

**GARRISON PLACE
WATER RESERVE ACCOUNT
ESCROW AGREEMENT**

Agreement made this 26th day of November, 2018, by and between Brendon Properties Garrison Place, LLC, a Massachusetts limited liability company, with a place of business at 259 Turnpike Road, Suite 110 Southborough, Massachusetts 01772 (“Brendon”) and Leslie S. Carey, as she is Trustee of Garrison Place Condominium Trust, under a declaration of trust dated November 26, 2018 and recorded with the Middlesex North District Registry of Deeds in Book 32592, Page 157, having a mailing address of 259 Turnpike Road Suite 110 Southborough, MA 01772 (“Garrison”).

Whereas, the Town of Carlisle, through its Planning Board, has issued an “Amended and Restated Decision on Special Permit for a Senior Residential Open Space Community at 81 Russell Street For Brendon Properties Inc. (sic) To be known as “Garrison Place” dated November 28, 2016 and recorded with the Middlesex North District Registry of Deeds in Book 30912, Page 167 for the development of land located at 81 Russell St., Carlisle, MA as a Senior Residential Open Space Community (SROSC) pursuant to the Zoning Bylaws of the Town of Carlisle and the Rules and Regulations of its Planning Board (“Special Permit”);

Whereas the SROSC is shown as Lot 1 (the “Property”) on the Plan entitled “Garrison Place a Senior Residential Open Space Community in Carlisle, Massachusetts”, dated February 21, 2014 and revised through November 5, 2014, prepared by Stamski and McNary, Inc., which plan is recorded with the Middlesex North District Registry of Deeds in Plan Book 242, Page 142;

Whereas Brendon Properties Garrison Place, LLC is the owner of the Property and Declarant of the Garrison Place Condominium (for Brendon’s title see deed dated February 9, 2017 and recorded with the Middlesex North District Registry of Deeds in Book 30923, Page 27 and Master Deed dated November 26, 2018 recorded with said Deeds in Book 32592, Page 119;

Whereas, Garrison is a condominium trust established for the ownership, management and maintenance of all of the common elements of the SROSC which will be a 16-unit condominium community approved pursuant to the Special Permit;

Whereas Brendon and Garrison, along with their respective successors and assigns, including, without limitation, the owners from time to time of units in the Garrison Place Condominium, are hereinafter collectively referred to herein as “Owner”;

Whereas, the Massachusetts Department of Environmental Protection has approved the construction and use of a Community Public Water Supply System for the SROSC (the “Garrison Place Community Public Water Supply System”, hereinafter the “Water Supply System”), as set forth in an Approval Letter dated March 30, 2018, copy of is attached hereto as Exhibit A, which requires, among other things, that Garrison provide this Escrow Agreement to finance the reconstruction, operation and maintenance of the Water Supply System;

Now, therefore, for good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, Brendon and Garrison, their successors and assigns, hereby agree as follows:

1. This Agreement shall be binding on each Owner of a Unit in the Condominium, and all of the terms, provisions and conditions herein contained will run with the Property in perpetuity.
2. For purposes of this Agreement, the total installation cost of the Water Supply System is determined to be at or near \$94,610.00, which replacement funds have been estimated to be funded over time as follows:

Component: (Years)	AVG Life	Annual Reserve	Monthly Reserve	Monthly Unit Reserve
a. Drilled Well	25 years	392.00	32.67	1.31
b. Well Head Electrical Controls	25 years	100.0	8.33	0.52
c. Electric Pump, HP	7 years	257.28	21.42	1.34
d. Submersible Pump, 2HP	7 years	500.00	41.67	2.60
e. 2 Booster Pumps 3HP	5 years	1,000.00	83.33	5.21
f. Booster Pump Station Controls	5 years	3,600.00	300.00	8.75
g. 2 Pressure Tanks	10 years	200.00	16.67	1.04
h. 2 Plastic Storage Tanks	10 years	700.00	58.33	3.65
i. Master Meter	10 years	50.00	4.17	0,26
j. Piping (1inch)	50 years	67.20	5.60	0.35

k. Piping (4inch)	50 years	561.00	46.75	2.92
l. Customer Meters	20 years	520.00	43.33	2.71
m. Distribution Valves	20 years	225.00	18.75	1.17
TOTALS:		\$8,031.36	\$669.28	\$41.83

The costs associated with any improvements required to the physical structure of the Pump House which are anticipated to be minimal will be addressed by Special Assessment to the Unit Owner of Garrison.

3. Owner has herewith established an Operations and Maintenance Fund to be held by Garrison for the normal and regularly occurring maintenance of the Water Supply System in an amount which will be established each year as part of the condominium budget of Garrison, in such an annual amount as the Trustees thereof deem appropriate from time to time, which shall be used solely for such operations and maintenance.
4. Owner has herewith established a Water Reserve Fund to be held by the Garrison, in order to accumulate sufficient capital to repair and replace components of the Water Supply System at the end of the estimated useful lives thereof as set forth above, which range from five years to fifty years. The amounts set forth above were projected based upon input from Garrison's engineering consultant as reflected in an Approval dated March 30, 2018, a copy of which is attached hereto as Exhibit A.

Deposits to the Water Reserve Fund shall be made no less often than annually from the Common Charges due from the various owners of Units in the Condominium which shall occur no later one year after the commencement date of the Water Supply System operations. Such reserve, which shall cumulatively be equivalent to a sum equal to the replacement costs of the elements of the Water Supply System, shall be provided by means of deposits into an interest bearing account no less than one deposit per year. The principal and interest of said account shall be used exclusively for the replacement of the components of the Water Supply System, and related infrastructure. This provision is intended to ensure that Owner will have available to it sufficient financial resources to replace elements of the Water Supply System, provided however that the minimum endowment of the fund shall be \$94,610.00, funded and prorated over a 50-year period, and in the event that there are not sufficient funds to replace the elements of the Water Supply System, additional funds will be raised by assessment of the Unit Owners.

The Water Reserve Fund is intended to provide that adequate funds will be available to Owner to replace elements of the Water Supply System and nothing contained herein shall be construed so as to create any obligation on the part of the Town of Carlisle to perform, or arrange for the performance of, any work relating to said Water Supply System, or otherwise provide any funding for such work.

5. All funds held by Garrison under this Agreement will be held in an account fully insured by the FDIC or other government agency, with all interest to accumulate to said Escrow Account.
6. This Agreement may only be terminated at such time at the Water Supply System no longer services the SROSC. Upon termination of this agreement, all funds held under this Agreement shall be added to the general funds of the Condominium.
7. The obligations of the Owner in this Covenant are joint and several; provided, however, that Brendon shall be deemed to be released from the terms of this Agreement upon its conveyance, in an arms-length transaction to a good-faith purchaser for residential purposes, of the sixteenth (16th) and last condominium unit, and Garrison shall thereafter be exclusively responsible for the obligations of the Owner stated herein.

In Witness Whereof Brendon Properties Garrison Place, LLC has hereto set its duly authorized hand and seal this 26th day of November, 2018.

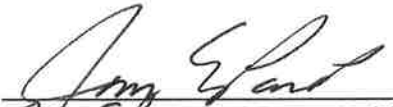
Brendon Properties Garrison Place, LLC

By: 
Brendon P. Giblin, Manager

COMMONWEALTH OF MASSACHUSETTS

Worcester, ss,

On this 26th day of November, 2018, before me, the undersigned notary public, personally appeared Brendon P. Giblin, Manager of Brendon Properties Garrison Place, LLC, personally known to me to be the person whose name is signed on this document and acknowledged to me that he signed it voluntarily for its stated purpose.

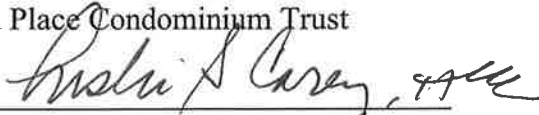

Joann E. Paradis Notary Public
My Commission Expires: 3-13-20



In Witness Whereof Garrison has hereto set its duly authorized hand and seal this 26th day of November, 2018.

Garrison Place Condominium Trust


By:


Leslie S. Carey, Trustee

COMMONWEALTH OF MASSACHUSETTS

Worcester, ss,

On this 26th day of November, 2018, before me, the undersigned notary public, personally appeared Leslie S. Carey, Trustee of Garrison Place Condominium Trust, personally known to me to be the person whose name is signed on this document and acknowledged to me that she signed it voluntarily for its stated purpose.


Joann E. Paradis Notary Public
My Commission Expires: 3-13-20

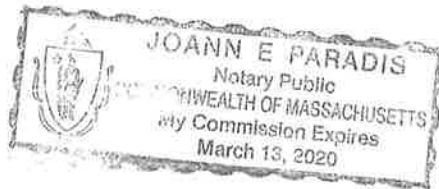


EXHIBIT A



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn F. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Snelberg
Commissioner

March 30, 2018

Kevin Giblin
Brendon Properties, LLC
259 Turnpike Road, Suite 110
Southborough, MA 01772

RE: City/Town: Carlisle
PWS Name: Garrison Place
PWS-ID No.: Not Yet Assigned
Program: System Modifications
Action: Bedrock Well--Approval--Source
Final Report/Construction Design
Transmittal Nos.: X276320, X276321

Dear Mr. Giblin:

Please find attached the following information:

Approval of the Source Final Report for a bedrock well intended to provide public water supply to the proposed Garrison Place senior housing development in Carlisle. Approval of the construction design for the Garrison Place water system, which will constitute a Community Public Water System.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this letter, please contact James Persky at (978) 694-3227.

Sincerely,

James Persky
Environmental Analyst
Drinking Water Program

Sincerely,

Sean Griffin
Environmental Engineer
Drinking Water Program

Sincerely,

Thomas Mahin
Drinking Water Section Chief
Northeast Regional Office

cc: DWP/Boston Office (no attachment)
Bruce Bouck, MassDEP, Drinking Water, Boston
Donald Provencher, Provencher Engineering, LLC, 6 Wasserman Heights, Merrimack, NH 03054
Carlisle Board of Health, 66 Westford Street, Carlisle, MA 01741

File Name: Y:\DWP Archive\NERO\Carlisle-XXXXXXX-System Modifications-2018-03-30

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-8751.

TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

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DESCRIPTION OF PROJECT

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed a September 27, 2017 submittal by the firm Provencher Engineering, LLC, that presents the Source Final Report for a bedrock well for the proposed Garrison Place senior housing development in Carlisle, and the design for construction of the Garrison Place water system. The water system serving the development will be a **Community Public Water System**, in accordance with Massachusetts Drinking Water Regulations and the Federal Safe Drinking Water Act.

MassDEP issued a Statement of Technical Deficiency on November 14, 2017, which required submittal of additional information needed to review the permit application. A response that provided the required information was submitted to MassDEP via electronic mail on January 9, 2018. A hard copy of the response was received by MassDEP on January 11, 2018.

The Garrison Place development is proposed to include 16 residential senior housing units, in the form of 8 duplexes. The water needs of the project, based on the Title 5 design flow estimate, are 2,400 gallons per day (gpd). MassDEP approved the well site and pumping test design on February 2, 2017.

The bedrock well is six inches in diameter and 700 feet deep. The well is cased to a depth of 40 feet below the ground surface, with bedrock encountered at a depth of 14 feet. The primary fracture zone was encountered at a depth of 515 to 520 feet, with a secondary fracture zone at a depth of 180 to 185 feet.

A pumping test of the bedrock well was conducted from June 14 to June 16, 2017. The well was pumped at an average rate of 5.23 gallons per minute (gpm). The pumped water was discharged about 200 feet east of the well, to a wetland adjacent to an unnamed tributary of Spencer Brook. The maximum drawdown during the pumping test was 24.65 feet below the static water level. MassDEP's stabilization criterion for a bedrock well is that a semi-logarithmic plot of time vs. drawdown, when extrapolated to 180 days, must result in at least 10% of the water column (or minimally 15 feet) remaining above the top of the pump. The well stabilized at a pumping rate of 5.23 gpm, based on the 600 foot depth at which the pump was set. Prior to the 48-hour test, a step-drawdown test was conducted on June 13, 2017, with the well pumped at 3 gpm, 6 gpm, 9 gpm, and 12 gpm for 90 minutes each.

For bedrock wells, the approvable well yield is the rate at which the well achieves stabilization, multiplied by a safety factor of 0.75. In accordance with MassDEP Guidelines, the well is therefore approvable for up to 3.92 gpm, which is equivalent to a daily withdrawal volume of 5,650 gpd. The applicant is seeking an approval rate of 2,400 gpd (1.67 gpm), which is sufficient to meet the project's water needs. The Zone I protective radius of 157 feet that will be maintained is based upon a 2,400 gpm daily withdrawal volume.

Samples collected at the end of the pumping test showed elevated levels of iron and manganese in the well water. The manganese concentration was 0.591 milligrams per liter (mg/L), in excess

of the health-based Drinking Water Guideline of 0.3 mg/L. The manganese and iron (4.7 mg/L) concentrations were an order of magnitude higher than the Secondary Maximum Contaminant Levels (SMCLs) of 0.05 mg/L for manganese and 0.3 mg/L for iron. The SMCLs are based on aesthetic standards — iron and manganese can discolor water and stain laundry and plumbing fixtures. The color of the water exceeded the SMCL of 15 color units, which was likely due to the iron and manganese. Provencher Engineering has proposed ion exchange treatment to remove the iron and manganese from the water.

Total coliform bacteria were detected in the well water. The well had been disinfected prior to installation of the pump. The Well Completion Report for the bedrock well indicates that it has a cement-bentonite seal. Provencher Engineering has suggested that the coliform detection could have been caused by sample collection using a threaded sample tap. The well will be disinfected again prior to start-up of the water system.

The volatile organic compound toluene was detected at 5.5 micrograms per liter ($\mu\text{g/L}$), far below the Maximum Contaminant Level (MCL) of 1,000 $\mu\text{g/L}$. Toluene is often detected at low levels in wells shortly after their installation. Toluene is a component of petroleum, and its detection may indicate a residual trace of oil in the well casing or pump discharge line. The well water is moderately hard, with a hardness of 115 mg/L. The pH at the end of the test was 7.0.

SUMMARY OF WORK

The major details of the work as presented in the information submitted are summarized below.

The proposed water supply originates from bedrock Well-1, which includes an existing Goulds submersible pump, which is already installed inside the well. The pump model is a 7 GS 15, 1.5-horsepower, with a 4-inch, 3-phase, 230-volt, motor. It is installed at 600 feet deep on 1-inch, schedule 120 PVC treaded pipe, with #8 AWG wire, and 590-ft of 1-inch HDPE open ended stilling tube from the top of the well casing down to within 10 feet of the pump. The three-phase motor is compatible with the proposed well pump VFD, described further below, which inverts single-phase power into three phase power.

The existing above-ground pitless will be removed from its present location, the hole in the casing plugged, and the pitless reinstalled five feet below grade, as indicated on the plans.

A 1.25" IPS, 200-PSI HDPE well supply line will convey the well water underground, as indicated on the plan sheets to a proposed 16'x24' above ground pump station building. An appropriately sized power conduit and electrical wire will be installed underground between the pump station and well to provide power to the well pump from the pump station. The station power is single-phase, 120/230-volt. Telephone service for an alarm system or auto-dialer is also provided.

The well pump activation will be controlled by a variable frequency drive (VFD), "Intellidrive" by Pentek Corp. This system includes a pressure transducer (PT), pressure relief blow-off (BO) valve, and small bladder tank. The VFD adjusts the electrical frequency of the well pump power supply between 30 and 60 Hertz, which speeds up and / or slows down the speed of the well pump based on system demand. The pressure transducer senses the well system pipe pressure and communicates with the Intellidrive's VFD, to maintain a pre-set system pressure between 60 – 70 PSI.

The pump station is to be constructed of wood framing on top of a concrete footing, foundation, and floor slab. The pump station building will be completely above grade with a proposed finished floor elevation of 184.00. The pump station will include an electrical overhead heating unit and floor dehumidifier. A minimum 367 cubic feet per minute (CFM) exhaust fan and automatic air intake louver will activate based on a thermostat and manual switch to provide the required six air changes per hour. A single door 30 inches wide x 6'-8" tall is proposed to accommodate personnel entrance into the pump station. A manual rollup garage door, 8' wide by 8' high is proposed to accommodate deliveries of salt for brine, and will allow a means to install the two atmospheric storage tanks.

An underground 1,000-gallon liquid propane gas (LPG) tank will supply full for an emergency backup power generator. A floor drain in the center of the pump station will discharge to daylight onto the ground surface outside of the pump station, and a backwash line through the floor and leach pit has been designed to accommodate backwash water from water softener.

Once the 1.25" HDPE raw well water supply line enters the pump station building up through the floor slab, it will transition into a 1" PVC vertical line, which will include a raw water sample tap, and a 1" totalizer meter. Following the 1" totalizer meter, the 1" PVC well supply line will bend horizontally and include a pressure gauge, small bladder tank, pressure relief valve, pressure transducer (for well control), before connecting to a sediment filter with hose drain with vacuum breaker, as well as a normally-closed sediment filter by-pass line. The 1" PVC filter outlet includes a pressure gauge, sample tap, and check valve.

A pressurized 1" PVC treated water line will connect to the well supply line to facilitate backwashing of water softener vessels with clean treated water from the storage tanks and booster pumps. Following the treated water tee, the 1" PVC well supply line will include a hose drain with vacuum breaker and ball valve, and will then be connected to the inlet of the cation exchange water softeners with 2 cubic feet of Purolite strong acid cation gel resin per vessel to reduce Iron & Manganese. Fleck 2510 control heads are proposed to backwash and regenerate the softeners at predetermined intervals. The backwash rate will be limited to 6 GPM by a flow control orifice located on the softeners' 1" PVC backwash discharge piping. The treated water outlet piping from the softeners will include a sample tap, a pressure gauge, and hose drain with vacuum breaker. The pressure gauges and sample taps on both sides of the softeners and sediment filter will facilitate monitoring of headloss and treatment efficiency, respectively, across the softener and sediment filter.

Controls inside the pump station will actuate a normally-closed motorized ball valve. MBV-2 is located on the 1" PVC treated well water supply line prior to two atmospheric storage tanks. When the level of water in the storage tanks drops due to water demand, a level sensor (LT) on the storage tanks will cause MBV-2 to open. This will allow water to flow from the pressurized well supply line, which will drop the well system pressure, and activate the Intellidrive VFD to activate the well pump to maintain the preset well system pressure. This will cause well water to flow through the sediment filter and softener, and into the storage tanks. When the storage tanks' water level is satisfied, the tanks' level control will close MBV-2, which will cause the well pump system pressure to build, and the Intellidrive VFD will deactivate the well pump. The well pump flow rate is proposed to be limited by a 10-GPM flow control orifice located just prior to MBV-2. An emergency chlorine injection plug is proposed prior to the flow control orifice.

A 120-volt twist-lock power receptacle, interlocked with MBV-2, is proposed to be installed proximal to the emergency chlorine injection plug, to facilitate a future chlorination pump interlock, if required. A sample tap is proposed following MBV-2, and then the 1" PVC treated well water line will run upward and across the tops of the storage tanks, and tee into two 1" PVC lines directed downward that will feed both tanks through a top flat vertical penetration. The softener control head will include electrical dry contacts to facilitate communication with the main control panel, to provide an electrical interlock with MBV-2. The dry contacts will activate upon a backwash cycle, signaling to the control panel, which will cause MBV-2 to close, to deactivate the well pump. The control panel will then open a normally-closed motorized ball valve (MBV-1) on the treated water supply piping. In backwash mode, the softener control head will prevent water from leaving the treated water outlet piping from the softener, and instead direct the backwash water out through the backwash piping. Once the backwashing vessel returns to service, the backwash signal will terminate, the control panel will cause both MBVs to return to their normal positions, and the well pump will free to re-activate.

Dual 2,500-gallon above-ground 86" diameter x 119" tall polyethylene atmospheric water storage tanks on the floor inside the pump station. This 5,000 gallons of total storage will provide the two days of atmospheric storage required in the Guidelines with one source well. The tanks include a 16" manway with lid, an overflow pipe, vent, and a 1" PVC level transducer line connecting the tanks near their bottoms. This line includes a ball valve on both sides of a level transducer (LT), which will communicate with the main control panel to monitor the tanks' water level, to provide the well pump control via MBV-2. This will allow either tank to be valved off for inspection or maintenance, while leaving the second tank in service, without needing to modify any level controls. Under normal operation, both tanks will be active in parallel configuration, and the 1" PVC level transducer line connecting both tanks will also allow for equalization of the tanks' water level, in the event that one tank may fill slightly more or less than the other. A 2" PVC booster pump suction line header near the bottom of the tanks will draw water equally from both tanks through individual 2" PVC suction lines, and will feed two Goulds vertical booster pumps in parallel, which will operate in a lead-lag configuration, alternating between starts. The lead pump is proposed to activate at a system pressure of 50 PSI, the lag at 45 PSI, and both pumps will shut off at 70 PSI. Each booster pump will be capable of delivering the full-build site's estimated 38-GPM peak flow rate. Two bladder tanks are proposed to accommodate the 50-70 PSI pressure range. No distribution flow meter is proposed.

Two 2" fill / drain ports are proposed on the suction line as well as one on the pressurized distribution line to facilitate emergency fill or flushing. No irrigation or fire protection demand has been included in this public water system design. The 2" PVC booster pumps discharge header will pass by two bladder tanks, and then connect to a vertical 2" PVC, which will transition into a 4" C-900 PVC 200-PSI distribution line down through the floor, then laterally beyond the exterior of the pump station, where it will run underground a distribute water throughout the development in a looped 4" C-900 PVC water distribution system. We provided for two intermediate gate valves in the distribution system, and two at the one tee location. We also provided for a flushing port at the extreme end of the looped system, with gates valves on both legs so that directional flushing can be completed in the distribution system.

The pump station includes a telephone line for an alarm system or autodialer. Alarms will include storage tank high and low level warnings, low level booster pump shut down, and low distribution system pressure, as indicated in the "Pump Station Equipment & Controls Operation and Maintenance Specifications".

APPROVAL AND REQUIREMENTS

MassDEP hereby **approves** the pumping test final report for the Garrison Place bedrock well. MassDEP **approves** the bedrock well for a daily withdrawal volume of 2,400 gpd (equivalent to a pumping rate of 1.67 gpm); this is the maximum amount that may be withdrawn from the well in any day. Based on the approved pumping rate, the **Zone I** protective radius for the well is 157 feet, and the **Interim Wellhead Protection Area (IWPA)** has a radius of 453 feet.

MassDEP hereby **approves** the design of the permanent pumping facilities for the Garrison Place Bedrock Well, as set forth in the September 2017 submittal by Provencher Engineering.

The approvals granted in this letter do not relieve the proponent of the requirement to obtain any other permit or approval that may be necessary for establishing the bedrock well as a permanent water source.

This New Source Approval is good for 5 years. If the proponent has not begun construction of the permanent pumping facilities within 5 years of the date of this letter, the approval will be considered to have lapsed. After that, MassDEP will require portions of the New Source Approval process to be conducted as it deems necessary before granting a new approval — this will likely include requirement of another pumping test to provide updated water quality data.

Pursuant to MassDEP's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this permit is made subject to the following conditions:

1. **Changes/Modifications:** If there are any changes made to the approved plans or specifications, the proponent must obtain the prior written approval of MassDEP. Any such changes made without prior approval shall constitute a violation of the "Regulations"

which may result in legal actions by MassDEP including revocation of this permit, criminal prosecution, court imposed penalties or civil administrative penalties assessed by MassDEP.

2. **Approved Withdrawal Volume:** Production from the well may not exceed the daily withdrawal volume of 2,400 gpd during any day.
3. **Final Inspection:** A Request for a Final Inspection shall be submitted to this office in accordance with MassDEP Policy 88-19 and the Guidelines.
 - a. The request shall include a Determination of Compliance prepared by the consulting engineer or water system representative that inspected the work that certifies the following:
 1. that the facilities are fully operational, tested, and ready to be placed on line,
 2. that the work was completed in accordance with MassDEP's approval,
 3. that all conditions of the approval letter have been met,
 4. that any chemicals meet the requirements of the Guidelines,
 5. that all materials, equipment and technology have received approval for use in drinking water,
 6. that the operations and maintenance procedures have been prepared and are available,
 7. the operators have been trained and are ready to begin operating the facilities,
 8. that all alarms have been tested and are operating properly.
 - b. A copy of the punch list and water quality reports shall also be provided with request.
 - c. After a review of the letter and the sample results, MassDEP will then contact the applicant to arrange a final inspection if MassDEP determines such an inspection is necessary.
 - d. During the final inspection, the applicant shall demonstrate the proper operation of the facilities and equipment, with the facility running to waste.
 - e. The applicant shall not pump the water from the bedrock well into the water distribution system until MassDEP grants its Final Approval.

4. **Protection of Source During Construction:** The applicant will implement appropriate measures to protect the well during construction. Such measures may include restrictions on storage of hazardous materials and location of refueling. Additionally, there shall be no application of fertilizers or pesticides within the Zone I area.
5. **Operation and Maintenance:**
 - a. An Operations & Maintenance (O&M) Manual shall be prepared in compliance with DWP Policy 93-02; the manual shall be available at the pump station at the time of final inspection and at all times after the well is approved to go on-line by MassDEP.
 - b. The O&M Manual shall include a stand-alone schedule of inspections, testing, and preventative maintenance recommendations shall be provided for all the components of the facilities. That schedule shall incorporate the recommendations of the equipment manufacturer(s) and the design engineer.
 - c. The O&M Manual shall include annual or more frequent performance evaluation of all alarms and signals.
 - d. Once the O&M manual has been prepared in accordance with these requirements, the applicant shall operate the facilities in accordance with the procedures and complete all recommended maintenance and inspections.
6. **Disinfection:** Water in the completed facilities, to include any and all wells, treatment units, piping, and equipment shall be absent of coliform bacteria prior to being placed into service. Prior to being placed in service, all facilities as described above shall be disinfected in accordance with applicable AWWA standards. To determine adequate disinfection, samples from the completed facilities, to include all treatment units, shall be collected and analyzed for coliform bacteria; samples shall be free of any coliforms to demonstrate adequate disinfection. The samples shall be collected no earlier than seven calendar days prior to when the facilities are to be placed on line. All samples shall be collected in accordance with good operating practices and analyzed by a laboratory certified by MassDEP for the analysis of coliform bacteria. All lab reports shall be prepared on MassDEP approved forms. Copies of the laboratory analysis shall be provided to MassDEP for review and approval prior to the final inspection.
7. **Maintenance of Records:** The public water supplier shall maintain a copy of this letter, and a copy of the approved plans and specifications, for as long as the facilities described herein are in service.
8. **Ownership/Control of Zone I:** Brendon Properties, LLC, intends to transfer much of the property to the Town of Carlisle for use as open space land, including most of the Zone I protective radius around the well. Brendon Properties is retaining a Perpetual Right and "Zone I and Water Supply" Easement to protect the portion of the Zone I that is being

transferred. The draft Quitclaim Deed for the land transfer states that the land is being transferred to the Town for "conservation, agricultural and passive recreation purposes only." MassDEP does not allow agricultural activities in a Zone I that involve application of chemicals (fertilizer, herbicides, pesticides, etc.) or livestock grazing. MassDEP has allowed haying in a Zone I, provided that no chemical applications are made and the mowing equipment is stored outside the Zone I. The Quitclaim Deed must be revised to prevent agricultural activities other than haying within the Zone I and Water Supply Easement.

9. **Adequate Capacity:** MassDEP Regulations at 310 CMR 22.04(1)(a)3 require that the public water system shall demonstrate to MassDEP's satisfaction that it has the technical, managerial, and financial capacity to operate and maintain the public water system in compliance with 310 CMR 22.00 and each National Primary Drinking Water Regulation in effect at the time of MassDEP's determination and in effect in the foreseeable future.

Prior to final approval the Garrison Place public water system will be required to provide an escrow agreement (Water Reserve Account) to demonstrate the ability to finance the operation, maintenance, repair, and replacement in the event of an emergency and on a long term basis. The escrow agreement shall provide an itemized cost estimate of construction and operation and maintenance of the public water system components, including but not limited to, the pump house, the treatment facility, and appurtenant structures, to provide the basis for the escrow agreements for repair and maintenance.

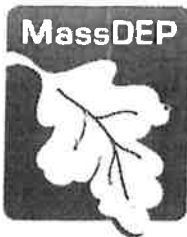
An Asset Management Worksheet (Excel template) is available on MassDEP's website to assist with the asset listing and an annualized cost basis for the escrow account:

<http://www.mass.gov/eea/agencies/massdep/water/drinking/water-systems-ops.html>

Upon the establishment and funding of the "Water Reserve Account", Garrison Place is determined to have adequate Capacity. Brendon Properties (or the home owners association) will continue to fund the "Water Reserve Account" on an annual basis. The account will be verified during the Sanitary Survey process.

10. The Garrison Place public water system shall have the treatment building inspected by a certified cross connection control inspector and shall install backflow prevention components, as necessary, as determined by the inspector. Backflow prevention devices installed shall be inspected as required by 310 CMR 22.22.
11. Garrison Place shall not conduct emergency chlorination of the system as described in the application without written approval by the Department.

12. The vertical space above the water storage tanks shall be sufficient to provide access for inspecting and cleaning of the water storage tanks. Garrison Place shall adhere to safety regulations when developing procedures for maintenance and cleaning of the water storage tanks.
13. All wet materials using in construction shall conform to NSF 61 Standards.
14. The facility shall be fitted with a flow rate indicating and totalizing meter as required in Section 7.4 of the Guidelines.
15. Garrison Place shall obtain a UIC registration from the Department for the discharge of brine waste to the ground. For more information contact Joe Cerutti at 617-292-5859.
16. An alarm system shall be installed as described in the application. Alarms shall be tested as required in the Guidelines and as recommended by the manufacturer. Alarms shall notify system personnel immediately in order to address any system malfunctions or emergencies.
17. Tank overflows and vents shall be screened to prevent insects from getting into the storage tanks.
18. An emergency generator that is sized to operate the pumping and treatment facilities shall be installed and maintained in accordance with manufacturer's recommendations. The emergency generator shall provide for the uninterrupted operation the treatment building and the pump station, when called upon.
19. Brine solutions shall be stored on containment of not less than 110 percent of the total volume of the tanks.
20. The Guidelines recommend that ion systems be limited to applications in which the iron and manganese concentrations are below 0.3 mg/L. The engineer has certified that the system is capable of reducing concentrations of iron and manganese below secondary concentrations. The engineer provided supporting documentation to support this assertion. The Department reserves the right to require additional treatment should the installed system fail to reduce manganese concentrations to below secondary levels.
21. At no time shall the system discharge water that exceeds 0.3 mg/L of manganese.



Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

November 13, 2018

Kevin Giblin
Brendon Properties, LLC
259 Turnpike Road, Suite 110
Southborough, MA 01772

RE: City/Town: Carlisle
PWS Name: Garrison Place
PWS-ID No.: Not Yet Assigned
Program: System Modifications
Action: Bedrock Well—Approval—Source
Final Report/Construction Design
Transmittal Nos.: X281856

Dear Mr. Giblin:

Please find attached the approval of the permit modifications for the construction design for the Garrison Place water system, which will constitute a Community Public Water System.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this letter, please contact James Persky at (978) 694-3227.

Sincerely,

Sean Griffin
Environmental Engineer
Drinking Water Program

Sincerely,

Thomas Mahin
Drinking Water Section Chief
Northeast Regional Office

cc: DWP/Boston Office (no attachment)
Donald Provencher, Provencher Engineering, LLC, 6 Wasserman Heights, Merrimack, NH 03054
Carlisle Board of Health, 66 Westford Street, Carlisle, MA 01741

File Name: Y:\DWP Archive\NERO\Carlisle-XXXXXXX-System Modifications-2018-11-13

DESCRIPTION OF PROJECT

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed a November 7, 2018 submittal by the firm Provencher Engineering, LLC that proposes modifications to the Garrison Place treatment facility treatment process which was approved by the Department March 30, 2018. The water system serving the development is a proposed **Community Public Water System**, in accordance with Massachusetts Drinking Water Regulations and the Federal Safe Drinking Water Act.

MassDEP issued an Approval of Source Final Report and Construction Design on March 30, 2018. The Approval, in part, approved the construction of a above ground 16' X 24' treatment building that consists of a water softener system to remove iron and manganese. Additional components included in the treatment building include a sediment filter, space for chlorination if needed, controls, a transfer switch for emergency power, dual 2,500-gallon above-ground polyethylene atmospheric water storage tanks, and appurtenances.

The Garrison Place development includes 16 residential senior housing units, in the form of 8 duplexes. The water needs of the project, based on the Title 5 design flow estimate, are 2,400 gallons per day (gpd). MassDEP approved the well site and pumping test design on February 2, 2017.

The bedrock well is six inches in diameter and 700 feet deep. The well is cased to a depth of 40 feet below the ground surface, with bedrock encountered at a depth of 14 feet. The primary fracture zone was encountered at a depth of 515 to 520 feet, with a secondary fracture zone at a depth of 180 to 185 feet.

Samples collected at the end of the pumping test showed elevated levels of iron and manganese in the well water. The manganese concentration was 0.591 milligrams per liter (mg/L), which exceeds the health-based Drinking Water Guideline of 0.3 mg/L. The manganese and iron (4.7 mg/L) concentrations were an order of magnitude higher than the Secondary Maximum Contaminant Levels (SMCLs) of 0.05 mg/L for manganese and 0.3 mg/L for iron. The SMCLs are based on aesthetic standards — iron and manganese can discolor water and stain laundry and plumbing fixtures.

On October 1, 2018, the consulting engineer submitted a request for a final inspection of the project which was approved March 30, 2018. The project was constructed substantially as approved; however, performance testing of the treatment building showed that although the primary treatment parameter, manganese, was effectively treated to below secondary standards oxidized iron was passing through the water softener at levels three times the secondary standard.

The proposed modifications submitted on November 7, 2018 propose additional greensand filters ahead of the particulate filters to provide additional removal of iron and manganese. Any

remaining manganese passing through the greensand filters would be treated by the water softeners as was demonstrated after post construction testing of the initial design.

On-Site Pilot Test:

A pilot test vessel, 10-inch diameter x 54 inches tall, filled with one cubic foot of Greensand Plus media, and that vessel was connected to a hose bib on the raw well water piping inside the pump station on November 1, 2018. A flow rate of approximately 2.5 GPM was commenced through the pilot filter, and the discharge was run to waste. No chlorine or chemical oxidant is proposed.

Based on the graph above, it was estimate that iron will break through at the SMCL concentration of 0.3 mg/L, after approximately 900 gallons of treated water. For this pilot test with 1 cubic foot (7.48 gallons) of media, 900 gallons of treated water represents 120 bed volumes (i.e. 900 gal / 7.48 gal). Therefore, for a proposed 2.5 CF vessel, breakthrough is expected at 2,244 gal. (120 bed volumes x 2.5 CF x 7.48 gal/CF). Backwashing at 2,000 gallons is proposed.

SUMMARY OF WORK

The modifications as presented in the information submitted are summarized below.

The proposal is to install dual Greensand Plus vessels in a parallel configuration. The two vessels are proposed to be 14-inch diameter x 65 inches tall, model C53-MG14-10, with 1-inch inlet and outlet piping, each with 2.5 cubic feet of Greensand Plus media by Inversand Company. Each vessel will be limited to a 5-GPM flow rate (i.e. 10 GPM total flow through both vessels combined), by a flow control button on the discharge side of each control head. Each vessel will be programmed to backwash after treating 2,000 gallons of water, or every three days, whichever occurs first. A 10-minute backwash at 12 GPM, generating 120 gallons of backwash water is proposed; followed by a 0.5 GPM water / air-draw for 60 minutes, generating an additional 30 gallons, for a total of approximately 150 gallons of backwash water per vessel. One vessel will be programmed to be out of phase with the other by 1,000 gallons, and by one day. Treated water will be used for backwash similar to the existing softeners. An electrical signal on the control heads will indicate a backwash cycle to the PLC, and the PLC will lockout the well pump, close off a motorized ball valve (MBV) on the storage tank inlet, and open a normally closed. MBV on the treated water backwash supply line to allow treated water for backwash.

An air intake device on both control heads will allow for air to be drawn into the headspace of each vessel during the backwash process. This air induction step is similar to a water softener brine draw, except that air is inducted instead of salt brine. The inducted air is used inside each vessel to oxidize the media so that the Iron can be better adsorbed to the Greensand Plus media. No chlorine or chemical oxidant is proposed.

The application states that installation of both Greensand vessels on the raw water supply line before the existing cartridge sediment filter, and before the existing dual softeners, acts as polishing filters to capture some oxidized Iron that could leak through the Greensand Plus

vessels, before entering the softeners. The proponent does not believe the Greensand Plus vessels should be installed after the softeners because they are concerned that the ferric (oxidized) Iron would quickly foul the softener resin. The dual softeners will be able to chemically exchange any remaining ferrous (dissolved) Iron, and dissolved Manganese that the Greensand Plus vessels do not remove. Garrison Farms proposes to eliminate a brine tank, and have both softeners regenerate from one tank to provide more room.

The initial design / permit submission included a Leach Pit Design for a bottom area infiltration rate of up to 1,327 GPD. The softeners were each designed to backwash 98 gallons, or approximately 200 gallons combined. The dual Greensand Plus vessels are each anticipated to backwash 150 gallons, or approximately 300 gallons combined. Therefore, the maximum combined backwash volume of 500 gallons from all treatment vessels is less than the infiltration capacity of 1,327 GPD.

APPROVAL AND REQUIREMENTS

MassDEP hereby **approves** the permit modifications for the Garrison Place Water Treatment Facility, as set forth in the November 2018 submittal by Provencher Engineering.

The approvals granted in this letter do not relieve the proponent of the requirement to obtain any other permit or approval that may be necessary for establishing the bedrock well as a permanent water source.

Pursuant to MassDEP's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this permit is made subject to the following conditions:

1. **Changes/Modifications:** If there are any changes made to the approved plans or specifications, the proponent must obtain the prior written approval of MassDEP. Any such changes made without prior approval shall constitute a violation of the "Regulations" which may result in legal actions by MassDEP including revocation of this permit, criminal prosecution, court imposed penalties or civil administrative penalties assessed by MassDEP.
2. **Approved Withdrawal Volume:** Production from the well may not exceed the daily withdrawal volume of 2,400 gpd during any day.
3. **Final Inspection:** A Request for a Final Inspection shall be submitted to this office in accordance with MassDEP Policy 88-19 and the Guidelines.
 - a. The request shall include a Determination of Compliance prepared by the consulting engineer or water system representative that inspected the work that certifies the following:

1. that the facilities are fully operational, tested, and ready to be placed on line,
 2. that the work was completed in accordance with MassDEP's approval,
 3. that all conditions of the approval letter have been met,
 4. that any chemicals meet the requirements of the Guidelines,
 5. that all materials, equipment and technology have received approval for use in drinking water,
 6. that the operations and maintenance procedures have been prepared and are available,
 7. the operators have been trained and are ready to begin operating the facilities,
 8. that all alarms have been tested and are operating properly.
- b. A copy of the punch list and water quality reports shall also be provided with request.
 - c. After a review of the letter and the sample results, MassDEP will then contact the applicant to arrange a final inspection if MassDEP determines such an inspection is necessary.
 - d. During the final inspection, the applicant shall demonstrate the proper operation of the facilities and equipment, with the facility running to waste.
 - e. The applicant shall not pump the water from the bedrock well into the water distribution system until MassDEP grants its Final Approval.
4. **Operation and Maintenance:**
- a. An Operations & Maintenance (O&M) Manual shall be prepared in compliance with DWP Policy 93-02; the manual shall be available at the pump station at the time of final inspection and at all times after the well is approved to go on-line by MassDEP.
 - b. The O&M Manual shall include a stand-alone schedule of inspections, testing, and preventative maintenance recommendations shall be provided for all the components of the facilities. That schedule shall incorporate the recommendations of the equipment manufacturer(s) and the design engineer.
 - c. The O&M Manual shall include annual or more frequent performance evaluation of all alarms and signals.

- d. Once the O&M manual has been prepared in accordance with these requirements, the applicant shall operate the facilities in accordance with the procedures and complete all recommended maintenance and inspections.
5. **Disinfection:** Water in the completed facilities, to include any and all wells, treatment units, piping, and equipment shall be absent of coliform bacteria prior to being placed into service. Prior to being placed in service, all facilities as described above shall be disinfected in accordance with applicable AWWA standards. To determine adequate disinfection, samples from the completed facilities, to include all treatment units, shall be collected and analyzed for coliform bacteria; samples shall be free of any coliforms to demonstrate adequate disinfection. The samples shall be collected no earlier than seven calendar days prior to when the facilities are to be placed on line. All samples shall be collected in accordance with good operating practices and analyzed by a laboratory certified by MassDEP for the analysis of coliform bacteria. All lab reports shall be prepared on MassDEP approved forms. Copies of the laboratory analysis shall be provided to MassDEP for review and approval prior to the final inspection.
6. **Maintenance of Records:** The public water supplier shall maintain a copy of this letter, and a copy of the approved plans and specifications, for as long as the facilities described herein are in service.
7. The Garrison Place public water system shall have the treatment building inspected by a certified cross connection control inspector and shall install backflow prevention components, as necessary, as determined by the inspector. Backflow prevention devices installed shall be inspected as required by 310 CMR 22.22.
8. Garrison Place shall not conduct emergency chlorination of the system as described in the application without written approval by the Department.
9. All wet materials using in construction shall conform to NSF 61 Standards.
10. At no time shall the system supply water to users that exceeds 0.3 mg/L of manganese.
11. Greensand filter air intakes shall be screened with 24-mesh screen.
12. Garrison Place shall conduct validation testing of the completed treatment facility for iron and manganese prior to Final Approval. Validation testing shall include at least two iron and manganese samples. One sample shall be taken after treatment of 2,000-gallons of water and prior to backwashing.