



The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2017-0001

to the permittee

MERRIMACK VILLAGE DISTRICT WATER WORKS
2 GREENS POND ROAD
MERRIMACK, NH 03054
(603-424-9241)

for the withdrawal of the following volume of groundwater from the following well for the purpose of community water supply:

Mitchell Woods Well	432,000 gallons over any 24-hour period subject to the annual withdrawal limitation established by Condition No. 4 of this permit
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Date of Issuance: March 15, 2017

Date of Expiration (if the withdrawal is not activated): March 15, 2022

Date of Expiration (if the withdrawal is activated): March 15, 2027

Pursuant to authority in N.H. RSA 485-C:21, the New Hampshire Department of Environmental Services (NHDES), hereby grants this permit to withdraw groundwater from the Mitchell Woods Well subject to the following conditions:

1. The permittee shall comply with the requirements of Env-Wq 403 and RSA 485-C at all times.
2. Water Conservation: The permittee shall implement the approved Water Conservation Plan, received April 10, 2012, in accordance with Env-Wq 2101 and NHDES' approval dated May 4, 2012.
3. Metering Requirements: Withdrawals from the source must be metered at all times. All meters must be selected, installed, tested, and maintained in accordance with Env-Wq 2101. The permittee shall read source water meters to adequately report the following volumes to the reporting program referenced in condition No. 7 of this permit:
 - a) The 24-hour peak day volume withdrawn from the source during each month and the date the water use occurred; and
 - b) The cumulative total volume withdrawn from the source during each month.
4. Annual Withdrawal Limitation: The total volume of groundwater withdrawn from the Mitchell Woods Well in any calendar year shall be limited to 45 million gallons, subject to the monitoring and mitigation requirements of conditions No. 5 and 6 of this permit.
5. Monitoring and Reporting Requirements: The permittee shall establish and maintain the monitoring and reporting program as described below:
 - a) Groundwater Level Monitoring
 - i. Production well: The permittee shall install a pressure transducer and data logger and measure water levels at a frequency of at least once every four hours in the Mitchell Woods Well. Water level monitoring shall commence upon initiating a withdrawal from the Mitchell Woods Well and shall continue indefinitely as a condition of this permit.
 - ii. Monitoring wells: The permittee shall install pressure transducers and data loggers and measure water levels at a frequency of at least once every four hours in monitoring wells MW-4 and MW-7. Water level monitoring shall commence at least three months prior to the intended start date of the Mitchell Woods Well and shall continue indefinitely as a condition of this permit.
 - b) Wetlands Monitoring: The permittee shall implement the wetlands monitoring program as described in the Final Report Addendum, incorporated herein by reference, subject to the following conditions:
 - i. By June 1, 2017, the permittee shall:
 - a. Identify and gain access to three wetland monitoring plots for incorporation into the wetlands monitoring program: two within the influence area of the Mitchell Woods Well in areas where shallow water levels were observed to respond to pumping, and one control plot outside of the influence area of the well. One of the plots within the influence area

shall be within the riparian wetlands associated with the unnamed tributary to Baboosic Brook and one shall be within the "Ponded Wetlands" south of the well;

- b. Submit a site plan depicting the locations of the monitoring plots and any associated piezometers and surface water level monitoring gauges, and the results of an initial survey of the wetland monitoring plots performed in accordance with Env-Wq 403.25(c); and
 - c. Submit a proposal for baseline monitoring to be performed during the 2017 growing season and a proposal for monitoring to be performed during subsequent years.
- ii. The permittee shall perform a minimum of one year of wetlands monitoring prior to initiating a withdrawal from the Mitchell Woods Well.

The wetlands monitoring program shall continue indefinitely as a condition of this permit. All work shall be conducted under the direct oversight of a New Hampshire Certified Wetland Scientist. Results of the wetlands monitoring and surveys must provide a determination as to whether or not an adverse impact has occurred, may occur, or has not occurred over the monitoring period.

- c) All monitoring shall be completed by a person who can demonstrate, by education or experience, competency in collecting and reporting hydrogeologic measurements.

Monitoring locations and frequencies may be added or changed if the data obtained contradict the information provided in the permittee's application, or if additional data points are required to assess the potential for adverse impacts to occur.

An annual monitoring report and all monitoring data shall be submitted to NHDES annually by January 31 of each year. The annual monitoring report shall provide text, tables or figures that present a summary of all previously collected data and note any relevant observations that may affect the measurements made from the preceding year inclusive of pertinent field notes or observations that document the annual monitoring activities undertaken to comply with this permit.

The annual monitoring report shall be submitted in an electronic format and hard copy format. All water level monitoring data shall be submitted in an electronic format only.

6. Mitigation Requirements

- a) In the event that an adverse impact occurs, the permittee shall comply with all of the requirements below and with the impact mitigation and source replacement requirements of Env-Wq 403.
- b) Where the status of an unanticipated impact is not clear, the permittee shall gather information needed to quantify the impact and determine its status relative to the adverse impact criteria defined under RSA 485-C:21, V-c and provide this

information to NHDES within 48 hours of being notified by NHDES. A verified adverse impact shall be mitigated in accordance with Env-Wq 403.

- c) NHDES will routinely review the results of all monitoring data, and if water level monitoring data indicates that groundwater is being extracted at a rate that exceeds natural recharge on average, then NHDES will modify the permit in accordance with Env-Wq 403 in order to prevent adverse impacts from occurring. In addition, the permittee shall operate the Mitchell Woods Well in accordance with this permit.
7. The permittee shall register its new source of water with the NHDES Water Use Registration and Reporting Program and maintain the water use reporting requirements established by RSA 488, Env-Wq 2102 and this permit.
8. The permittee shall apply for renewal of this permit at least 365 days prior to its expiration date in accordance with Env-Wq 403. The permittee shall continue to comply with all conditions in this permit until the permit is renewed or the facility is closed in accordance with all applicable requirements, regardless of whether a renewal application is filed.

Any person aggrieved by any terms or conditions of this permit may appeal in accordance with RSA 21-O:7, IV within 30 days.


for Eugene J. Forbes, P.E.,
Director Water Division

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PROJECT NARRATIVE

Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2017-0001 Merrimack Village District Water Works, PWS ID 1531010 Mitchell Woods Well Merrimack, New Hampshire

March 15, 2017

BACKGROUND

The Merrimack Village District Water Works (MVD) has submitted an application to the New Hampshire Department of Environmental Services (NHDES) requesting approval of a large community production well and issuance of a large groundwater withdrawal permit for the withdrawal of up to 432,000 gallons per day (gpd) or 300 gallons per minute (gpm) over a 24-hour period. MVD is requesting approval for this new well to be used in combination with its existing sources for the purposes of municipal water supply.

The purpose of developing the new community production well (designated the Mitchell Woods Well) is to: 1) provide additional water supply capacity, particularly during summer months when system demand is highest; 2) accommodate potential increases in water demand based on historic water use trends and projected future growth in areas served by the system; and 3) help address existing distribution system pressure issues.

The Mitchell Woods Well is located in the town of Merrimack's Mitchell Woods conservation area northeast of Baboosic Lake Road. The potential impact area for the withdrawal from the Mitchell Woods Well encompasses approximately 5 square miles of the Baboosic Brook watershed from its confluence with the Souhegan River.

The well site is underlain by glacial outwash deposits associated with glacial Lake Merrimack. Fine gravel and coarse-grained sand, although limited in areal extent, occur at thicknesses up to 50 feet. Glacial lake bottom deposits consisting of fine-grained sand, silt, and clay overlie the coarse-grained deposits in some areas; however, they are not laterally extensive across the site. These deposits are underlain by a thin veneer of glacial till, which is underlain by bedrock of the Massabesic Gneiss Complex. The Mitchell Woods Well is screened from a depth of 35 feet to 45 feet below ground surface in fine- to coarse-grained sands and gravels.

WITHDRAWAL TESTING AND CONCLUSIONS

A withdrawal testing program was conducted by Emery & Garrett Groundwater, Inc. (EGGI) from October 5, 2010 through November 2, 2010. The purpose of withdrawal testing is to provide data to estimate long-term sustainable water quantity and quality; observe the response of the aquifer to pumping; evaluate the degree of hydraulic connection with overlying deposits; and, assess the potential for adverse impacts to water resources and users that may result from the proposed withdrawal. The withdrawal testing program included monitoring during pre-pumping, pumping, and water level recovery periods, where the Mitchell Woods Well was pumped at an average rate of 320 gpm between October 13, 2010 and October 20, 2010.¹

¹ After three days of pumping the Mitchell Woods Well at 350 gpm, a mathematical projection of the water level measurements indicated that the water level in the well would decline to the top of the well screen before the end of the withdrawal testing program; as such, the pumping rate was decreased to 300 gpm for the final four days of the test.

Discharge from the Mitchell Woods Well was measured using an orifice weir during the withdrawal testing program to maintain a constant pumping rate, and water quality samples were collected during the pumping period to characterize the quality of the water derived from the well.

During the withdrawal testing program, water level measurements were collected at: the Mitchell Woods Well; 13 monitoring wells; 9 piezometers; 5 surface water stations (two of which included stream flow measurements); and 5 private water supply wells (1 overburden well and 4 bedrock wells) located at distances ranging from approximately 1,700 feet to 2,900 feet from the well site. Groundwater and surface water measurements were recorded to assess the degree of hydraulic connection between the overburden aquifer, bedrock, wetlands, and an unnamed tributary to Baboosic Brook that passes through the well site.

Water level measurements collected during the withdrawal testing program indicate that all of the overburden monitoring wells (with the exception of the background monitoring well) and most of the piezometers responded to pumping of the Mitchell Woods Well. Groundwater levels in the private water supply wells did not respond to pumping. Pumping-induced drawdown of water levels in the monitoring wells ranged from approximately 0.3 feet to 15.8 feet and was greatest in wells located closest to the Mitchell Woods Well. In the piezometers (predominantly located in wetland areas), pumping-induced drawdown was on the order of 0.2 feet to 1.8 feet.

Surface water level and flow measurements collected in the unnamed tributary to Baboosic Brook did not show a direct effect of pumping the Mitchell Woods Well; however, quantifying the potential degree of influence of the withdrawal on surface water levels or flows was confounded by the influence of a rainfall event near the beginning of the pumping test and subsequent stream flow recession, and a reduction in the production well pumping rate on Day 3 of the pumping test. Based on the data collected during the pumping test, use of the proposed production well will likely affect shallow groundwater levels near, and shallow groundwater discharge to, the unnamed tributary to Baboosic Brook and associated riparian wetlands, in turn affecting surface water levels or flows in these areas that could potentially result in a violation of the State's surface water quality standards specified in Env-Wq 1700 or negatively affect riparian wetlands adjacent to the unnamed tributary, which are criteria for adverse impacts under RSA 485-C:21, V-c.(f) and (g). These issues are addressed through conditions of the large groundwater withdrawal permit as described below.

Based on a distance-drawdown analysis of graphical projections of water level responses in the monitored wells that assume 180 days of continuous pumping of the Mitchell Woods Well at 300 gpm with no net recharge from precipitation to the aquifer, and inference from the refined conceptual hydrologic model of the withdrawal, pumping-induced drawdown is estimated to extend on the order of 900 feet to 1,000 feet from the well.

Based on the monitoring results, conceptual hydrologic model, and water budget analysis presented in the final report, a production rate of 432,000 gpd (300 gpm) is a production rate that the Mitchell Woods Well and aquifer can only sustain on a fixed-term basis; EGGI's evaluation indicated that there is sufficient natural recharge to the aquifer to sustain a total annual groundwater withdrawal from the Mitchell Woods Well of 45 million gallons (approximately one-half of the estimated groundwater recharge), equivalent to approximately 100 days of production from the well at maximum rate annually.

Results of the water quality sampling conducted during the withdrawal testing program indicate that each parameter was below the applicable Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL).

PUBLIC INVOLVEMENT

Pursuant to RSA 485-C:21, II through V-a, materials submitted in support of the large groundwater withdrawal permit (the preliminary application, final report, and supplemental materials) were sent (via certified mail) to municipalities and public water suppliers in the potential impact area of the withdrawal. Copies of the above-referenced materials were sent to the towns of Merrimack and Bedford. No public water suppliers other than the permittee are in the potential impact area. No public hearings were requested, and no public meetings were held regarding the application for this large groundwater withdrawal permit.

LARGE GROUNDWATER WITHDRAWAL PERMIT MONITORING, REPORTING, AND WITHDRAWAL REQUIREMENTS

The large groundwater withdrawal permit limits the total volume of groundwater that MVD may withdraw from the Mitchell Woods Well in any calendar year to 45 million gallons.

MVD is also required to implement an impact monitoring and reporting program that includes groundwater level and wetlands monitoring. General monitoring requirements are summarized as follows:

- Groundwater levels – The permit requires that on-site locations be monitored to assess the effects of the groundwater withdrawal from the Mitchell Woods Well on water levels in the aquifer.
- Wetlands – The permit requires that MVD establish a wetlands monitoring program to assess the potential for and/or detect the occurrence of an adverse impact on riparian wetlands associated with the unnamed tributary to Baboosic Brook and an area of ponded wetlands south of the well via observations of shallow groundwater levels, surface water levels, and wetland characteristics.

In the event that an adverse impact is reported and verified, an impact mitigation program would be implemented in accordance with conditions of the large groundwater withdrawal permit and Env-Wq 403. More information concerning these requirements is provided in the large groundwater withdrawal permit under condition No. 6.

MVD is required to submit an annual monitoring report in hard copy and electronic format to NHDES by January 31st of each year. As stipulated in the permit, the annual report shall include a summary of trends and variability observed in the monitoring data, all monitoring data and records required by the permit, and an assessment of the potential impacts associated with the withdrawal from the Mitchell Woods Well. The annual report will be available to the public for review. A complete description of monitoring and reporting requirements is presented in the large groundwater withdrawal permit under condition No. 5.