



The
NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2015-0002

to the permittee

TOWN OF EPPING WATER AND SEWER DEPARTMENT
157 MAIN STREET
EPPING, NH 03042-2440
(603-679-5441)

for the withdrawal of the following volumes of groundwater from the following wells for the purpose of community water supply:

Epping Crossing Well D2: 302,400 gallons over any 24-hour period

Epping Crossing Well E1: 324,000 gallons over any 24-hour period

Date of Issuance: December 30, 2015

Date of Expiration: December 30, 2025

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 Epping Crossing Wells D2 and E1 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 and maintain compliance with the approved Water Conservation Plan, dated December 2, 2010, in accordance with Env-Wq 2101 and NHDES' approval dated February 3, 2011.
3. Metering Requirements: Withdrawals from the wells 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. 8 of this permit:
 - a) The 24-hour peak day volume withdrawn from each source during each month and the date the water use occurred; and
 - b) The cumulative total volume withdrawn from each source during each month.
4. Initial Withdrawal Volume Restriction: The permittee shall limit its cumulative withdrawal of groundwater from production wells D2 and E1 to no greater than 313,200 gallons in any 24-hour period for the initial 36 months of use of the well field.
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 wells: The permittee shall install pressure transducers and data logger and measure water levels at a frequency of at least once every four hours in production wells D2 and E1. Water level monitoring shall commence upon initiating a withdrawal from the Epping Crossing well field and shall continue indefinitely as a condition of this permit.
- ii. On-site monitoring wells: The permittee shall install pressure transducers and data logger and measure water levels at a frequency of at least once every four hours in monitoring wells MW-A, MW-B and MW-G. Water level monitoring shall commence upon initiating a withdrawal from the Epping Crossing well field and shall continue indefinitely as a condition of this permit.
- iii. To determine whether a water level monitoring trigger established under condition No. 6 is met or exceeded, the permittee shall obtain and review the water level monitoring data collected quarterly.

b) *Groundwater quality sampling*

- i. Production wells: The permittee shall collect raw (untreated) water quality samples from production wells D2 and E1 at a frequency of at least twice every year in the months of August and January. Water quality sampling shall commence upon initiating a withdrawal from the Epping Crossing well field and shall continue indefinitely as a condition of this permit.

20150002PWD2
20150002PWE1

20150002MWMWA
20150002MWMWB
20150002MWMWG

- ii. On-site monitoring wells: The permittee shall collect water quality samples from monitoring wells MW-A, MW-B and MW-G at a frequency of at least twice every year in the months of August and January. An initial water quality sample shall be collected from the monitoring wells three months prior to the intended start date of the Epping Crossing well field and sampling shall continue after initiating a withdrawal from the Epping Crossing well field indefinitely as a condition of this permit.
- iii. The samples collected from the production wells and monitoring wells shall be submitted to a New Hampshire accredited analytical laboratory for analyses for volatile organic compounds (VOCs) using EPA Method 8260B or equivalent drinking water method and low-level 1,4-Dioxane.

All water level monitoring and water quality sampling shall be completed by a person who can demonstrate, by education or experience, competency in collecting and reporting hydrogeologic measurements.

Monitoring well and sampling 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 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 and water quality monitoring data collected shall be submitted in an electronic format only.

6. Triggered Response Plan and Notification Requirements:

- a) In the event that drawdown at the 180-day level as indicated on Table 1 is encountered at any of the monitoring well locations listed, then the permittee shall submit a response plan to NHDES. The response plan shall propose actions the permittee shall take to address excessive drawdown in the well field and surrounding area to include, but not be limited to:
 - i. Reducing groundwater withdrawal volumes such that drawdown in the well field remains higher than 180-day projected water levels;
 - ii. Increasing the frequency of water level reporting;
 - iii. Expanding the water level monitoring network to include private water supply wells north of the well field; and
 - iv. Other appropriate measures.

The response plan shall be submitted to NHDES for review and approval within 30 days of observation of trigger groundwater levels at any of the monitoring wells. NHDES shall establish conditions in its approval that are appropriate and necessary to comply with this permit and assess for adverse impacts, and include a schedule for implementation of action items in the plan.

- b) The permittee shall notify NHDES within 15 days of receiving results from water quality sampling conducted in accordance with condition No. 5.b. as follows:
 - i. For any VOC water quality results for samples collected from monitoring wells at concentrations equivalent to or greater than New Hampshire ambient groundwater quality standards or drinking water standards; or
 - ii. For any VOC water quality results for samples collected from the production wells at any concentration above analytical detection limits.

7. 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) Prior to initiating a withdrawal from the Epping Crossing well field, the permittee shall notify in writing via certified mail the owners of all properties shown that are served by private wells or public wells not owned by the permittee within the area estimated to be the influence area of the Epping Crossing well field, as illustrated on Figure 31, titled "Wellhead Protection Area, Epping and Brentwood, Zoning and Tax Maps" included in the Final Report titled "Groundwater Development at Epping Crossing Well Field Production Wells D2 and E1" prepared by Emery & Garrett Groundwater Investigations, Inc. (EGGI), dated October 15, 2015. The permittee shall provide a copy of the notification letter and copies of the certified return mail receipts to NHDES. The notification letter shall explain to property owners with wells in the identified area that their well may be influenced by the withdrawal at Epping Crossing wells D2 and E1, and provide the property owners with contact information for both the permittee and NHDES in the event they believe they may be adversely impacted by the withdrawal.
- c) 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 about a reported impact. A verified adverse impact shall be mitigated in accordance with Env-Wq 403.
- d) 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 Epping Crossing wells D2 and E1 in accordance with this permit.

8. 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.
9. 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.



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

for

Table 1. Trigger Water Level Elevations for Town of Epping Water and Sewer Department's Large Groundwater Withdrawal Permit LGWP-2015-0002.

Tax Map / Tax Lot	Property Address	Monitoring Well	NHDES-Assigned Station ID*	Projected 180-day No-Recharge Water Level Elevation (feet AMSL)
	N/A	MW-A	20150002MWMWA	102.7
	N/A	MW-B	20150002MWMWB	101.2
	N/A	MW-G	20150002MWMWG	127.5

* See enclosed Electronic Data Reporting Program Letter and Guidelines Document

PROJECT NARRATIVE

Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2015-0002 Town of Epping Water and Sewer Department, PWS ID 0761010 Epping Crossing Wells D2 and E1 Epping, New Hampshire

December 30, 2015

BACKGROUND

The Town of Epping Water and Sewer Department (Epping) has submitted an application to the New Hampshire Department of Environmental Services (NHDES) requesting approval of two new large community production wells and issuance of a large groundwater withdrawal permit for the withdrawal of up to 626,400 gallons per day (gpd) or 435 gallons per minute (gpm) over a 24-hour period. Epping's approval request includes the combined withdrawal of up to 302,400 gpd (210 gpm) and 324,000 gpd (225 gpm) from two separate production wells for the purposes of municipal water supply.

The purpose of developing the new community production wells, designated Epping Crossing Wells D2 and E1, is to: 1) offset recorded losses in yield from the system's other groundwater wells; 2) provide source redundancy for production wells that currently serve the water system; and 3) accommodate potential increases in water demand based on historic water use trends and projected future growth in areas served by the water system.

Epping Crossing Wells D2 and E1 are located in the southeast portion of the town of Epping north of NH Route 101, east of a commercially developed corridor along NH Route 125, and south and west of NH Route 27. The well field property is located at the regional surface water divide between the Lamprey River to the north (approx. 2,500 feet) and Piscassic River to the south (approx. 1,000 feet). The wells are located within a topographically flat area dominated by a wetland complex defined by a network of diffuse but interconnected, perched forested wetlands that largely drain via unnamed streams to the south/southeast towards the Piscassic River, and partially drain west/northwest through Clay Pond to the Lamprey River. The potential impact area for the withdrawal from the wells encompasses a little over nine square miles and is primarily in the central Piscassic River watershed, with a small portion of the middle Lamprey River watershed.

Drilling results indicate that bedrock beneath the Epping Crossing well field is comprised of schists and metasedimentary rocks of the Elliot Formation. Wells D2 and E1 are located on the margin of a north-to-southeast trending 'trough' in the bedrock surface at the site, where the depth of competent bedrock ranges from about 50 to 70 feet beneath the ground surface and steepens further to the south, yet rises quickly to outcrop at ground surface on the northeast and northwest margins of the well field property. Surficial materials at the site consist primarily of glaciomarine deposits of the Presumpscot formation and grades from the silty sand member of the unit near ground surface to its finer grained silt-clay member at depth. The transition zone (contact) between overburden and bedrock at the site is comprised of a mix of glacial till, fine to coarse sand, and weathered bedrock that ranges in thickness from about 10 to 25 feet. Wells D2 and E1 were finished as bedrock wells drilled to depths of 680 and 485 feet, and are believed to produce most of their groundwater from fractures present below a depth of about 270 feet.

WITHDRAWAL TESTING AND CONCLUSIONS

A withdrawal testing program was conducted by Emery & Garrett Groundwater Investigations Inc. (EGGI) from June 1 through July 3, 2015. 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 wells D2 and E1 were pumped at approximately 435 gpm between June 9 and June 17, 2015. Discharge from the wells was metered during the withdrawal testing program to maintain a near-constant pumping rate, and water quality samples were collected during the pumping period to characterize the quality of the groundwater derived from the proposed production wells.

Water Level Monitoring and Observations

During the withdrawal testing program, water level measurements were collected at:

- Two onsite production wells (D2 and E1);
- 14 onsite bedrock and overburden monitoring wells;
- Eight offsite private and public water supply wells (bedrock);
- Three offsite monitoring wells;
- Eight shallow groundwater piezometers; and,
- Four stream gauges.

The eight water supply wells are located at distances ranging from approximately 1,500 to 4,000 feet from the production wells in a residential area northeast of the well field along NH Rte. 27 (private water supply wells are not present in other areas surrounding the well field). Groundwater levels at the water supply wells and deep onsite groundwater monitoring wells were recorded to evaluate the zone of influence of the production wells, while shallow groundwater and surface water level measurements were recorded to assess the degree of hydraulic connection between the bedrock aquifer and the shallow water table, surrounding wetlands, and streams.

Under a non-pumping condition at the well field water level measurements indicate that regional groundwater flow is upwards, out of bedrock and into overburden, suggesting that bedrock is semi-confined by the overlying fine grained deposits. Under a pumping condition, water level drawdown expands substantially and in a slightly preferential orientation consistent with the previously noted trough in the bedrock surface, and recharge to the well field is largely through slow leakage from the overlying soils.

The pumping test water level measurements indicate that eight on-site bedrock and deep overburden monitoring wells responded to pumping with drawdowns ranging from 1.3 to 53.3 feet; and four off-site private water supply wells experienced drawdown related to pumping at both D2 and E1 at levels ranging from about 2.8 to 17.3 feet at the end of the test. Drawdowns in production wells D2 and E1 at the end of the test were 202.9 and 63.8 feet, respectively. Drawdown occurred only in deep overburden and bedrock wells monitored during the pumping test, and no drawdown or hydraulic effects occurred at any of the shallow monitoring wells, piezometers or surface water staff gauges that were instrumented during the test.

Based on a distance-drawdown analysis of graphical projections of water level responses in the monitored wells that assume 180 days of continuous pumping 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 3,000 feet from the well site.

Water Quality Monitoring and Observations

Due to the presence of known groundwater contamination in areas along the commercially developed section of NH Rte. 125 west of the site, groundwater quality samples were collected at four of the offsite water supply wells that were monitored for groundwater levels, and 13 of the onsite monitoring wells, in addition to the production wells. Groundwater quality sampling was done to assess for the presence of groundwater contamination in areas where the flow of groundwater is potentially influenced or captured by the production wells, and assess for impacts.

Results of water quality sampling of offsite water supply wells indicates the presence of low-level groundwater contamination at two of the locations sampled, but these locations were not hydraulically influenced by pumping at the proposed production wells. Results of water quality sampling of onsite monitoring wells indicates that low-level groundwater contamination is present at two locations that are hydraulically influenced by the production wells. The contaminants present included 1,4 dioxane and 1,1-dichloroethane at concentrations less than 0.6 micrograms per liter ($\mu\text{g/L}$) at the beginning of the pumping test, but dropped to non-detect levels as the test progressed; and methyl tert butyl ether (MtBE) that ranged between 1.7 to 2.4 $\mu\text{g/L}$ during the testing program.

Results of production well water quality sampling conducted during the withdrawal testing program indicates that arsenic ranges from 13 to 20 milligrams per liter (mg/L) in water produced from both wells D2 and E1, in excess of its associated Maximum Contaminant Level (MCL) of 10 mg/L and therefore will require treatment. Secondary MCLs for iron and manganese of 0.3 and 0.05 mg/L were exceeded in water produced from well D2 only and may require treatment, likewise the secondary MCL range for pH of 6.5–8.5 was exceeded in water produced from both wells and may need to be reduced prior to supplying to consumers. MtBE was detected at 1.3 $\mu\text{g/L}$ in one sample collected from production well D2 on the first day of the pumping test but was not detected above the laboratory detection limit (0.5 $\mu\text{g/L}$) in the remaining volatile organic compounds (VOC) samples collected throughout the pumping test. No other VOCs were detected in water from either well during the pumping test.

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 Brentwood, Epping, Exeter and Newfields. On October 30, 2013, the town of Brentwood requested a hearing following submittal of the preliminary application; NHDES subsequently held a public hearing on the application in Epping on November 20, 2013. At the hearing, a summary of the regulations governing large groundwater withdrawals was presented by NHDES, a project summary was presented by Epping and EGGI, and a question and answer session was held. Following the summary presentation and the question and answer session, an oral testimony period was opened; however, no oral testimony was submitted by the public

attending the hearing. Questions received by the public during the hearing related to: the capacity of the existing well field currently serving Epping's water system; the expected useful lifespan of the water supply wells in the proposed new well field; expected recharge area and recovery time needed for the proposed production wells; and the status of private wells near the well field and how they would be monitored during the pumping test program. After the public hearing, the 45-day written comment period on the report commenced, and closed on January 4, 2014. No written testimony was received during the period. Following submittal of the final report, no public hearing was requested by notified parties and no written testimony or comments were submitted to NHDES.

LARGE GROUNDWATER WITHDRAWAL PERMIT PUBLIC NOTIFICATION, MONITORING, REPORTING AND WITHDRAWAL REQUIREMENTS

To provide a means for notification in the event of an unforeseen impact, the large groundwater withdrawal permit requires Epping to notify any property owner with a private well within the estimated zone of influence of the well field prior to initiating a withdrawal from the well. As part of the notification, Epping must explain to each property owner that their well may be influenced by the withdrawal at the production wells and provide them with contact information at Epping and NHDES in the event they believe their well may be impacted by the withdrawal. More information concerning this requirement is provided in the large groundwater withdrawal permit under condition No. 7.

The large groundwater withdrawal permit requires Epping to conduct a water level and water quality monitoring program that includes the production wells and on-site monitoring wells. General monitoring requirements are summarized as follows:

- The permit requires that water levels in production wells D2 and E1 be monitored so that water level fluctuations in nearby wells can be compared to the operation of the production wells.
- The permit requires that water levels in three on-site monitoring wells be monitored to infer the extent of potential water level effects on nearby wells within the influence area of the production wells.
- The permit requires that water quality samples be collected from the production wells and on-site monitoring to assess for the presence of groundwater contamination.

The large groundwater withdrawal permit requires:

- A reduced maximum production volume from the well field for the first three years of operation of the production wells.
- Submission and implementation of a plan to expand the water level and water quality monitoring program, or reduce withdrawals, in the event that certain trigger water levels are met or exceeded in on-site monitoring wells; or
- NHDES determines that the withdrawal is not sustainable based on a review of water level or water quality monitoring data from the on-site monitoring wells or production wells.

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. The program would implement actions necessary to mitigate the impact including reducing the withdrawal volume, establishing water use restrictions for customers of the water system, modifying or replacing an impacted source at no initial capital cost to the user, and expanding (or establishing) a monitoring network to assess the effectiveness of the mitigation program. More information concerning these requirements is provided in the large groundwater withdrawal permit under condition No. 7.

Epping 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 wells D2 and E1. The annual report will be available to the public for review. A complete description of monitoring and reporting requirements is presented in more detail in the large groundwater withdrawal permit under condition No. 5.