contaminant of concern related to possible fuel spillage related to construction equipment); PFAS (related to snow removal equipment preparation and impact on the proposed stormwater management infrastructure); nitrate (related to on-site individual wastewater disposal via septic systems); and toluene (related to household solvent discharge to on-site individual wastewater disposal via septic systems). The corresponding releases for each contaminant were conservative relative to the projected impact on the Well Field in that they assume an excessive volume and/or duration for the respective "hypothetical" release, and they do not consider the contribution of non-impacted groundwater to the Dry Brook Well Field from other parts of the Zone II WHPA.

Based on the modeling results, only benzene (related to a hypothetical equipment diesel fuel release at the Property, as close to the Well Field) was projected under conservative conditions to possibly impact the Well Field at a concentration exceeding the respective MassDEP drinking water standard. Adequate protection of the Well Field from such a hypothetical release may be afforded as part of appropriate Best Management Practices (BMPs) required of the Applicant by the Town.

we recommend that the Town consider requiring updating of the currently completed modeling efforts to determine if the currently projected impacts will adversely change in the event that future changes in the Development are proposed. Changes warranting such an update includes construction of additional housing/buildings and increase in the amount of on-site paved/impervious areas; an increase in the proposed amount of sand and gravel removal (vertically and/or laterally); and changes in water supply source (on-site versus off-site), wastewater disposal, and stormwater management infrastructure.

… the efforts utilized by McLane to model the potential impacts on the Dry Brook Well Field and the local water resources from the proposed Development are adequate and address the hydrogeologic and groundwater quality concerns that we have previously identified.

Though the McLane modeling projections indicate that generally, the currently proposed Development should not adversely impact the Well Field, the use of BMPs related to the construction and subsequent maintenance of corresponding roadways, and stormwater and individual wastewater disposal systems as a means of protecting the Well Field and further mitigating any potential for groundwater quality impacts should be considered. In addition, we recommend the Applicant should be encouraged to maintain and use for periodic groundwater level measurements and possible sampling the existing onsite observation wells (and possibly augment with one or two additional ones located along the northern property boundary) to provide detailed background hydrogeologic information in support of future use of and/or changes to the Property beyond what is currently being proposed. A description of some of the more relevant BMPs for consideration (assuming that they are not already required by the Town of the Applicant) relative to the proposed Development are:

1. Adequate measures for erosion, sediment control, and runoff related to potential fluid and fuel spillage in construction equipment storage and maintenance areas, which should be located as far as possible from the Property boundary closest to the Well Field.

2. Monitoring of construction equipment and worker vehicles for leaks should be completed daily during the site development activities. Oil-absorbing mats should be placed under equipment during periods of prolonged non-use (e.g., weekends) and storage. Repair of equipment or machinery should be performed as far as possible from the Property boundary closest to the Well Field. If on-site vehicle washing is necessary, it should be completed in an area as far away as possible from the Property boundary closest to the Well Field. Capture and off-site disposal of all rinse water should be completed as soon as possible. Off-site equipment washing and maintenance should be considered a preferred approach.

3. In the event of a spill, the on-site supervisor should be notified and required to assess the incident and initiate proper containment and response procedures immediately upon notification. Primary notification of a spill should be made to the local Fire Department and Police Department. Secondary notification should be made to a certified cleanup contractor if deemed necessary by Fire and/or Police Department. The third level of notification (within 1 hour) be made to the MassDEP or the Applicant's Licensed Site Professional (LSP). The Applicant should be required to record any spill or release including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

4. Postconstruction activities should include the distribution of educational materials to the future residents regarding the proper use and maintenance of septic systems and disposal prohibitions. The materials should include an explanation of where their water supply comes from and the significance of their residences being located in a Zone II WHPA.

5. The Town may wish to have the Applicant incorporate adequate BMPs for operation and maintenance of the stormwater infrastructure relative to the seasonal removal and off-site disposal or recycling of accumulated road salt and related sediment.

8. April 6, 2020 – Letter from MassDEP Drinking Water Program's Catherine Hamilton to Fire District #2 Superintendent Mark Aiken

This letter indicates that local protection controls, namely South Hadley's Drinking Water Protection Overlay District Bylaw, falls short of the requirements in 310 CMR 22.21(2).

9. May 2020 - Community Resilience Building Workshop Summary of Findings

Public Water Supply - The Town's current public water supply is supported by two independent water districts. District #1 serves 2/3 of residents that are reliant on public water supply and receives its water from the Quabbin (through 9 interconnections). The water is stored in two 1.5 million-gallon water tanks, one on Industrial Drive and one on Alvord Street.

District #2 serves the northern portion of Town and the remaining 1/3 of residents (150 homes) on public water supply. The District receives water from the Dry Brook Hill well on Sullivan Lane. There are tie-ins between the two districts, allowing them to support each other in emergency situations. Both districts expressed that critical infrastructure, equipment, and water mains may be susceptible to hazards, especially flooding and extreme temperatures. Upgrades to the drinking water infrastructure are necessary and ongoing—the water line on Route 116, built in the 1920s, was recently replaced. The departments have also instituted shut-off valves on both sides of bridge structures, a practice that was initiated after a storm 15 years ago dropped nine inches of rain in 24 hours. The valves allow water to be shut down from either side of the structure in the event of bridge flooding/failure or other emergency. Workshop participants were also concerned about the impact of a rising water table on water supplies. (page 5)

In addition to algal blooms, workshop participants were also concerned about the impact of climate change on drinking water. Mark Aiken from the South Hadley Water District #2, noted uncertainty regarding water quality and quantity in the future, although he has not observed any issues yet in his district. (page 7)

10. December 2020 Draft - South Hadley Master Plan

Includes objective to: Protect the community's drinking water supply and groundwater and ensure that the water supply is adequate to meet the needs of the community in perpetuity.

Relate proposed metrics for this objective are:

- Acres of land formally protected
- Adequacy of water supply for current and future needs
- Quality of water

- Enforcement of Water Supply Protection District (WSPD) regulations

Current actions indicated toward this objective are:

- Fire District 1, Board of Water Commissioners - Updating infrastructure to ensure reliability of service
- Fire District 2, Board of Water Commissioners - Advocating for water quality and protection of the aquifer
- Planning Board - Applying expanded land use regulations within the Water Supply Protection District (WSPD) to new applications; and Supporting prohibition of significant excavation in WSPD

New actions indicated toward this objective are:

- Increase land protection in the Bachelor Brook watershed, including the Dry Brook Well Zone 2.
- Permanently protect land in Zone 2 for aquifer recharge to public water supplies.

Metrics for this action are: Change in number of acres permanently protected
Responsible entities are: Planning & Conservation Department, and Water District #2

- Support the proposed investigation of the delineation of the Dry Brook watershed.

Metrics for this action are: Date investigation completed. Date action plan adopted.
Responsible entities are: FD #1 and #2, Board of Water Commissioners, Conservation Commission, and Planning Board

Priority locations for preservation: Aquifer, Bachelor Brook Watershed, including Dry Brook Hill

11. 2019 - South Hadley Open Space & Recreation Plan

Community Setting Chapter includes:

Fire District #2 is supplied by the Dry Brook wells. Due to the sensitive nature of the well supply, the Town and Fire District #2 have worked to develop a regulatory framework to protect the groundwater supply. Recently, the owner of an existing sand and gravel extraction pit was planning to expand operations within the water supply protection area. Due to opposition, the owner withdrew the special permit application that had been submitted to the Planning Board. The owner has subsequently submitted a preliminary subdivision plan for this property. The proposed 72-lot development has ignited a discussion regarding the protection of the aquifer resource.

Page 3-21 indicates:

Residence A-1 District dimensional requirements generally include:
• maximum building cover is 30%,
• maximum impervious cover is 60%,
• minimum lot size is 22,500 square feet, unless in the Water Supply Protection Overlay District - unsewered, then the minimum lot size is 40,000 square feet or

10,000 square feet per bedroom, whichever is greater, and

• for special permit use, building lots are required to be a minimum of two (2) acres.

Agricultural District dimensional requirements generally include:

• maximum building cover is 30%,

• maximum impervious cover is 50%, and minimum lot size is 30,000 square feet, unless in the Water Supply Protection Overlay District, then the minimum lot size is 40,000 square feet.

Environmental Inventory and Analysis Chapter #4 includes:

The water supplied from District #2 is pumped from the 108-foot deep Dry Brook wells located near Dry Brook Hill between Hadley Street and the Connecticut River. This well is situated in saturated sand and gravel deposits sandwiched between the approximately 80 feet of confining clay layer above, and impervious bedrock below.

In 1992 the Town set up the Water Supply Protection District (WSPD) to provide land use protections within areas that serve as primary and secondary recharge areas of groundwater aquifers and to watershed areas of reservoirs, including Lithia Springs Reservoir, which now or may in the future provide public water supply. The WSPD incorporates the MassDEP approved delineations of the Zone II and III, which represent the recharge areas for the District #2's drinking water supply wells, and includes the watershed for Lithia Springs Reservoir, which has since been discontinued.

The Mount Holyoke Range constitutes the watershed for the former Lithia Springs Reservoir and recharges the underground aquifer in the northern section of South Hadley. This aquifer supplies water for District #2's Dry Brook Hill wells. A Water Supply Protection District (§ 255-35 of the South Hadley Zoning By-Law) was established in 1992 to protect and preserve the quality and quantity of surface and ground water in this area of Town.

Fire District #2 obtains its water supply from wells on Dry Brook Hill. As development moves northerly in a more dense and concentrated fashion, the potential for development to encroach within the recharge areas of the District's wells increases. Much of the land which is the recharge area for these wells is in private ownership. Some of the existing uses, such as quarrying, have the potential to adversely impact the aquifer. A recent proposal to expand existing sand and gravel mining operations over the aquifer highlighted the potential for new development over the aquifer. While the Town has a Water Supply Protection Overlay District, this is an opportune time to review the limits and requirements of the overlay district for consistency with MassDEP requirements and to meet the Town's and District's interests for aquifer protection. Future protection of the aquifer could also include acquisition of key parcels. (4-25)

Inventory of Lands of Conservation and Recreation Interest Chapter #5 includes:

Fire District #2 is a separate public entity which provides fire protection and water service to the northern half of the town. At one time, the district utilized the Lithia Springs Reservoir as a primary water supply. Consequently, to protect that water supply, the district owned over 600 acres of land in the Mount Holyoke Range. With the district's conversion to wells as the source of their water supply, they discontinued useof the reservoir. Subsequently, in 2004, the Department of Conservation and Recreation (DCR) acquired most of this land from the district. However, Fire District #2 continues to own 84.7 acres of largely undeveloped land in South Hadley, principally:

- Mount Holyoke Range. The district owns three parcels totaling 65 acres which lie north of Pearl Street or Amherst Road. None of these parcels are used for either district operations nor retained to protect the water supply. Therefore, these parcels are considered by the district for surplus. The district is reviewing options for utilizing the lands to generate additional revenue, including the possible use of this land as a solar farm.
- Dry Brook Hill. The district owns 15 acres on Dry Brook Hill as part of the water supply system. The district's current wells are located on a portion of the property.

Analysis of Needs Chapter #7 includes:

The results of the first community forum held on February 27, 2019, identified the following areas as key for protection:

- Dry Brook Hill Area for protection of the water source/aquifer
- Farmland to increase APR and encourage farm preservation
- J.A. Skinner State Park / Holyoke Range to continue to preserve the Range
- Alvord Street to protect the scenic values
- South Hadley Falls to provide additional access along river and increase trail connectivity
- Bachelor Brook watershed (including Olesiuk Farm) to protect the watershed area

Located within the northeast corner of town is the Dry Brook Hill area. Dry Brook Hill is significant as a public water supply but development including the potential for increasing gravel mining operations and increased residential development has the potential to impact the water quality and quantity of the aquifer. Preservation of the drinking water infrastructure and the contributing recharge areas of the aquifer is a vital community need. (7-5)

Development in the western and northern areas of town can be perceived as a threat to the remaining agricultural community and the water supply of District #2. Accordingly, measures must be taken to assure retention of agricultural land and ensure that development in proximity to the water supply does not have a detrimental effect on water quality. Dry Brook Hill is the source of the District #2 water supply. Therefore, protection of the aquifer is of utmost importance. While District #2 owns all of the land within the Zone I, there are considerable lands within Zone II which should be targeted for public acquisition, either in fee or in a Conservation Easement. (7-14)

Seven Year Action Plan Chapter #9 includes:

Action: Review the Water Supply Protection Overlay District to better address protection of drinking water supply sources.
Priority rank: High
Lead responsibility: Planning & Conservation Dept.
Additional responsibility: Planning, Health, Conservation, FD#2-Water Commissioners, Selectboard, Sustainability and Energy Commission

Action: Prioritize protection of land for aquifer protection.
Priority rank: High
Lead responsibility: Planning & Conservation Dept.
Additional responsibility: Health, Conservation, FD#2-Water Commissioners, Selectboard