The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2006-0001

to the permittee

HOOKSETT VILLAGE WATER PRECINCT (HVWP)
7 RIVERSIDE DRIVE
HOOKSETT, NH 03106
(603) 485-3392

for the withdrawal of the following volumes of groundwater from well:

EAST WELL - 576,000 gallons over any 24-hour period

located at the Pinnacle Pond site in Hooksett, New Hampshire ( )

Date of Issuance: March 24, 2006
Date of Expiration: March 24, 2016

Pursuant to authority in N.H. RSA 485-C:21, the New Hampshire Department of Environmental Services (Department), hereby grants this permit to Hooksett Village Water Precinct (HVWP) to withdraw groundwater from East Well, subject to the following conditions:

1. Application of Env-Ws 388 - The permittee shall continue to comply with the requirements of Env-Ws 388 at all times.

2. Inspections - Pursuant to RSA 485-C:15, the permittee shall allow any authorized member of the Department's staff, or its agent, to enter the property covered by this permit for the purpose of collecting information, examining records, collecting water level measurements, or undertaking other action associated with this permit.

3. Monitoring and Reporting - The permittee shall conduct a water flow rate and water level monitoring program according to paragraphs a.-c. below and as described in the Department letter containing monitoring requirements dated March 7, 2006 and a letter titled "Monitoring Plan", by Geosphere Environmental Management, Inc., dated March 13, 2006. A summary of all monitoring data shall be prepared in a hard copy format and submitted in an annual report to the Department by January 31 of each year, commencing January 31, 2007. The annual report shall include data for the preceding year ending on December 31. The annual report shall include a tabulated and graphed electronic spreadsheet submitted in a format approved by the Department. The annual report shall include an assessment of the potential impacts associated with the withdrawal including trends and variability. The permittee shall note any relevant observations that may affect water flow rate or water level measurements. The annual report shall include all field notes documenting monitoring activities for the preceding year. All field notes shall be signed and dated by the personnel responsible for collecting measurements. All water level measurements shall be made to the nearest 0.01 foot increment by a person who can demonstrate by education or experience, competency in collecting hydrogeologic measurements. This requirement shall apply to the following locations:

    a. Protecting Minimum Flows in Brickyard Brook - The permittee shall install a gauge and calibrate the gauge to monitor flow in Brickyard Brook at the box culvert located beneath Route 3A. The purpose of the monitoring will be to ensure that water is not diverted from Brickyard Brook when flow is below the seasonal Q60, or when the diversion would result in flow below the seasonal Q60. The seasonal Q60 streamflows are provided on the table below. The permittee shall maintain records of all gauge maintenance and calibration activities and submit this information to the Department in the annual report.

Season	Q60 streamflow (cubic feet per second)
Winter (January 1 to March 15)	1.55
Spring (March 16 to May 31)	5.9
Summer (June 1 to October 31)	0.25
Fall (November 1 to December 31)	2.28

b. Brickyard Brook Diversion Tracking - The permittee shall install a flow meter at the diversion pipe downstream of the gate valve to monitor the volume of water diverted from Brickyard Brook to Pinnacle Pond. A log book shall be used to record the dates, times, and flow meter readings in gallons each time the gate valve is opened and closed, at a minimum. The permittee shall provide the Department with a certificate of flow meter calibration, meter performance specifications, and meter maintenance and calibration requirements as prepared by the manufacturer. Meters shall be maintained and calibrated according to the manufacturer's specifications. The permittee shall maintain records of all meter maintenance and calibration activities and submit this information to the Department in the annual report.

c. Pinnacle Pond Water Level Management - The permittee shall operate the diversion pipe such that the resultant water level in Pinnacle Pond will not fall below the discharge end of the diversion pipe at Pinnacle Pond provided that the seasonal Q60 minimum flow is maintained at the proposed Brickyard Brook gauging station before and after opening the diversion pipe gate valve (refer to item 3a). The permittee shall install a permanent, surveyed gauge in Pinnacle Pond to monitor pond water levels. The permittee will notify DES within seven days if the pond water level is below the discharge end of the diversion pipe and the diversion cannot be used because the flow in Brickyard Brook is below the seasonal Q60 minimum flow or the Q60 minimum flow cannot be maintained with the diversion operating.

4. Mitigation Requirements - In the event that adverse impacts occur, the permittee shall comply with the requirements of Env-Ws 388:19.

5. Registered Water User - The permittee shall become a Registered Water User and maintain the water use reporting requirements of RSA 488 at all times. The permittee shall provide registration information for the South Backup Well and Brickyard Brook diversion to the New Hampshire Geological Survey.

6. Permit Renewal - The permittee shall apply for renewal of this permit at least 90 days prior to its expiration date. 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.

Harry T. Stewart, P.E.,
Director Water Division

PROJECT SUMMARY

Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2006-0001
Hooksett Village Water Precinct, PWS ID 1181020
East Well at Pinnacle Pond Site
Hooksett, New Hampshire

BACKGROUND

HVWP has submitted an application for a new large community water supply source and large groundwater withdrawal permit. The new well, identified as the East Well, is located approximately 60 feet east Pinnacle Pond in the town of Hooksett, New Hampshire as shown on the attached Figure 2, Site Plan. Pinnacle Pond is located in the northwestern portion of Hooksett east of Interstate 93 and west of the Merrimack River. It is reported that the East Well is located on property identified as Tax Map , owned by , and consists of approximately 34.5 acres of undeveloped land. HVWP owns Map , including Pinnacle Pond, and Lots , which are adjacent to Pinnacle Pond to the north, and Lot , which abuts Pine Street and provides access to the North Well. HVWP has owned the land encompassing and abutting Pinnacle Pond since 1950. Prior to 1950, land abutting the pond was developed as private, seasonal cottages which were removed after HVWP purchased the property. HVWP originally used Pinnacle Pond as a surface water supply, however, currently provides drinking water from sand and gravel wells located around the perimeter of the pond.

Pinnacle Pond is a steeply sloping kettle hole or depression fed solely by groundwater. The Pond is located in a large, sand and gravel aquifer that occupies much of the Merrimack River valley. Interstate 93 lies approximately 75 feet and 660 feet west of Pinnacle Pond and the East Well, respectively. The area west of this portion of Interstate 93 is primarily undeveloped woodland with occasional wetlands. Brickyard Brook is an east-flowing stream located approximately 1500 feet south of Pinnacle Pond at its closest point. The Pinnacle, a steeply rising bedrock hill covered by glacial till, lies immediately east of the East Well and Pinnacle Pond. Private residences are located approximately 850 feet northeast of the East Well and approximately 1,200 feet southeast of the well site. These residences are currently served by the water system.

BRICKYARD BROOK DIVERSION

The East Well is in addition to three active drinking water production wells located at the northern and southern perimeter of Pinnacle Pond. No streams lead into or out of Pinnacle Pond, however, a 16-inch diameter pipeline is used periodically to divert water, by gravity feed, from Brickyard Brook and increase the water level in the pond, typically during the summer season. The diversion pipeline is constructed in two sections. The first section of the pipeline begins at an intake grate at a flow control dam west of Interstate 93, is designed to flow continuously and parallels Brickyard Brook downstream for approximately 2,500 feet, where it returns water back to the brook via a return flow header built into the stream bank (about 1,000 feet west of its discharge to the Merrimack River). HVWP personnel regularly remove debris from the intake grate to ensure the continuous flow of water in this section of the pipeline when the water level at the flow control dam is high enough to flow into the intake grate. The second section of the pipeline extends north from a gate valve at the return-flow header to a discharge point in Pinnacle Pond. Water is diverted to Pinnacle Pond in this section of the pipeline when the gate valve is closed by HVWP personnel. HVWP has managed the pond water level by diverting water to the

pond when the pond level has receded approximately 4-5 feet laterally from the discharge end of the pipeline. The diversion usually continues until the pond level rises approximately 1-2 feet above the discharge end of the pipeline.

WITHDRAWAL TEST AND CONCLUSIONS

A withdrawal test was conducted at the East Well from April 6, 2005 to April 22, 2005 to assess sustainable water quantity and quality and the response of sand and gravel aquifer to pumping. Water level measurements were collected throughout the withdrawal test which was comprised of three periods, the antecedent or pre-pumping period, the pumping period, and the recovery period. The flow of water diverted from Brickyard Brook to Pinnacle Pond via the pipeline was stopped during the withdrawal test. Water level measurements were collected at monitoring wells, piezometers and staff gauges to evaluate the drawdown of the water table and the interaction between the surface water at Pinnacle Pond and the East Well. The withdrawal rate of 400 gallons per minute (gpm) or 576,000 gpd was also monitored to confirm a constant rate was maintained during the pumping period.

Withdrawal test results indicate that the East Well can sustain a withdrawal rate of 400 gpm or 576,000 gpd. The effects of induced infiltration from Pinnacle Pond appear after 48-hours of pumping the East Well. No drawdown from East Well pumping was observed at either the North Well, located approximately 1,100 north of the East Well at the northern perimeter of the pond, or the South Well, located approximately 900 feet south of the East Well at the southern pond perimeter. It is reported that approximately 90% of groundwater flow into the East Well is derived from Pinnacle Pond via induced infiltration. The induced infiltration to supply the East Well from Pinnacle Pond is similar to the observed affects of pumping the North Well and the South Well. It is reported that HVWP personnel have observed a water level drop in Pinnacle Pond of approximately 10 feet as a result of pumping the North Well and South Well. Based on extrapolation of the effects of pumping the East Well at the maximum rate for 180-days with no recharge to groundwater from rainfall or snowmelt and no water diverted from Brickyard Brook, it is estimated that water levels in Pinnacle Pond would drop an additional two to three feet below historical levels. The only impacts observed as a result of pumping the North Well, South Well, and proposed East Well, were to Pinnacle Pond. It is reported, based on withdrawal test results, that it is unlikely that the withdrawal from the East Well will impact any other water resources or users located in the study area.

LARGE GROUNDWATER WITHDRAWAL PERMIT MONITORING AND REPORTING REQUIREMENTS

The large groundwater withdrawal permit requires the permitee conduct a water flow rate and water level monitoring program consisting of the monitoring of Brickyard Brook, the tracking of the Brickyard Brook diversion, and the management of the water level in Pinnacle Pond as summarized below. A complete description of Monitoring and Reporting requirements is presented in more detail in the attached permit under condition No. 3.

- Protecting Minimum Flows in Brickyard Brook - The permit requires that a gauge be installed and calibrated to monitor flow in Brickyard Brook to ensure that water is not

diverted from Brickyard Brook when flow is below the seasonal Q60, or when the diversion would result in flow below the seasonal Q60.

- Brickyard Brook Diversion Tracking - The permit requires that a flow meter be installed at the diversion pipe downstream of the gate valve to monitor the volume of water diverted from Brickyard Brook to Pinnacle Pond.

- Pinnacle Pond Water Level Management - The permit requires the Brickyard Brook diversion be operated such that the resultant water level in Pinnacle Pond will not fall below the discharge end of the diversion pipe at Pinnacle Pond provided that the seasonal Q60 minimum flow is maintained at the proposed Brickyard Brook gauging station before and after opening the diversion pipe gate valve.

A summary of all required monitoring data shall be prepared in a hard copy format and submitted in an annual report to the Department by January 31 of each year, commencing January 31, 2007, and include data for the preceding calendar year. The annual report shall include an assessment of the potential impacts associated with the withdrawal including trends and variability.