

III.F Groundwater

I. Introduction and Principal Conclusions

No significant adverse impacts to the bedrock aquifer or watershed are anticipated from the planned groundwater withdrawal. The data indicates that the available groundwater recharge from precipitation is more than sufficient to meet the water demand of the project.

Two of the site's on-site wells will be utilized for the non-transient, non-community water-supply for the site. The existing onsite proposed supply well OW-3 is located on the northern portion of the project site, west of Fields Corner Road and north of Barrett Road. The existing onsite proposed supply well NW-4 is located on the southeastern portion of the project site, east of Pugsley Road and north of Route 312.

The proposed groundwater withdrawal from wells OW-3 and NW-4 of 29,000 gpd is significantly less than the estimated groundwater recharge to the bedrock aquifer underlying the project site under normal precipitation conditions of 205,000 gpd and drought conditions of 133,250 gpd. The data indicates that the available groundwater recharge is sufficient to meet the water demand of the project. Based on the existing well pumping test data, no significant adverse impacts to existing offsite wells near the project site are anticipated from pumping in onsite wells OW-3 and NW-4.

Infiltration and recharge of a portion of the water withdrawn back into the groundwater system through the use of an onsite septic system will also reduce the consumptive water withdrawal of the project, further reducing the potential for cumulative aquifer impacts.

Therefore, no mitigation measures in regard to the planned groundwater withdrawal are warranted.

2. Existing Conditions

a. Recharge/Discharge Areas And Relationships Of Existing Wells

In till-covered, fractured metamorphic bedrock in Putnam County, the pattern of natural groundwater flow is generally similar to the pattern of surface-water flow. The natural groundwater recharge areas can be approximated by defining the surface-water drainage basins and sub-basins. The watershed area for the onsite wells, which is shown on Figure III.F-1, encompasses approximate 2.1 square miles.

The majority of groundwater recharge within the watershed comes from precipitation which falls directly on the watershed and infiltrates into the underlying soil and bedrock. Of the total rainfall and snowmelt that occurs about half is lost to evaporation and transpiration processes. The remaining half becomes surface-water runoff and groundwater recharge. The precipitation that recharges groundwater infiltrates through the soil zone and percolates downward to recharge the bedrock aquifer system.

Recharge to till-covered metasedimentary bedrock has been estimated at 400,000 gpd/sq. mi. or about 8 inches annually by the U.S. Geological Survey open file report 80-437 for the Fishkill-Beacon area. This is equal to about 625 gpd/acre (gallons per day per acre) of precipitation recharge. Based on this value, precipitation recharge to the 2.1 square mile watershed area for the onsite wells would be about 840,000 gpd. To be more conservative, the total recharge to area underlying the project site has been reviewed. Based on the site's 328 acres, the groundwater recharge from direct precipitation within the project site boundaries is approximately 205,000 gpd or about 142.4 gpm.

Average precipitation in the area is 50.38 inches based on the monthly climate normals from 1981-2010 for the nearby Carmel 4N weather station. During drought periods groundwater recharge and available water supply would be

reduced. The one-year-in-30 low precipitation (3.33% chance of recurrence) in the area typically ranges from a 30-35% reduction in annual precipitation. To be conservative, a 35% reduction in the average annual precipitation has been used which results in a drought precipitation of 32.75 inches. Assuming groundwater recharge decreases at the same rate as precipitation during periods of diminished rainfall, the estimated recharge from direct precipitation recharge for the bedrock aquifer underlying the project site during an extreme drought period would be 133,250 gpd or 92.5 gpm.

Under natural conditions, well yields can be expected to be higher in areas where groundwater is discharging in surface water, such as areas near streams and naturally-occurring wetlands. Fractured bedrock often underlay these features and bedrock well sites are targeted nearby with the intention of encountering the bedrock fractures and producing higher-yielding wells. The existing onsite proposed supply wells are located near onsite surface-water features and were successful in achieving the higher yields.

b. Available Yield Of Existing Wells

A simultaneous 72-hour pumping test was conducted on three onsite bedrock wells, OW-1, OW-3 and NW-4, in June 1992 by Leggette, Brashears & Graham, Inc. The results of the pumping test successfully demonstrated that the individual yield capacities of the wells were 140 gallons per minute (gpm), 58 gpm and 90 gpm, respectively, for a combined 288 gpm under simultaneous pumping conditions.

A follow up yield test was conducted in March 2004 on wells OW-1, OW-3 and NW-4 by Leggette, Brashears & Graham, Inc. The wells demonstrated sustainable rates of 56 gpm, 30 gpm, and 60 gpm. The wells were tested at lower rates during the 2004 testing program because the project that was proposed at that time had a lower water demand requirement than the previously proposed project in 1992.

A comparison of the pumping test drawdown and specific capacity data between 1992 and 2004 showed no significant diminishment in the yield capacities in wells OW-1 and NW-4. However, for well OW-3, the 2004 test data did indicate a slight loss in yield from 58 gpm to 30 gpm. This loss was attributed to a possible partial well collapse or a blockage within one of the water-bearing fractures. However, despite the decrease, OW-3 was able to demonstrate a stabilized production capacity of 30 gpm.

Wells **OW-3** and **NW-4** are proposed for use to supply water for the Northeast Interstate Logistics Center. The tested yields of the wells at 30 gpm and 60 gpm from the 2004 pumping test are more than sufficient to individually meet the current combined project water demand of 29,000 gpd (20.1 gpm) for both the planned potable and irrigation water uses.

c. **Water Quality Of Existing Wells**

Water samples were collected from wells OW-1, OW-3 and NW-4 during the July 1992 72-hour pumping test and analyzed for parameters in the New York State Sanitary Code Subpart 5-1. The results of these sample analyses met all New York State Department of Health (NYSDOH) drinking water standards at that time.

Additional water samples were collected from wells OW-1, OW-3 and NW-4 in March 2004 and analyzed for parameters listed in the New York State Sanitary Code Subpart 5-1 and for microscopic particulate analysis (MPA). The sample results from all three wells met all NYSDOH drinking water standards with the exception of the presence of total coliform in well OW-3. Total coliform was not present in the 1992 sample collected from well OW-3, therefore the presence in 2004 was attributed to the pulling and reinstallation of a dip tube in the well during

the test period and was not an issue with the groundwater quality. Well disinfection and resampling was the proposed remedy.

In 2004 the reported chloride concentration in well OW-1 was elevated at 174 milligrams per liter (mg/L). The concentration in OW-1 was below the NYSDOH maximum contaminant level (MCL) for chloride of 250 mg/L; however, the value had increased notably since the 1992 testing when the concentration reported in OW-1 was 49 mg/L. The increase in chloride in well OW-1 was attributed to the proximity of the well to Interstate I-84 and road salt application to the highway. This well is not proposed to be used by the project. The chloride concentrations in wells OW-3 and NW-4 in 2004 were much lower than in OW-1, at 30 mg/L and 27 mg/L, respectively.

The results of the MPA samples collected from wells OW-1, OW-3 and NW-4 in 2004 reported low potential risk for groundwater under the direct influence of surface water (GWUDI) in all three of the wells.

Resampling is to be conducted of the proposed water supply wells OW-3 and NW-4 for parameters required by the NYSDOH Sanitary Code Part 5, Subpart 5-1 for non-transient, non-community water-supply wells. The Part 5 parameter list includes total coliform and chloride to address the prior total coliform detection in OW-3 and to confirm that the road salt application to I-84 has not significantly affected the proposed supply wells. MPA samples will also be collected from wells OW-3 and NW-4 to confirm the low GWUDI risk previously reported.

d. Location Of Existing Wells

The locations of the onsite wells are shown on the Figure III.F-1. The existing onsite proposed supply well OW-3 is located on the northern portion of the project site, west of Fields Corner Road and north of Barrett Road. The existing onsite proposed supply well NW-4 is located on the southeastern portion of the project site, east of Pugsley Road and north of Route 312.

e. Other Relevant Conditions

During the March 2004 pumping tests, piezometers were installed in the wetlands adjacent to wells OW-1, OW-3 and NW-4 to assess the potential for hydraulic interconnection between the groundwater withdrawals from the deep bedrock aquifer and the shallow groundwater and surface water in the onsite wetlands. The water-level measurements collected from all three piezometer locations showed no discernible drawdown or interference effects from pumping the onsite wells which indicated no direct hydraulic connection between the bedrock wells and onsite wetlands.

3. Future Without the Proposed Project

Without the proposed project, the three on-site wells will remain in-place but will not be used. There will be no groundwater withdrawal, that in any case with the proposed project would be significantly less than the recharge to the groundwater during both normal and drought precipitation conditions. The potential exists for a future development of the site to utilize the existing wells as a source of water.

4. Anticipated Impacts

a. Zone Of Influence Of Existing Wells

During the June 1992 pumping test on wells OW-1, OW-3 and NW-4, fourteen nearby wells were measured to assess pumping-related effects in the bedrock aquifer from pumping at a combined rate of 288 gpm. Water-level measurements were collected from five existing onsite wells and nine offsite wells.

The nine offsite wells measured in 1992 were located surrounding the study property, and were identified as Simmons well, Terravest Corporate Park, Southeast Executive Park, Duke/Benedict Farm, Gottwald, Twin Manor, Hunter's Glen Condominium, Ginsburg Development Corporation Well 3 and Ginsburg Development Corporation Well 4. The location of the offsite monitoring wells are shown on Figure III.F-1. Drawdown was measured in only one of the nine offsite wells during the test period. The Ginsburg Development Corporation Well 3 had approximately 29.5 feet of drawdown during the test period with the wells pumping at a combined 288 gpm. This offsite well is located northeast of OW-3 on the east side of Fields Lane.

The five onsite monitoring wells measured during the 1992 test were wells TW-1, TW-2, TW-3, TW-4 and NW-3. Drawdown was measured in four of the five wells. No drawdown was measured in TW-2 during the test. The drawdown in wells TW-1, TW-3, TW-4 and NW-3 ranged from 3.3 feet in TW-3 to 9.6 feet in NW-3.

The 1992 combined tested yield of wells OW-1, OW- 3 and NW-4 of 288 gpm (414,720 gpd) exceeds the combined potable and irrigation water demand of the current project of 29,000 gpd by more than 14 times. The drawdown that was observed during the 1992 pumping test was limited to four onsite monitoring wells

and one offsite well to the northeast of OW-3. Considering the significantly lower proposed withdrawal from the onsite wells (29,000 gpd), any drawdown effects that may occur in nearby wells in this area will be significantly less than what was measured during the 1992 pumping test.

During the pumping test conducted in March 2004 on wells OW-1, OW-3 and NW-4, a well monitoring program was also completed. As part of the March 2004 test, the NYSDEC requested that any new wells drilled in the area since the original test was conducted in 1992 be measured to assess potential pumping-related effects. In response to the request, two new offsite wells were located and measured, the Home Depot well north of OW-3 and the Yarusoo well south of NW-4. The location of the offsite monitoring wells are shown on Figure III.F-1. During the March 2004 pumping test on wells OW-1, OW-3 and NW-4, no water-level drawdown that was attributed to pumping in the onsite wells was measured in either of the offsite wells monitored.

Onsite well NW-3 was also measured during the March 2004 pumping test. Drawdown measured in NW-3 during the 2004 test was 1.8 feet which was more than five times less than the drawdown measured during the 1992 test of 9.6 feet. This data supports that a reduction in pumping rate will result in less drawdown in the aquifer and less potential effect on other nearby wells.

An approximate area of influence in the bedrock aquifer from pumping in the onsite wells is shown on Figure III.1. As discussed above, the only drawdown measured in an offsite well during either pumping test program was in the Ginsburg Development Corporation Well 3 northeast of OW-3 on the east side of Fields Lane in 1992, which the NYSDEC did not ask to be tested again in 2004 because they requested that only any new wells be tested.

b. Cumulative Impact Of Proposed Projects On Watershed And Aquifers

The proposed groundwater withdrawal from the onsite bedrock wells OW-3 and NW-4 of 29,000 gpd is significantly less than the estimated groundwater recharge to the bedrock aquifer underlying the project site under normal precipitation conditions of 205,000 gpd and drought conditions of 133,250 gpd. This data indicates that the available groundwater recharge is sufficient to meet the water demand of the project.

Water-level data collected from the 1992 and 2004 pumping tests demonstrated that pumping-related water-level drawdown effects in the bedrock aquifer were limited to the onsite wells and a small area to the northeast of OW-3. The pumping test data also showed that interference effects decreased with a decrease in the pumping rates in the onsite wells. Therefore, the planned withdrawal of 29,000 gpd (20.1 gpm) is not anticipated to have any significant effect on offsite wells or the bedrock aquifer in the area. The PCDOH, the regulatory permitting agency for the planned non-transient, non-community public water system, was contacted to determine whether the department would require additional yield testing or offsite well monitoring to confirm results from the prior tests conducted on the proposed supply wells. The PCDOH responded that the existing testing data was sufficient, and no additional testing was required.

Onsite subsurface wastewater disposal is also planned for the project. Infiltration and recharge of a portion of the water withdrawn back into the groundwater system through the use of an onsite septic system will reduce the consumptive water withdrawal of the project, further reducing the potential for cumulative aquifer impacts.

Water-level data was also collected from piezometers installed in the onsite wetlands during the 2004 pumping test. The data collected showed no discernible

pumping-related drawdown which indicates no direct hydraulic connection between the bedrock wells and onsite wetlands. Therefore, no cumulative effect to surface water within the watershed is anticipated from use of the onsite bedrock wells.

Stormwater management practices will also be implemented as part of the planned development to address the potential for cumulative effects to the watershed and aquifer. The stormwater facilities have been designed such that the quantity and quality of stormwater runoff will not significantly change during or after construction on the site,

c. Infiltration Of Pesticides And Fertilizers; Applicant's Intended Use And Practice

Use and storage of fertilizers and pesticides will comply with the NYCDEP Watershed regulations. The regulations indicate that the storage or use of pesticides as permitted under state and federal law will not lead, with a reasonable likelihood, to a discharge into the environment which causes degradation of surface water quality or of the water supply. Use of pesticides and fertilizers will be in conformance with state and federal law as well as with the manufacturers label instructions, by a competent landscaper or other professional. Fertilizer and pesticide use, when applied in accordance with state and federal law as well as with the manufacturer's guidelines, is not anticipated to have an impact on groundwater or surface water resources.

d. Impact On Neighboring Wells

Water-level data collected during the 1992 and 2004 pumping tests demonstrated that pumping-related water-level drawdown effects in the bedrock aquifer were limited to the onsite wells and a small area to the northeast of OW-3. The pumping test data also showed that interference effects decreased with a decrease in the pumping rates in the onsite wells. Therefore, the planned withdrawal of

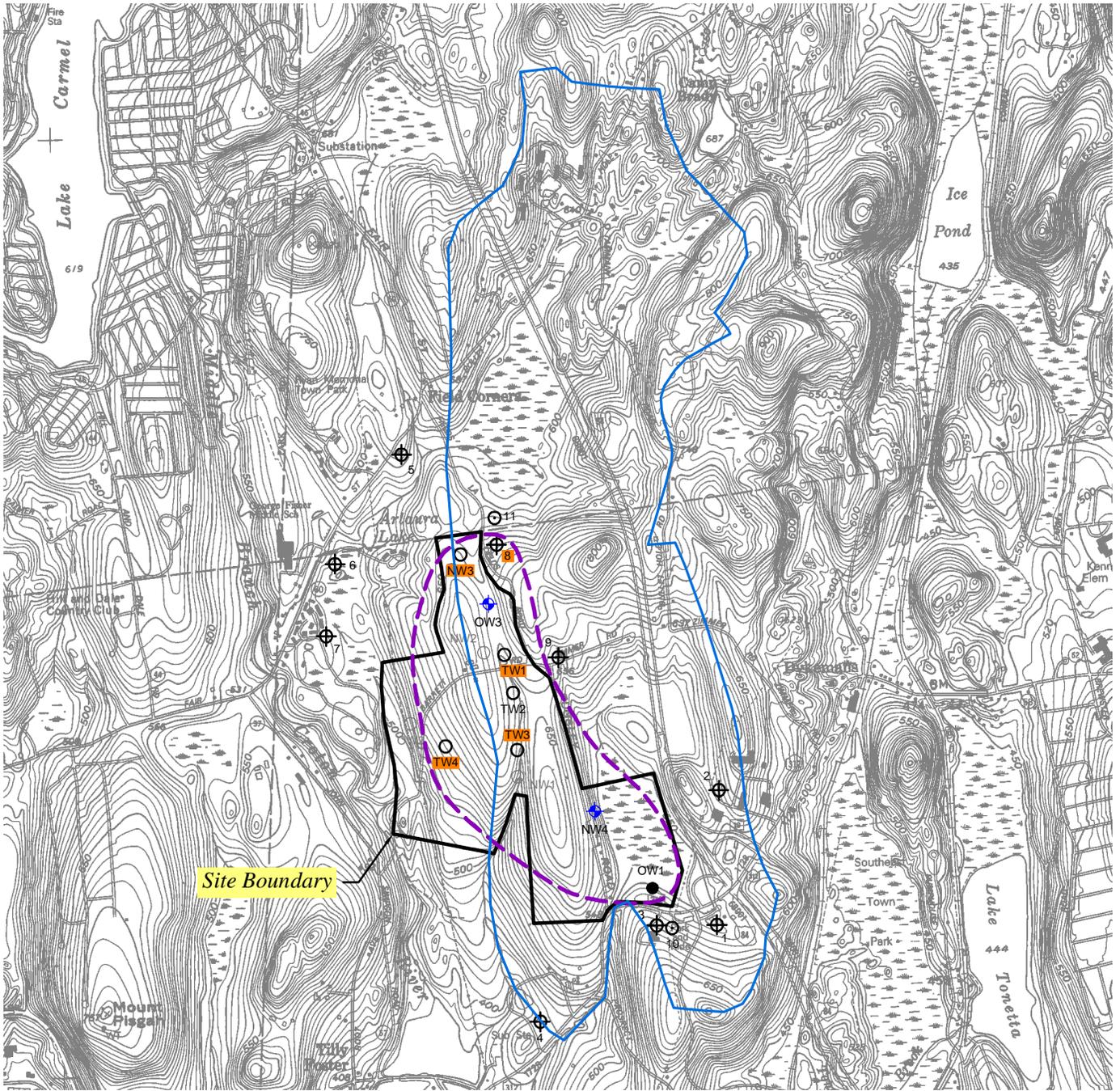
29,000 gpd (20.1 gpm) is not anticipated to have any significant effect on nearby offsite wells or the bedrock aquifer in the area.

5. Mitigation Measures

No significant adverse impacts to the bedrock aquifer or watershed are anticipated from the planned groundwater withdrawal. Additionally, based on the existing well pumping test data, no significant adverse impacts to existing offsite wells near the project site are anticipated from pumping in onsite wells OW-3 and NW-4. Therefore, no mitigation measures in regard to the planned groundwater withdrawal are warranted.

Fertilizers and pesticides will be applied in accordance with state and federal law as well as with the manufacturer's guidelines, and as such are not anticipated to have an impact on groundwater or surface water resources.

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SOURCE: USGS DIGITAL QUADRANGLE LAKE CARMEL AND BREWSTER, NEW YORK.

LEGEND



- PUMPING WELL (1992 AND 2004)
- ⊕ PUMPING WELL (1992 and 2004) PROPOSED AS SUPPLY WELL FOR NORTHEAST INTERSTATE LOGISTICS CENTER
- ⊕ OFFSITE MONITORING WELL (JUNE 1992)
- ⊕ OFFSITE MONITORING WELL (MARCH 2004)
- ONSITE MONITORING WELL
- ONSITE WELL NOT MEASURED
- WATERSHED FOR ONSITE PUMPING WELLS
- DRAWDOWN MEASURED IN MONITORING WELL DURING JUNE 1992 AND/OR MARCH 2004 PUMPING TEST
- - - APPROXIMATE AREA OF INFLUENCE IN BEDROCK AQUIFER FROM PUMPING ONSITE WELLS BASED ON JUNE 1992 AND MARCH 2004 PUMPING TESTS



NORTHEAST INTERSTATE LOGISTIC CENTER SOUTHEAST, NEW YORK

WELL LOCATION AND WATERSHED MAP

DATE	REVISED	PREPARED BY:					
			WSP USA 4 Research Drive Suite 204 Shelton, Connecticut 06484 (203) 929-8555				
DRAWN:	RAC	CHECKED:	SS	DATE:	03/12/18	FIGURE:	III.F-1