3.8 SURFACE WATER, WETLANDS AND GROUNDWATER

This section is divided into two subsections: 3.8i, which addresses wetlands and surface waters; and 3.8ii, which addresses groundwater resources.

3.8i Surface Water and Wetlands

This section describes existing water quality conditions of on-site water resources and potential changes to water quality and quantity of these on-site resources as a result of the Project, including downstream off-site effects. The Project's stormwater pollution protection plan (SWPPP) included in Appendix H has been prepared in accordance with the New York State Stormwater Management Design Manual and is analyzed below. This section concludes the Project would not result in any significant adverse impacts to wetlands and surface waters.

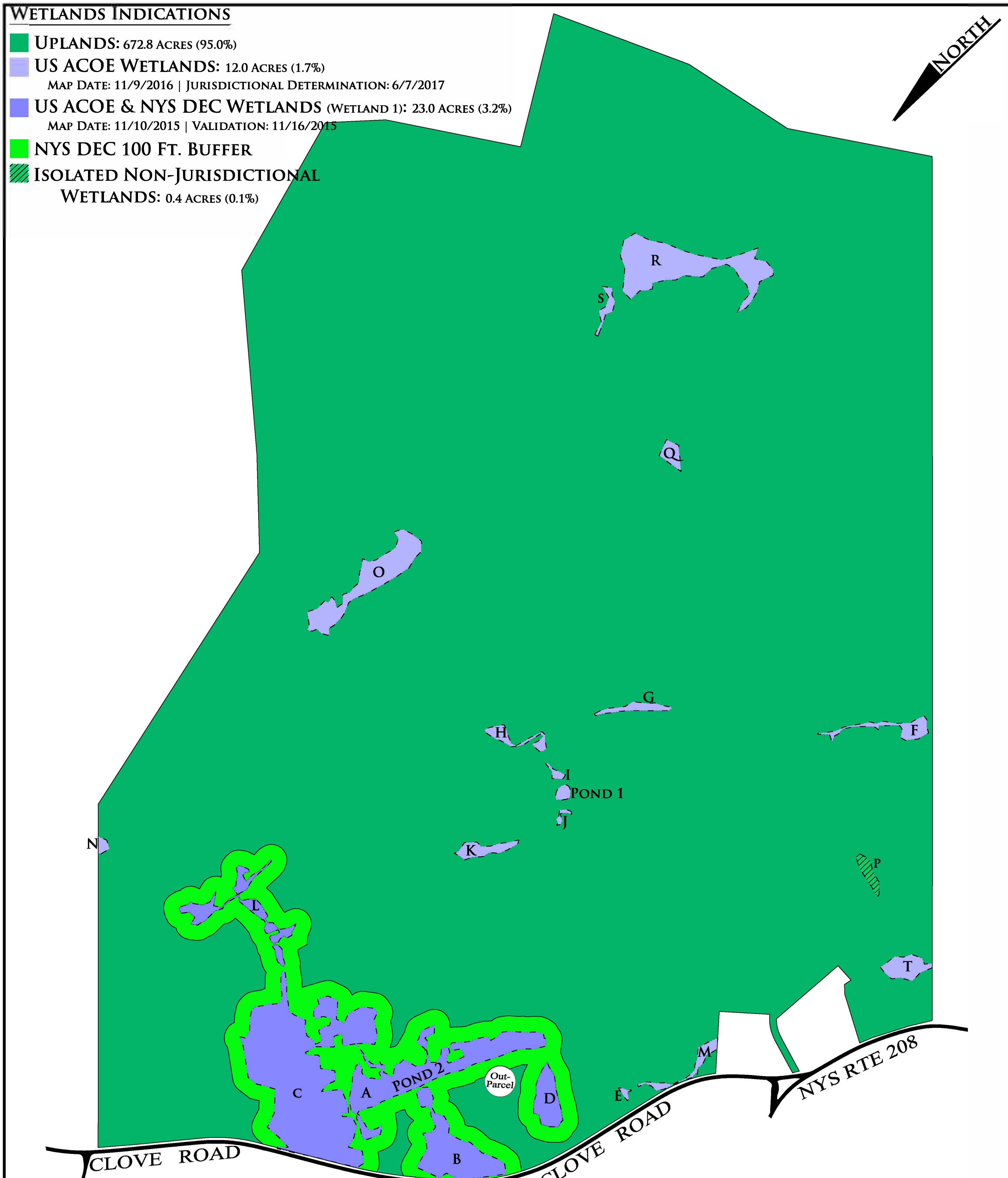
3.8i.1 Existing Conditions

The Project Site's 708.2 acres of land includes 37.48 acres of wetlands, watercourses and surface waters. Drainage, generally, is into the stream through Blaggs Clove, which flows across the Project Site. It flows into Satterly Creek, which flows into the Otterkill and Moodna Creek. Moodna Creek is a significant tributary of the Hudson River, entering the river north of Cornwall-on-Hudson. The stream through the Project Site is classified as a Class C fishing stream. Existing flow characteristics were thoroughly analyzed in studies conducted by HDR (See Appendix I).

The Project Site contains 2.12 acres of unnamed watercourse and 35.36 total acres of wetlands, of which 34.98 acres are under the jurisdiction of the United States Army Corps of Engineers ("USACOE") and 0.38 acres are isolated non-jurisdictional wetlands (Wetland P). Of the 34.98 acres under the jurisdiction of the USACOE, 23.03 are also under the jurisdiction of the NYSDEC. As a result, the total regulatory jurisdictional wetlands total an area of 34.98 acres, which is approximately 5% of the Project Site. Those regulatory jurisdictional wetlands are described below. All wetlands mapping has been verified by both the NYSDEC and the USACOE, who issued a Jurisdictional Determination included in Appendix E. Table 381 following summarizes the wetlands on the Project Site, which are also mapped in Figures 381 and 382, the latter of which includes the Project's development layout.

The 34.98 acres of USACOE wetlands account for approximately 5% of the total Project Site area and include 23.03 acres from Wetland No. 1, which includes Wetland No. A, B, C, D, L and Pond 2, and 11.95 acres comprised of Wetland No. E, F, G, H, I, J, K, M, N, O, Q, R, S, T and Pond 1. Together, these wetlands contain a total of 617 flags.

The NYSDEC freshwater wetlands boundary was delineated in 2014 and 2015 by the NYSDEC,



Clovewood
Draft Environmental Impact Statement

FIGURE 381

Clovewood Wetlands Map

March 28, 2018 | Scale: 1" = 840'

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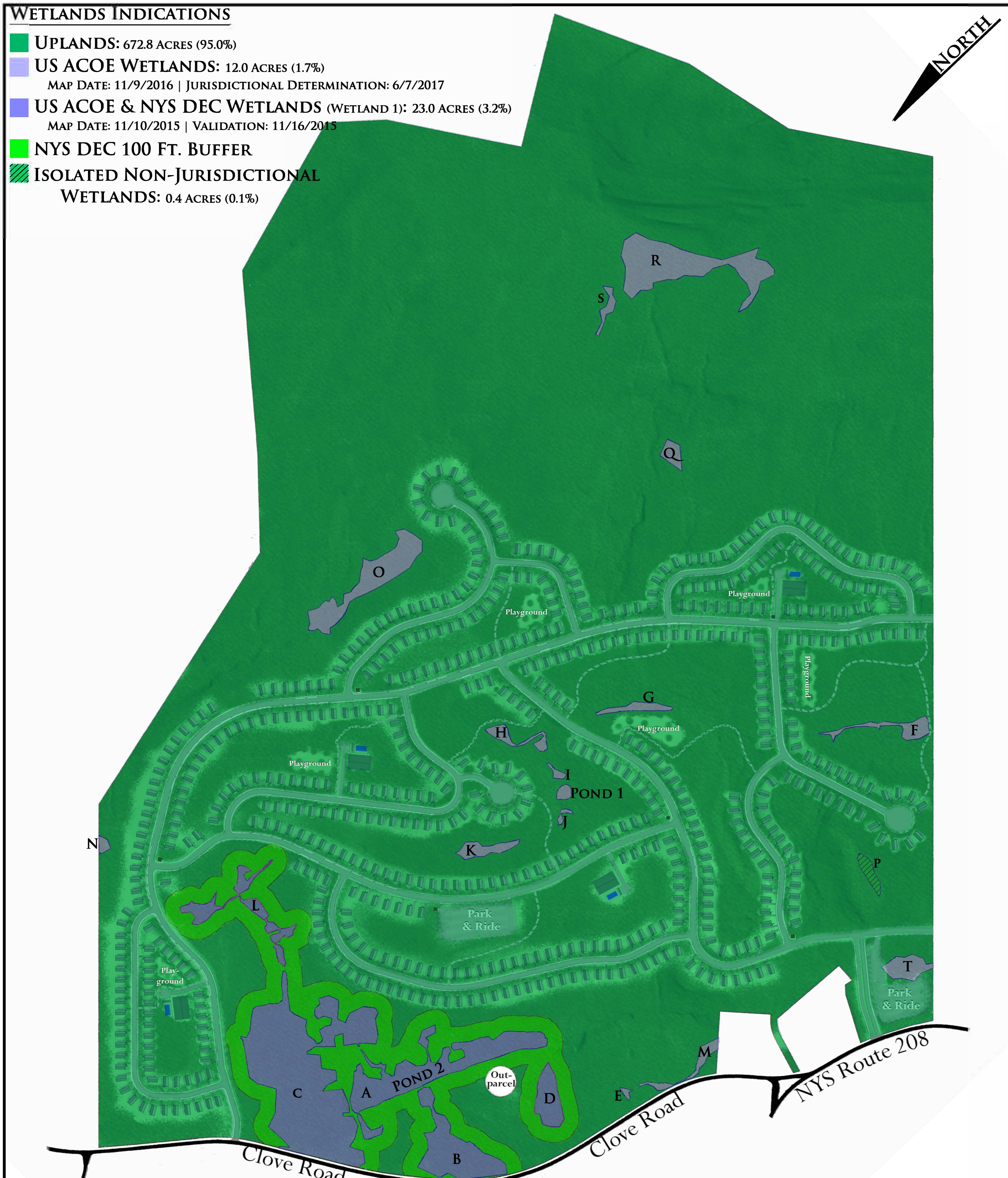


Clovewood
Draft Environmental Impact Statement

Figure 382
Clovewood Composite Image
Wetlands Map with Propsoed Development areas
March 28, 2018 | Scale: 1" = 840'

Community Planning Consultants
P.O. Box 2020, Monroe New York 10949
Tel: (845) 774 · 8000 | cpcnynj@gmail.com

validated by the NYSDEC on November 16, 2015, and was submitted to the Village on December 18, 2015. It includes 23.03 acres of wetlands that are also under the jurisdiction of the USACOE identified as Wetland No. 1, which includes Wetland No. A, B, C, D, L and Pond 2, accounting for approximately 3% of the Project Site. These wetlands contain a total of 348 flags.

Table 381

Clovewood Project Site Wetlands

Jurisdiction	Wetland No.	No. of Flags	Area (Acres)
USACOE & NYSDEC	1*	348	23.03
USACOE	E	9	0.07
	F	37	0.71
	G	24	0.42
	H	28	0.48
	I	11	0.11
	J	14	0.08
	K	19	0.58
	M	11	0.50
	N	4	0.13
	O	46	2.83
	Q	4	0.37
	R	36	4.41
	S	12	0.28
	T	14	0.81
	Pond 1	n/a	0.17
Isolated**	P	9	0.38
		Total Wetlands Area	**35.36**

*Includes Wetlands No. A, B, C, D, L and Pond 2; **Non-Jurisdictional Wetlands

The Project would not include construction, grading filling, excavating, clearing or other regulated activity on the wetlands as well as within 100 feet of the NYSDEC wetland boundary. The Project Site is not located within any Federal Emergency Management Agency ("FEMA") designated floodplain or floodway.

There is a former golf course on the Project Site, but it has been long abandoned. No pesticides or herbicides of any kind are being used in connection with the former golf course lands, and no significant pesticide or herbicide use would be undertaken in connection with any proposed use.

There are no existing surface water withdrawals, surface water discharges, wastewater treatment facilities, or stormwater management facilities currently in existence on or otherwise associated with the Project Site, although such facilities are proposed to be installed in connection with the Project.

3.8i.2 Potential Impacts

The Village Scoping Document requested the following information regarding the potential impacts of the Project on wetlands and surface waters:

(a) Disturbance of bed and banks of any streams traversing the project site.

The Project would not involve any construction within or adjoining a freshwater or tidal wetland, or in the bed or banks of any other water body. Therefore, there would be no environmental impacts in this regard. However, the Project would involve the crossing of intermittent streams with roads and their associated culverts as well as temporary disturbances associated with the installation of utilities. The crossing of ephemeral streams and watercourses by the proposed roadways would require coverage under either Nationwide Permit #29 for crossings resulting in permanent disturbance to the stream bed, or Nationwide Permit #33 for disturbances resulting in temporary disturbance to the stream bed such as for temporary construction access or for the construction of open bottom type structures that would restore the original stream bed upon completion of the structure.

(b) *Potential degradation of Satterly Creek and its unnamed tributary, including effects due to the quality and quantity of water that would be discharged from the proposed wastewater treatment facility (WWTF) and from stormwater runoff. Water quality impacts will be based on the existing water quality conditions in the waterbodies, the projected quality of the WWTF effluent, and the projected quality of the stormwater runoff. The assessment will further consider effluent limits for the proposed discharge of the WWTF based on the Waste Assimilation Capacity (WAC) analysis performed in accordance with NYSDEC Division of Water Technical and Operational Guidance. The assessment will consider seasonal and episodic variations in stream flow in Satterly Creek and the unnamed tributary. Water quality and quantity effects shall be modeled, if necessary. A summary of the field data report (including the laboratory report) will be provided as an appendix to the DEIS.*

HDR completed an initial Waste Assimilation Capacity ("WAC") Report, dated January 19, 2015 in accordance with DEC, Division of Water, "Technical and Operational Guidance" to analyze the potential discharge location from the proposed wastewater treatment facility ("WWTF") to serve the Project. The WAC Report is provided as Appendix D to the September 2015 "Application for State Pollutant Discharge Elimination System (SPDES) and Approval Plans for a Wastewater Disposal System for the Clovewood Wastewater Treatment Plant," received by NYSDEC on January 8, 2016 (see Appendix I).

The WAC Report concluded the proposed wastewater treatment discharge would require treatment to meet NYSDEC's Intermittent Stream Effluent Limits ("ISELs"). A WWTF was designed to produce treated effluent to meet the ISELs.

On June 28, 2016, HDR contacted the NYSDEC Deputy Regional Permit Administrator, Division of Environmental Permits, via email correspondence to confirm the information submitted with the September 2015 SPDES permit application satisfied all DEC requirements to evaluate water quantity and quality effects on the stream flow in Satterly Creek and the unnamed tributary. HDR also requested DEC confirm if any additional field sampling and/or modeling (using QUAL2E model or equivalent) was required as part of the WAC Report. On August 26, 2016, DEC provided an email response to HDR that no additional WAC studies were required, as verified by the Division of Water Staff Engineer. A copy of the email correspondence with DEC confirming the WAC Report was complete for Satterly Creek and the unnamed tributary is provided in Appendix I.

(c) Effects on natural and man-made impoundments on-site, as well as downstream of the Project Site if fed by waters drawn from the unnamed tributary.

No impoundments of any kind would be proposed as part of the Project.

(d) Effects of excavation and placement of fill in state- and/or federally-regulated wetlands.

No excavations or placement of fill in State- and/or federally-regulated wetlands would be proposed as part of the Project.

(e) The watersheds, and water bodies, to which the project will drain will be identified. The evaluation will specifically consider the Bloggs Cove, Satterly Creek, and Moodna Creek, and implications of the proposed project with the Moodna Creek Watershed Management Plan and current total maximum daily loads (TMDLs).

The Project would not drain to Blaggs Cove. Rather, the water body to which the Project would drain is an "unnamed tributary" next to the hamlet of Blaggs Clove. The WWTP would discharge into an unnamed stream at latitude 41° 22' 42.38" N and longitude 74° 10' 16.46" W. This unnamed stream joins another unnamed stream 0.35 miles below the WWTP discharge.

Flow from the unnamed tributary next to the hamlet of Blaggs Cove then joins this watercourse 0.21 miles further downstream. Note that the unnamed tributary would be unaffected by WWTP discharges, because it joins the watercourse below the WWTP discharge. This course then flows another 0.73 miles and joins Satterly Creek, which is a tributary to Moodna Creek.

HDR researched information regarding a Total Maximum Daily Load ("TMDL") for Moodna Creek and found Lower Moodna Creek and its minor tributaries have no known impacts. HDR also found information indicating that for Upper Moodna Creek and its minor tributaries, nutrients (phosphorus) have a suspected impact. Moodna Creek was not listed on the NYS Water Quality Report TMDL List maintained by the State pursuant to Clean Water Act §§ 305(b) or 303(d).

HDR confirmed with the NYSDEC that there are currently no TMDLs for Moodna or Satterly Creek nor any planned for the immediate future, as provided in the email correspondence from NYSDEC included in Appendix I.

(f) The potential thermal impacts of any discharge to receiving streams or water bodies will be discussed and evaluated.

Figure 383 shows the location of the proposed WWTP point of discharge and Figure 385 shows the network of streams and tributaries in the vicinity of the WWTP discharge. The WWTP discharges to an unnamed stream at latitude 41° 22' 42.38" N and longitude 74° 10' 16.46" W. This unnamed stream joins another unnamed stream 0.35 miles below the proposed WWTP discharge. The unnamed tributary next to the hamlet of Blaggs Clove then joins this watercourse 0.21 miles further downstream.

Note that the unnamed tributary (from Blaggs Clove) would be unaffected by WWTP discharges because it joins the watercourse below the WWTP discharge. This course then flows another 0.73 miles and joins Satterly Creek.

Table 382 shows the tributaries potentially affected by the WWTP discharge and respective NYSDEC classification according to NYSDEC Environmental Resource Mapper (http://www.dec.ny.gov/imsmaps/ERM/viewer.htm). This watercourse, including the unnamed streams and unnamed tributary (Blaggs Clove), at the confluence Satterly Creek is classified as a Class C, non-trout stream. Satterly Creek becomes a Class C trout stream ("Class C(T)") approximately 2.0 miles further downstream.

Table 382
Tributaries Classifications

Tributary	Classification
Unnamed Stream receiving WWTP discharge	C (Non-Trout Water)
Unnamed Tributary (by Blaggs Clove) Joins Unnamed Tributary	C (Non-Trout Water)
Satterly Creek Joins Unnamed Stream and Unnamed Tributary (by Blaggs Clove)	C (Non-Trout Water)
Satterly Creek at beginning of Class C(T)	C (Trout Water)
Source: NYSDEC Environmental Resource Mapper	

Estimates of instream temperature that would result from the WWTP discharge would be made using a temperature balance that considers instream flow and water temperature, as well as WWTP-treated discharge flow and temperature. This resulting temperature would be compared to NYSDEC temperature limits. This involves applying instream low flow estimates based on surrogate streams and estimates of instream seasonal temperatures based on long term meteorological data. Low flows at surrogate streams are based on USGS flow data. Development of ambient low flow and seasonal temperatures, as well as WWTP discharge temperature for use in the thermal balance, is presented below.

Figure 383: Study Area with Proposed Outfall Location

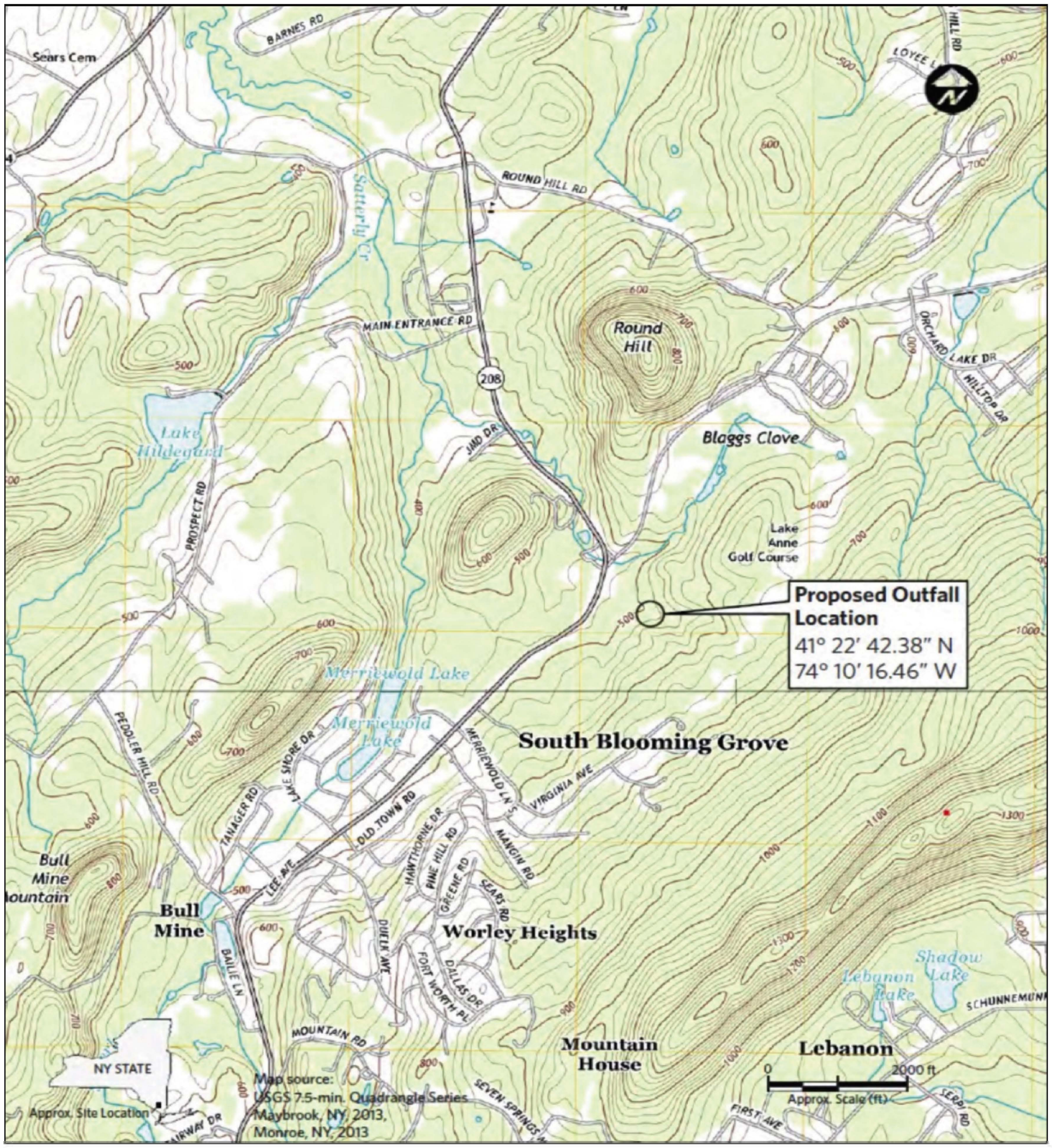
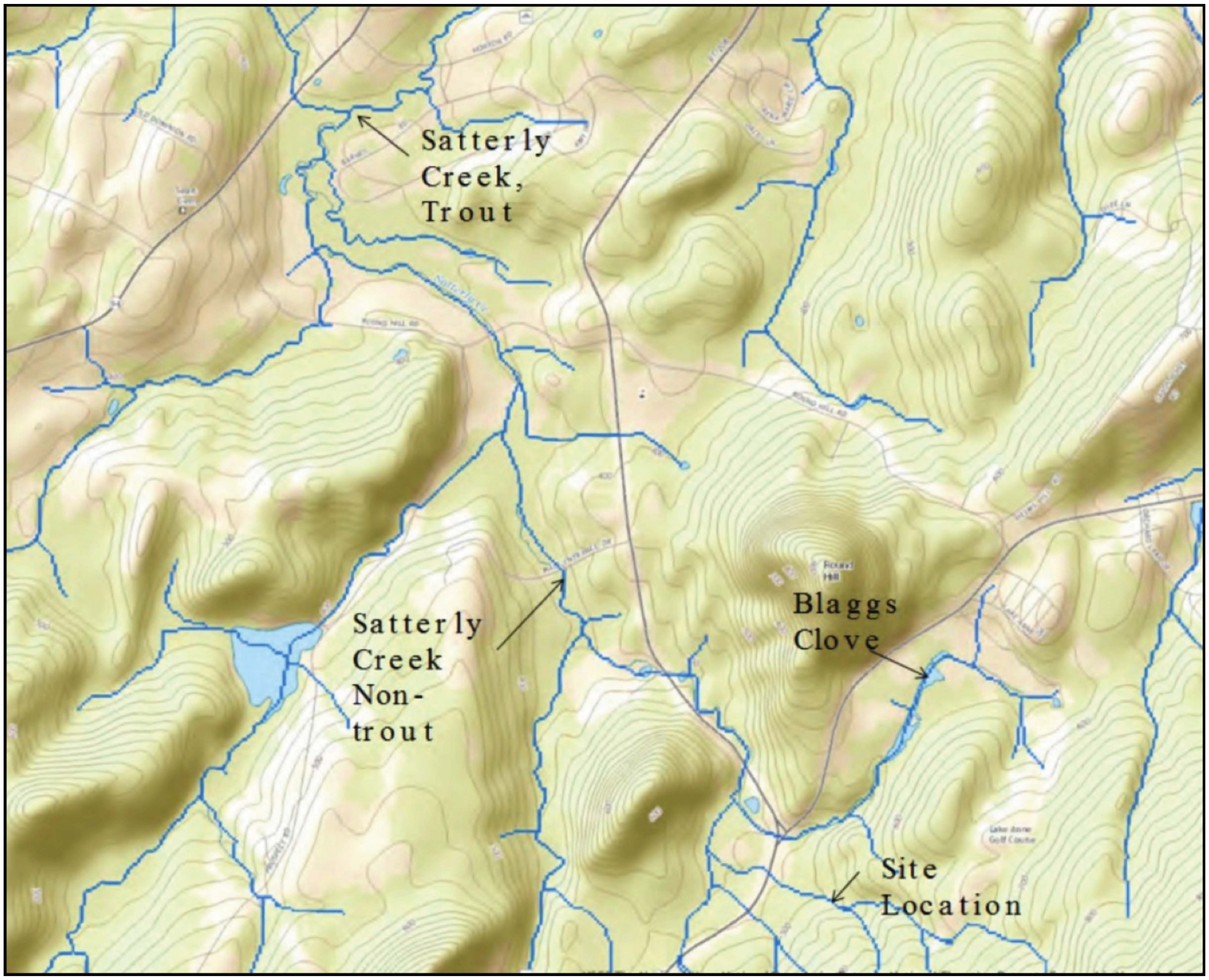


Figure 384



Receiving Stream Low Flow: NYSDEC regulations contain thermal water quality standards for aquatic life protection applicable to Class C waters that must be met at a critical flow condition. That critical flow condition is defined as the MA7CD10, also denoted as 7Q10, low flow.[1]

The MA7CD10 is the statistical minimum average seven consecutive day stream flow occurring on a frequency of once in ten years, and is the applied low flow for this temperature balance analysis. The MA7CD10 low flows for the streams in Table 381 were determined using the same methodology used in the WAC Report.

This methodology uses the MA7CD10 reported in the USGS/DEC Bulletin 74 for three nearby streams (Trout Brook, Woodbury Creek at Mountainville, and Woodbury Creek near Highland

[1] NYSDEC Division of Water Bureau of Watershed Management, Division of Water Technical and Operational Guidance Series (TOGS) 1.3.1 Total Maximum Daily Loads and Water Quality Based Effluent Limits. July, 1996.

Mills) to serve as surrogates. These stream flows are divided by their respective drainage areas resulting in a low flow per unit drainage area (cfs/mi^2). This normalized low flow is then multiplied by the receiving tributary drainage area to calculate its low flow. The three streams, MA7CD10, and drainage area normalized MA7CD10 are presented in Table 383.

Table 383 Surrogate Streams for MA7CD10 Low Flow Estimation			
Surrogate Stream	**Drainage Area (mi)**	**MA7CD10 (cfs)**	**Drainage Area Normalized MA7CD 10 (cfs/mi)**
Trout Brook (Near Walton Park, USGS 01373580)	2.39	0.2	0.084
Woodbury Creek (At Mountainville, USGS 01373700)	21.9	1.6	0.073
Woodbury Creek (Near Highland Mills, USGS 01373690)	11	0.4	0.036
Source: USGS NYS Stream Stats Tools			

Drainage areas were computed using the USGS New York State Stream Stats tool.[2] The proposed WWTP discharge site to the unnamed tributary, with a drainage area of 0.45 mi^2, results in a MA7CD10 = 0.016 cfs [0.45 mi^2 X 0.036 cfs/mi^2 (from Woodbury Creek near Highland Mills)]. The Woodbury Creek site has been selected as it represents the lowest, and hence the most conservative, estimate of low flow.

Table 384 Instream Drainage Areas and Estimated Low Flows Instream Drainage Areas and Estimated Low Flows			
Tributary	**Drainage Area (mi)**	**MA7CD10 (cfs)**	**Drainage Area Normalized MA7CD 10 (cfs/mi)**
Unnamed Tributary (At point of discharge)	2.39	0.2	0.084
Satterly Creek (Includes Blaggs Clove, Unnamed Tributary)	21.9	1.6	0.073
Woodbury Creek (Near Highland Mills, USGS 01373690)	11	0.4	0.036
Source: USGS NYS Stream Stats Tool			

Flow in Satterly Creek, at the confluence with flows from the unnamed receiving tributary and Blaggs Clove unnamed tributary, with drainage area of 5.96 mi^2, has a MA7CD10 =0 .215 cfs [5.96 mi^2 X 0.036 cfs/mi^2 (from Woodbury Creek near Highland Mills)].

Flow in Satterly Creek at the beginning of Class C (T), with drainage area of 11.30 mi^2, has a MA7CD10 =0.407 cfs [11.30 mi^2 X 0.036 cfs/mi^2 (from Woodbury Creek near Highland Mills)]

[2] URL: http://streamstatsags.cr.usgs.gov/v3_beta/viewer.htm.

Drainage area delineations, as summarized in Table 384, were also computed using the USGS NYS Stream Stats tool.

Ambient Stream Water Temperature: Water temperature was derived using long-term air temperature data and assuming the instream water temperature is equal to the air temperature. Air temperature from a 35-year meteorological data set from 1980 to 2015 was obtained from the National Oceanic and Atmospheric Administration ("NOAA") database for Stewart International Airport, Orange County, NY.[3] Stewart International Airport is located approximately 8.8 miles northeast of the proposed Project.

Based on this data set, the 90th percentile of daily average summer (May-September) air temperature is 79.9^{o}F and 90th percentile of daily average winter (November-March) air temperature is 48.9^{o}F. These temperatures would be applied for summer and winter conditions. Use of 90th percentile instream river temperature is consistent with use of the MA7CD10 low flow (i.e., calculated as the 10th percentile of annual minimum 7-day average flows). In addition, EPA modeling documents (EPA 1991[4] and EPA 1985[5]) recommend use of 10th percentile inputs for dilution studies where low values produce the worst case scenario. This is equivalent to the use of 90th percentile highest temperatures in this analysis.

Recent projects performed by HDR where the 90th percentile upstream temperatures have been accepted for use by State regulators include: thermal studies in New York State for AES Somerset and Westover Plants, the Great Lakes Cheese Adams Facility, the Domino Sugar Yonkers Facility, Lafarge Ravena Plant, Empire Plaza Albany facility, thermal mixing zone work for Exelon on the Kankakee River in Illinois, and a 316(a) demonstration for the We Energy Valley Plant in Wisconsin.

WWTP Effluent Flow and Temperature: The proposed WWTP discharge is designed to discharge at a peak flow of 840,000 gpd (or 1.30 cfs). WWTP effluent temperature is estimated to be 75^{o}F under summer conditions and 50^{o}F under winter conditions. These effluent conditions would be applied in the thermal calculations.

Thermal Balance Calculations: Temperature balances to address the potential thermal effects of the WWTP discharge were completed for summer and winter conditions. Calculations were done at three locations: 1) at the point of discharge, 2) after the confluence of the upstream tributaries including unnamed tributary from Blaggs Clove and Satterly Creek, and 3) where Satterly Creek

[3] Meteorological data collected by US Air Force and archived by NOAA from Air Force Datsav3 station number (USAF): 725038 WBAN Number (Weather Bureau AirForce Navy): 14714, Stewart International Airport, US.
[4] US EPA 1991. Technical Support Document for Water Quality-based Toxics Control. US Environmental Protection Agency Office of Water. EPA/505/2-90-001.
[5] US EPA 1985. Initial Mixing Characteristics of Municipal Ocean Discharges: Volume I. Procedures and Applications. US Environmental Protection Agency Environmental Research Laboratory, Narragansett, RI 02882. EPA 600 3-85-073a

becomes a Class C(T) water. These locations were selected to represent the end of pipe and non-trout and trout locations in Satterly Creek. The calculation utilizes inflow rate and water temperature. Stream temperature downstream of the discharge is the result of mixing of the upstream water with effluent water. This is represented in a thermal balance calculation of the following form where:

- T_s = resulting stream temperature
- Q_u = upstream flow
- T_u = upstream temperature
- Q_e = WWTP flow
- T_e = WWTP temperature

Table 385 presents upstream temperature and flow, discharge temperature and flow, and resulting temperatures for summer/winter thermal balance calculations.

Table 385
Summer and Winter Thermal Balances

Parameter	Summer Thermal Balance			Winter Thermal Balance		
	At Point of Discharge	At Satterly Creek, C	At Satterly Creek, C(T)	At Point of Discharge	At Satterly Creek, C	At Satterly Creek, C(T)
Qu (cfs)	0.016	0.215	0.407	0.016	0.215	0.407
Tu (oF)	79.9	79.9	79.9	48.9	48.9	48.9
Qe (cfs)	1.3	1.3	1.3	1.3	1.3	1.3
Te (oF)	75	75	75	50	50	50
Ts (oF)	75.1	75.7	76.2	50	49.8	49.7

Source: HDR

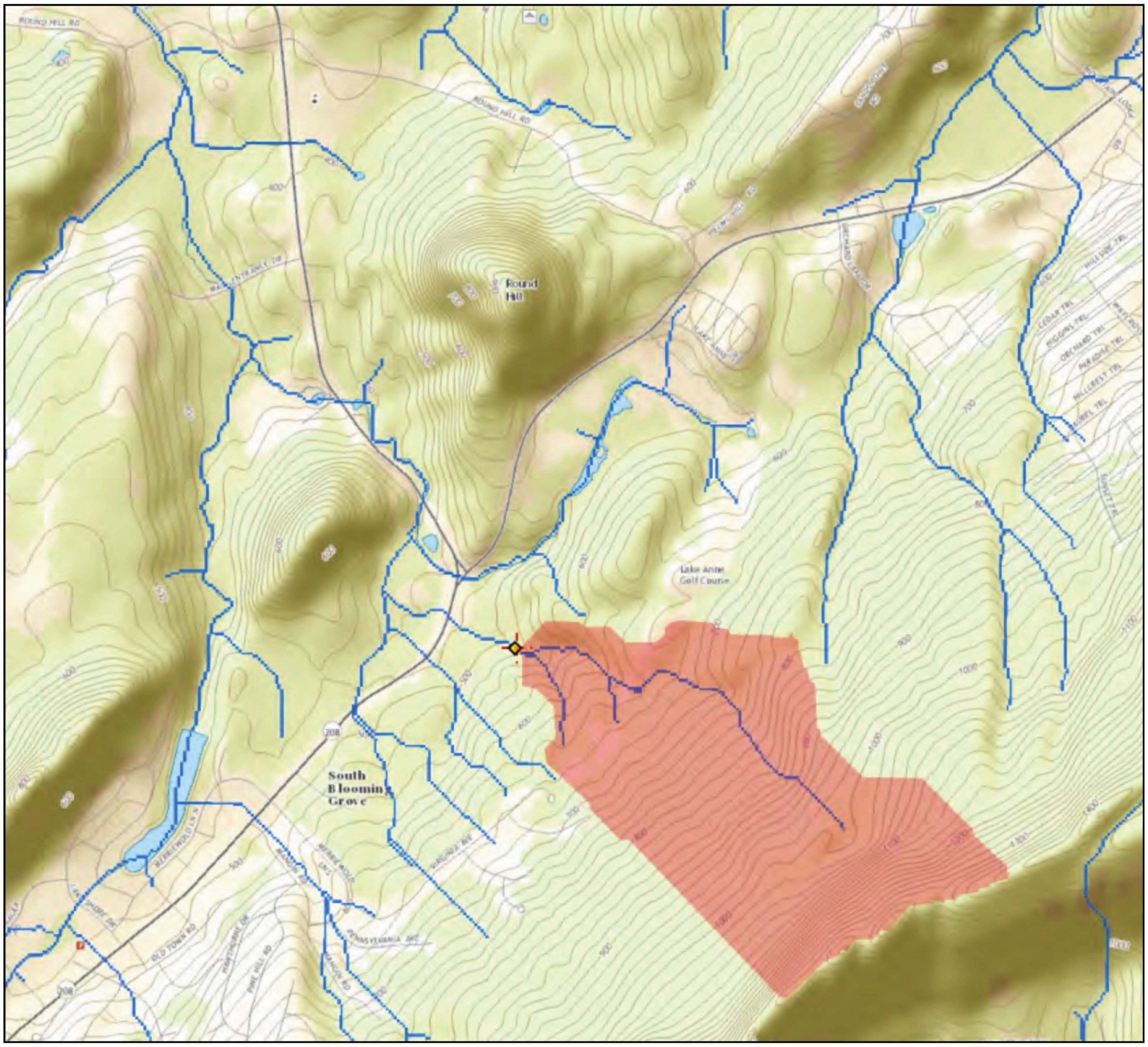
Table 386 summarizes thermal balance results, along with the temperature change from ambient temperature that can be expected with the proposed WWTP discharge.

Table 386
Summary of Thermal Balance Calculations

Stream Location	Summer Temperature (ºF)			Winter Temperature (ºF)		
	Existing	Proposed	Change	Existing	Proposed	Change
Point of Discharge	79.9	75.1	-4.8	48.9	50	1.1
Confluence with Satterly Creek	79.9	75.7	-4.2	48.9	49.8	0.9
Satterly Creek [Begin Class C(T)]	79.9	76.2	-3.7	48.9	49.7	0.8

Source: HDR

Figure 385: Drainage Area Delineation (Pink Area) – Unnamed Tributary at Point of Discharge. Drainage Point is Denoted by Yellow Diamond



DEC Thermal Regulations: The unnamed receiving stream and joining streams are classified as non-trout streams by NYSDEC. As mentioned above, Satterly Creek maintains both non-trout and trout classifications. The NYSDEC thermal regulations codified in 6 N.Y.C.R.R. §704.2 for non-trout and trout waters are listed in Table 387.

The NYSDEC non-trout and trout thermal regulations are applicable, and are used to assess the potential impacts of the proposed Project.

Table 387
NYSDEC Thermal Regulations
Non-Trout Streams
Maximum allowable temperature of 90°F.
Maximum temperature change at the edge of a mixing zone (higher or lower) from what existed without the thermal discharge must be <5°F or a maximum of 86°F, whichever is less.
Trout Streams
No discharge greater than 70°F.
June to Sept.-maximum temperature increase from what existed without the thermal discharge must be <2°F.
October to May-maximum temperature increase from what existed without the thermal discharge must be <5°F.
Source: NYSDEC Thermal Regulations (6 CRR-NY 704.2)

Thermal Model Conclusions: Comparison of the resulting seasonal instream temperatures under low flow worst case conditions for the proposed WWTP discharge scenario indicate that DEC thermal standards would be met. The following summarizes these findings.

- At the point of WWTP discharge and at the Satterly Creek Class C non-trout assessment location, maximum summer temperatures are expected to be 75.1°F and 75.7°F, respectively. These temperatures are well below the 90°F regulatory maximum and are also less than a 5°F maximum allowable change from the expected worst case ambient temperature of 79.9°F.
- At the point of WWTP discharge and at the Satterly Creek Class C non-trout assessment location, maximum winter temperatures are expected to be 50.0°F and 49.8°F, respectively. These temperatures are well below the 90°F regulatory maximum and are also less than a 5°F maximum allowable change from the expected worst case ambient temperature of 48.9°F.
- At Satterly Creek where Class C (T) begins the summer expected temperature of 76.2°F is less than the expected worst case ambient temperature of 79.9°F; therefore, an increase in temperature would not be expected. This meets the NYSDEC regulation of a less than 2°F increase during summer months.
- At Satterly Creek where Class C (T) begins the winter expected temperature of 49.7°F is 0.8°F increase from the worst case ambient temperature of 48.9°F. This meets the NYSDEC regulation of a less than 5°F increase during winter months.
- The proposed WWTP discharge is located approximately 4 miles upstream of where Satterly Creek Class C (T) begins and therefore the regulation for trout waters that no discharge is greater than 70°F does not apply.

(g) Impacts to streams, ponds, and wetlands regulated by the U.S. Army Corps of Engineers and NYSDEC will be enumerated and evaluated. Potential direct and indirect impacts, including alterations to hydrologic inputs, will be identified as well as efforts to avoid, minimize, and compensate for impacts.

There would be no disturbance or fill within any of the federal wetlands, Wetland No. 1 or the non-jurisdictional wetlands. Approximately 2,280 linear feet of temporary disturbance would occur within the 100-foot buffer to Wetland No. 1 for the purposes of installing a gravity sewer main and force main. It is noted that the area within which the disturbance would occur is already disturbed by an existing dirt road that has historically been the main access point on the property. Approximately 2,400 linear feet of various drainage channels or ephemeral stream would be piped or rerouted due to the development.

The crossing of ephemeral streams and watercourses by the proposed roadways would require coverage under either Nationwide Permit #29 for crossings resulting in permanent disturbance to the stream bed, or Nationwide Permit #33 for disturbances resulting in temporary disturbance to the stream bed such as for temporary construction access or for the construction of open bottom type structures that would restore the original stream bed upon completion of the structure. Other impacts to wetlands have been avoided except as described above. The Project does not have the potential to generate any significant adverse environmental impacts to regulated wetlands or surface hydrology and therefore no mitigation measures are required.

(h) An evaluation of reclaimed water entering the drainage system, in terms of impact on water quality and ecological habitat, shall be evaluated.

The Project would not generate any significant adverse impacts upon water quality and ecological habitat. The treated effluent from the WWTP would not be reclaimed water and would be discharged to an unnamed Class C tributary to Satterly Creek. A Waste Assimilation and Capacity (WAC) Analysis included in Appendix I-2 was performed in accordance with NYSDEC's Division of Water Technical and Operational Guidance (TOGS) as the tributary is an intermittent stream and would therefore be required to achieve Intermittent Stream Effluent Limits (ISEL) for the WWTP discharge. The treatment plant designed for the Project has been designed to conform to the preliminary ISEL limits provided by NYSDEC.

(i) Discuss the impacts of fertilizers, deicers, pesticides, herbicides, fungicides, and any other chemical applications which may be used for maintenance or other purposes within the community.

The Project would not involve use of any significant use of pesticides or herbicides. Therefore, there would be no environmental impacts in this regard. To the extent these items are utilized by residential homeowners, they would not have the potential to cause in any significant adverse impacts.

(j) For stormwater management, a description of the project's proposed stormwater management infrastructure improvements will be provided as well as any approvals that are necessary to

implement these infrastructure improvements. Stormwater analysis would include the volume of incremental increase in stormwater runoff with the proposed development along with an analysis of the pre- and post-development condition stormwater release. The Project's stormwater pollution protection plan (SWPPP) will also be prepared in accordance with the New York State Stormwater Management Design Manual and will be analyzed in this chapter.

A stormwater pollution prevention plan has been prepared to minimize potential impacts to the watershed from the Project. Potential impacts include soil erosion during construction and the introduction of pollutants such as garbage, construction debris, chemicals and sediments from rooftops, roadways, construction equipment and people both during and after construction. The SWPPP in Appendix H also addresses potential downstream impacts, such as flooding and channel erosion, caused by the conversion of natural areas to impervious surfaces which increases the rate and volume of stormwater run-off.

Stormwater quantity management, run-off reduction practices, stormwater quality control measures and erosion control measures have been designed and would be implemented in conformance with NYS SPDES Permit GP-0-15-002 requirements. The specific best management practices to be implemented are based on standardized criteria as set forth in the *NYS Stormwater Design Manual, (Jan. 2015 ed.)* and the *NYS Standards for Erosion and Sediment Control, (Nov. 2016 ed.)*.

Stormwater management would be accomplished via an open and closed storm drain infrastructure which consists roof leaders, splash blocks, rain-gardens, drainage swales, catch basins, pipes, culverts, bio-retention areas, and stormwater detention ponds. Run-off reduction practices would be implemented to retain stormwater run-off at its source with the primary run-off reduction practice used on the Project being rain gardens on individual lots, where practical, or bio-retention practices for larger impervious areas. Approximately 80% of the Project Site is slated to remain as open space allowing for substantial reduction in water quality treatment due to the preservation of the existing natural landscape. A minimum 100-foot riparian buffer is being proposed from all watercourses and wetlands to provide protection against water quality degradation. Impervious area reduction will be accomplished by the planting of trees in the areas adjacent to buildings and roadways. The conservation type subdivision design proposed for the Project also results in substantial reductions in roadway lengths and thereby less impervious area.

Detention would be provided to limit peak post-developed flow rates to pre-development levels and would be achieved by a system of fourteen stormwater management ponds that would be situated throughout the developed area of the Project Site. A hydrologic analysis has been performed for the 1-, 10-, and 100-year storm events and attenuation of the peak discharge rates for the aforementioned storms would satisfy SPDES permit requirements for Channel Protection (Cpv), Overbank Flood Control (Qp) and Extreme Flood Control (Qf). Given that the properties topographic setting includes the ridge of Schunnemunk Mountain, upstream run-off would not enter the Project Site, which eliminates the need to design the stormwater management facilities for the ultimate upstream build-out. A full description and analysis of the prep and post-developed rates of run-off together with the hydrologic model can be found in the full SWPPP Report that has been prepared and is included in Appendix H. Table 388 summarizes the pre and post-developed peak run-off rates at the four points at which stormwater flows off the site.

Erosion control would be accomplished via means of temporary and permanent erosion control measures. Erosion control features would be implemented prior to the start of construction activities. Erosion control measures would be inspected daily by a “Trained Contractor” to be employed by the excavation company. A thorough review and report by a “Qualified Inspector” would be performed at least once every seven days. Defects noted would be corrected immediately. Weekly inspection logs would be kept at the Project Site and made available for review by the Regulatory Agency having jurisdiction. Maintenance of erosion control measures would be the responsibility of the Applicant.

Table 388

Comparison of Pre- & Post-Developed Peak Flow Rates

Storm Event	1 Year (cfs)	10 Year (cfs)	100 Year (cfs)
Analysis Point #1			
Pre-Developed	128	423	982
Post-Developed	92	325	949
Difference	-36	-98	-33
Analysis Point #2			
Pre-Developed	147	474	1087
Post-Developed	132	426	1063
Difference	-15	-48	-24
Analysis Point #3			
Pre-Developed	2	6	13
Post-Developed	2	6	13
Difference	0	0	0
Analysis Point #4			
Pre-Developed	84	254	566
Post-Developed	82	248	557
Difference	-2	-6	-9
Source: Appendix H			

3.8i.3 Mitigation

The crossing of ephemeral streams and watercourses by the proposed roadways would require coverage under either Nationwide Permit #29 for crossings resulting in permanent disturbance to the stream bed, or Nationwide Permit #33 for disturbances resulting in temporary disturbance to the stream bed such as for temporary construction access or for the construction of open bottom type structures that would restore the original stream bed upon completion of the structure. Other impacts to wetlands have been avoided except as described above. As the Project is designed, there would be no potential for the Project to generate significant adverse impacts on regulated wetlands or surface hydrology.

The Project would include a WWTF capable of meeting effluent standards that ensure there would be no degradation to the unnamed tributary of Satterly Creek into which it would discharge. This facility would address the wastewater treatment needs of the Project while protecting surface water quality. The Project's WWTF would not have the potential to generate any significant adverse impacts, including those on regulated wetlands or surface hydrology.

The Project would also implement a stormwater management system that includes a combination of infrastructure improvements and stormwater management best practices to ensure the rate of stormwater leaving the Project Site would not increase and the quality of effluent from leaving the Project Site would not degrade the quality of receiving watercourses. The Project would comply with the erosion and sediment control measures detailed in its SWPPP.

Accordingly, the Project would not result in significant adverse impacts upon surface waters and wetlands, including those related to stormwater and wastewater treatment, and further mitigation would not be required.

3.8ii Groundwater Resources

This section summarizes geotechnical hydrogeological studies as well as the Project's groundwater investigation to describe the existing conditions of groundwater resources and the use of groundwater wells to supply water for the Project, as well as to analyze the Project's water supply demand and its wells' ability to yield the amount of water needed.

3.8ii.1 Existing Conditions

There are two small stream channels that flow out from the Project Site. Both exit the Project Site along its western boundary, near the intersection of Clove Road and NYS Route 208. The headwaters for both streams originate on the Project Site. The more northerly stream flows near pumping wells C-12 and C-7B (two of several groundwater investigation wells discussed in detail in Appendix F) and collects runoff from the northern and central portions of the Project Site.

A dam was built by a prior owner on this stream channel near onsite monitoring wells C-5 and C-9. There is ponded water behind the dam and some wetland areas around and upstream of the pond. The stream channel re-forms downstream of the dam and the stream flows west and off the site. The southerly stream passes near pumping wells C-6, 14, 21 and 23 and receives runoff from the southern and western portions of the Project Site. In addition to the wetlands near the valley pond formed by the dam, there are several other small-scale wetland areas also located around the Project Site.

Surficial Geology: The surficial material underlying the Project Site is mapped as mainly glacial till. Glacial till consists of non-sorted, non-stratified sediments deposited by glacial activity. The sediments contain varying proportions of clay, silt, sand, gravel, and boulders. Till is generally not suitable for well development because, as a result of the unsorted character of the material, it does not transmit water in sufficient quantities to support high-yielding wells. There is also a small area of sand and gravel mapped in the valley setting on the northwestern portion of the project site along Clove Road. This sand and gravel was encountered during the drilling of wells C-7A and C-7B. However, the material was not of suitable composition or saturated thickness to attempt the development of a sand and gravel water supply production well.

Bedrock Geology: The Project's bedrock geology is described in detail in Section 3.7. The bedrock units mapped underlying the Project Site include the Martinsburg Formation (On), Undifferentiated Lower Devonian and Silurian Rocks (DS), and Undifferentiated Hamilton Group (Dh); northeast of the Site is mapped Wappinger Group (OEw), and to the west and northwest is some Undifferentiated Gneiss (mu). The bedrock units, geologic contacts, fracture-trace lineations, and mapped faults underlying the Project Site are shown in Figure 386 and maps in Appendix F.

The bedrock in this area is sedimentary rock, with the exception of the undifferentiated gneiss which is metamorphic. The Martinsburg Formation contains shale, siltstone, sandstone and greywacke; the Undifferentiated Lower Devonian and Silurian Rocks are comprised of shale, sandstone and conglomerates; the Undifferentiated Hamilton Group contains shale, siltstone, sandstone, conglomerate and greywacke and the Wappinger Group is comprised of limestone, dolomite and shale.

3.8ii.2 Potential Impacts

LBG Hydrogeologic & Engineering Services, P.C. ("LBGHES" or "LBG") conducted a 72-Hour Water Well Pumping Test for the Project in order to demonstrate the water yield of the Project's wells. The Groundwater Well Investigation is found in Appendix F and the Water Supply Report is found in Appendix G. A map of the Project's offsite monitoring program including the location of the Project's wells is shown in Figure 387.

The simultaneous 72-Hour Water Well Pumping Test was conducted on wells C-6, C-12, C-14, C-16, and C-23 between July 10 and July 16, 2017. The five wells were pumped concurrently for 5.5 days (132 hours-50 hours more than the 72-hour regulatory requirement) and demonstrated pumping rates of 45 gpm, 40.5 gpm, 157 gpm, 50 gpm, and 90 gpm, respectively, for a combined yield from the five wells of 382.5 gpm or 550,800 gpd.

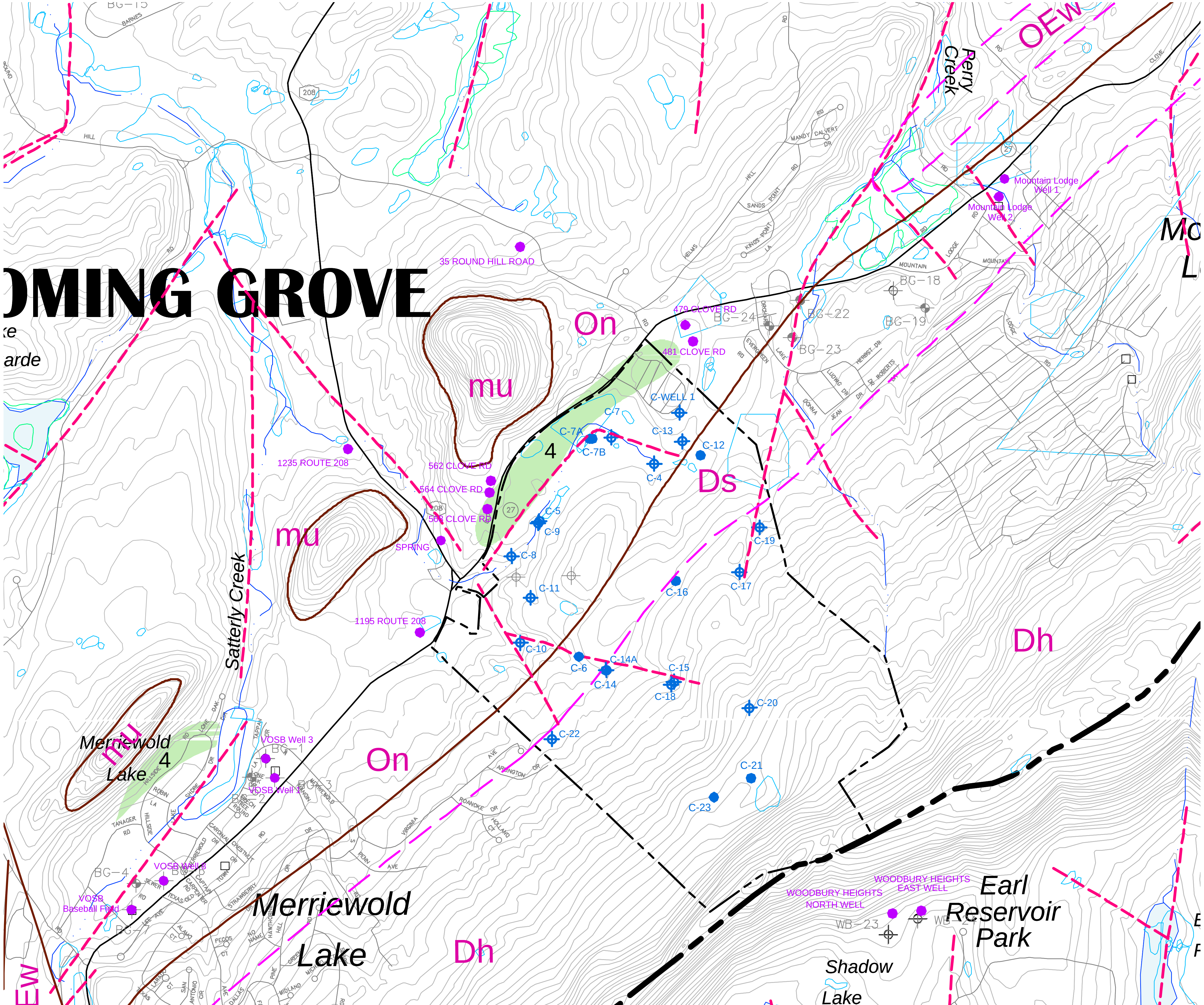
An individual pumping test was then conducted on Well C-21. Well C-21 was pumped individually as the best well between July 25 and July 28, 2017 for 72.5 hours. This well alone demonstrated a pumping rate of an additional 163 gpm or 234,720 gpd. The total combined yield of the 6 wells demonstrated a rate of 545.5 gpm or 785,520 gpd.

Existing water-quality data was collected from onsite wells C-6, C-12, C-14, C-16, C-21 and C-23 located around the Project Site. The samples were analyzed for parameters required by the NYSDOH Sanitary Code Part 5, subpart 5-1 for community, public water supply wells, which includes analyses for inorganics, metals, volatile organic compounds, synthetic organic compounds, semi-volatile organic compounds and radionuclides, as well as the extra compounds dioxin, endothall, glyphosate and diquat. Copies of the laboratory results for the samples collected are provided in the March 2018 LBGHES Pumping Test Report. There were no reported exceedance of any NYSDOH drinking water standards for the volatile organic compounds, synthetic organic compounds, semi-volatile organic compounds, radionuclides, or the extra compounds dioxin, endothall, glyphosate and diquat. The only parameter concentration that exceeded criteria were iron, manganese, color and turbidity in wells C-6, 14, 16, 21 and 23 and a total coliform detection in well C-12. Well C-12 was subsequently disinfected and the well was resampled for total coliform which was reported as absent in the resampling. The elevated turbidity in wells C-6, 14, 16, 21 and 23 was likely the cause of the elevated iron, manganese and color concentrations. These parameters are of aesthetic concern in a public water supply and do not pose a health hazard. Additional pumping would likely reduce the turbidity concentrations along with the associated iron, manganese and color. Additionally, microscopic particulate analysis (“MPA”) samples were collected from all of the wells, to test for *giardia* and *cryptosporidium*. The results of the water samples collected from the six proposed supply wells are detailed in Appendix F.

The Project would include a water supply system, comprised of multiple on-site water wells, new distribution piping, fire hydrants and an on-site water storage tank. The Project’s water demand is summarized below.

<u>Project’s Own Water Supply System</u>: Should the Project’s wells not connect to and not be incorporated as part of the Village’s water supply system, the Project would have sufficient water supply to support four-bedroom homes. An average daily water demand for the Project under this scenario has been calculated based on the March 2014 New York State Design Standards for Intermediate Sized Wastewater Treatment Systems water usage rate of 110 gpd/bedroom. For the planned 600, four-bedroom residential units the average daily demand is 264,000 gpd or 183.3 gpm. The maximum daily demand has been calculated based on the NYSDOH requirement that a new water system demonstrate twice the average water demand. Therefore, the system’s calculated maximum daily demand is 528,000 gpd or 366.7 gpm.

Figure 386: Hydrogeologic Features



LEGEND

	PROPERTY BOUNDARY
	PUMPING WELL LOCATION
	ONSITE MONITORING WELL LOCATION
	FAULT
	GEOLOGIC CONTACT
	FRACTURE TRACE
	WETLAND NYSDEC (STATE)
	WETLAND FEDERAL
BG-3	MUNICIPAL/COMMUNITY BEDROCK SUPPLY WELL - IN SERVICE
WB-23	MUNICIPAL/COMMUNITY BEDROCK SUPPLY WELL - NOT IN SERVICE
On	MARTINSBURG FORMATION - SHALE, SILTSTONE, SANDSTONE AND GRAYWACKE
mu	UNDIFFERENTIATED GNEISS
Dh	UNDIFFERENTIATED HAMILTON GROUP - SHALE, SILTSTONE AND SANDSTONE IN EASTERN ORANGE COUNTY: SKUNEMUNK FORMATION - SANDSTONE, CONGLOMERATE; BELLVALE FORMATION - SHALE, SANDSTONE AND GRAYWACKE; CORNWALL SHALE
Ds	UNDIFFERENTIATED LOWER DEVONIAN AND SILURIAN ROCKS. IN ORANGE COUNTY: KANOUSE SANDSTONE; WOODBURY CREEK FORMATION - SHALE, SANDSTONE; ESOPUS SHALE; CONNELLY CONGLOMERATE; CENTRAL VALLEY SANDSTONE
OEw	WAPPINGER GROUP - LIMESTONE, DOLOMITE AND SHALE
481 CLOVE RD	OFFSITE MONITORING LOCATION
4	STRATIFIED SAND AND GRAVEL AT LAND SURFACE AND ABOVE THE WATER TABLE

0 1500
SCALE IN FEET

CLOVEWOOD PROPERTY
VILLAGE OF SOUTH BLOOMING GROVE
BLAGGS CLOVE, NEW YORK

OCWA-HYDROGEOLOGIC FEATURES

DATE	REVISED

PREPARED BY:
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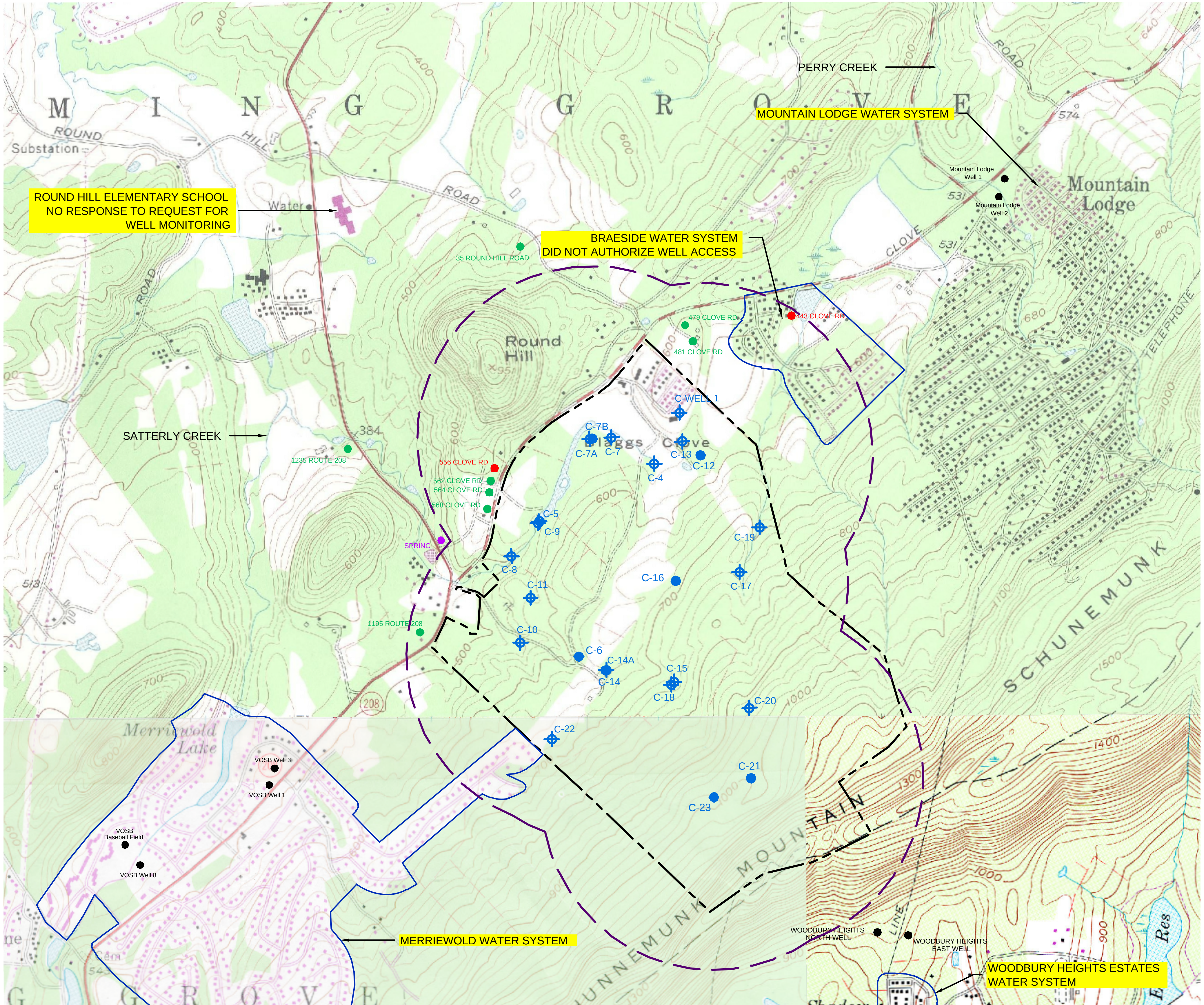
DRAWN:	RAC	CHECKED:	SS	DATE:	10/26/17	FIGURE:	2

Figure 387: Well Locations



N

LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE EXTENT OF PUBLIC WATER SUPPLY SYSTEMS
- 2,500-FOOT RADIUS AROUND PUMPING WELLS
- PUMPING WELL LOCATION
- ONSITE MONITORING WELL LOCATION
- PROPERTY OWNER PROVIDED AUTHORIZATION FOR PARTICIPATION IN OFFSITE MONITORING PROGRAM
- RESIDENTIAL PROPERTY DECLINED TO BE INCLUDED IN OFFSITE MONITORING PROGRAM
- PUBLIC WATER SUPPLY THAT WAS SOLICITED FOR PARTICIPATION IN OFFSITE MONITORING PROGRAM
- APPROXIMATE LOCATION OF WELL MONITORED DURING PUMPING TEST EVENT
- APPROXIMATE LOCATION OF THE SPRING ON ROUTE 208

0 1500
SCALE IN FEET

CLOVEWOOD PROPERTY
VILLAGE OF SOUTH BLOOMING GROVE
BLAGGS CLOVE, NEW YORK

USGS MAP - OFFSITE MONITORING PROGRAM - JULY 2017

DATE	REVISED

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DRAWN:	RAC	CHECKED:	SS	DATE:	10/26/17	FIGURE:	1

O:\DWG\Clovewood\2017\F1_JulyPT.dwg, Layout1, 3/23/2018 2:33:15 PM, AcroPlotTempDWF7876.pc3

Water usage from swimming pools/bath houses in the proposed Project has been calculated. The water usage rate for a swimming pool/bath house has been calculated based on 10 gpd per swimmer with an allowed 20% reduction for the use of water saving fixtures. Assuming 2 swimmers per residential unit, the additional water demand for the swimming pool/bath house would be 9,600 gpd or 6.7 gpm. Adding the pool demand to the water demand for the proposed 600 units results in a combined average water demand of 273,600 gpd or 190 gpm and a maximum daily demand in accordance with NYSDOH requirements that a new water system demonstrate twice the average water demand of 547,200 gpd or 380 gpm. Therefore, the Project's water supply yield of 550,800 gpd with the best well out of service would be sufficient to support the 600 four-bedroom homes and associated swimmers, with an additional surplus of 3,600 gpd.

<u>Connection with the Village's Water Supply System</u>: Should the Project's wells connect to and be incorporated as part of the Village's water supply system, the yield from its best well would be included the Project's overall water yield, as State regulations require only one best well per water supply system be out of service. Therefore, the Project would have a water supply yield of 785,520 gpd.

Under this scenario, an average daily water demand for the Project has been calculated based on the March 2014 New York State Design Standards for Intermediate Sized Wastewater Treatment Systems water usage rate of 110 gpd/bedroom. For the planned 600, 4-bedroom residential units the average daily demand is 264,000 gpd or 183.3 gpm. The maximum daily demand has been calculated based on the NYSDOH requirement that a new water system demonstrate twice the average water demand. Therefore, the system's calculated maximum daily demand is 528,000 gpd or 366.7 gpm.

The Village of South Blooming Grove Zoning Code §235-45.6.A(3) permits accessory apartments subject to specific limitations. Although the Project does not include accessory apartments, each homeowner would have the right in the future to propose such an accessory apartment under the Village Zoning Code. Projections of water demand for potential accessory apartments is based on the reasonable worst case assumption that all 600 principal dwellings would have an accessory apartment, of which 300 would be one bedroom units and 300 would be two bedroom units. The average daily demand for the accessory apartments would be 99,000 gpd or 68.8 gpm. The combined average water demand of the proposed 600 units and the potential future accessory apartments would be 363,000 gpd or 252.1 gpm. At the required level of twice the average water demand, the water supply required would be 726,000 gpd or 504.2 gpm.

The Project's water demand includes swimming pools/bathhouses. According to the 2014 NYSDEC "New York State Design Standards for Intermediate Sized Wastewater Treatment Systems", the water usage rate for a swimming pool/bath house is based on 10 gpd per swimmer, and with an allowed 20% reduction of that rate for the use of water saving fixtures. A water demand requirement for the potential swimming pools/bath houses has been calculated assuming three swimmers per residential unit (two swimmers per primary unit and one swimmer per accessory unit), which results in a water demand of 14,400 gpd or 10 gpm (3 swimmers x 600 units x 10 gpd per swimmer x 20% reduction for use of water saving fixtures = 14,400 gpd).

Therefore, the combined average water demand for the Project, including four-bedroom homes and the potential for 300 one-bedroom and 300 two-bedroom accessory apartments and up to three swimmers per residential unit (two swimmers per primary unit and one swimmer per accessory unit) would be 377,400 gpd (264,000 + 99,000 + 14,400) or 262.1 gpm. The system's calculated maximum daily demand is in accordance with NYSDOH requirements that a new water system demonstrate twice the average water demand, which is 754,800 gpd or 524.2 gpm.

Therefore, if the Project's water wells are deeded to the Village and become part of the Village's municipal water supply system, the Project's water supply yield of 785,520 gpd would be sufficient to support the 600 four-bedroom principal dwellings and 600 accessory apartments (300 two-bedroom accessory apartments and 300 one-bedroom accessory apartments) with the associated swimmers, with a surplus of 30,720 gpd.

The Village Zoning Code requires that 120% of the water needed shall be available. Accordingly, the Project would need to have additional water capacity of 20% in order to avoid payment of a fee when interconnecting, all as detailed in Village Zoning Code §235-14.1.(2)(d). In the Project's case, this 20% would total 75,420 gpd or 52.4 gpm. If the Village is willing to interconnect their Water Supply System with the Project, the Village would gain access to 408,020 excess gpd or 283.3 excess gpm (785,420 gpd overall yield minus 377,400 gpd Project's water demand) which is 504% greater than the extra 20% (75,480 gpd) needed according to Village regulations.

Drought Assessment: As required by the Village Scoping Document, the report prepared by LBGHES included a drought assessment based on the precipitation and bedrock groundwater levels which occurred during the 1960's extreme drought in the region, as well as a groundwater recharge assessment under both normal and drought precipitation conditions. To assess the effect the 1960's drought had on bedrock groundwater levels, historical information was located for the USGS well RO-18 (411802073593001) near Bear Mountain State Park. This well was selected for comparison because the measurement record encompasses the 1960's drought period, the well has current data for direct comparison to existing conditions, it is within reasonable proximity to the Project Site and the well is completed in bedrock.

Current water-level data from well RO-18 was correlated with water-level data from several of the Project's on-site monitoring wells (C-7, 10, 11, 17, 19 and 22) collected during the background monitoring period from June 21 through July 9 prior to the start of the pumping tests. These on-site monitoring wells were the first to have the pressure transducers installed and, therefore, had the longest data record for use in comparison. The correlation using the water levels from these six wells with USGS well RO-18 was good, with r-squared values ranging from 0.86 to 0.96. Monitoring wells C-7 and C-22 demonstrated the best correlation with the USGS well, and these two on-site monitoring wells were used in the subsequent calculations to assess water-level change during extreme drought conditions. Copies of the correlation graphs are included in Appendix F.

Using the equations generated from the correlation graphs between RO-18 and the on-site monitoring wells C-7 and C-22, the lowest water-level depths that occurred in RO-18 between 1961 and 1967 were used to calculate the corresponding water-level height that would occur in the two on-site wells. Additionally, present day water-level heights for the on-site monitoring wells were also calculated using the equations for the correlation graphs. The difference between the 1960's values and the 2017 values is a measure of the decline in on-site bedrock groundwater levels that would be expected during drought conditions similar to the 1960's drought.

Based on the drought assessment, the difference between 2017 water levels in the month of July when the testing program was conducted and the projected water-level heights from a 1960's magnitude drought in July would be in the range of -0.29 foot to -1.14 feet in the wells at the Project Site. This decline is not anticipated to have a significant impact on the on-site pumping wells.

Groundwater in a bedrock aquifer is continually being replenished by precipitation on the local watershed. The local recharge area for the Project Site had been approximated using the surficial drainage area, the hydrogeologic features and the fracture-trace assessment of the property (Figure 2 of Appendix F). The size of the local recharge area for the Project Site is approximately 1,177 acres.

Some of the precipitation that falls within a watershed infiltrates through the soil zone and percolates downward to recharge the bedrock. Recharge to till-covered metasedimentary bedrock is approximately 400,000 gpd/sq. mi. or about 8 inches annually based on the U.S. Geological Survey open file report 80-437. This is equal to about 625 gpd/acre (gallons per day per acre) of precipitation recharge. For the 1,177 acre watershed for the Project Site, the total recharge would be approximately 735,600 gpd (gallons per day) or about 510.8 gpm.

During drought periods groundwater recharge and available water supply would be reduced. The one-year-in-30 low precipitation (3.33% chance of recurrence) for Orange County is 29.5 inches. This precipitation amount is 69% of the annual average precipitation rate of 43 inches or a reduction in precipitation of 31%. This value is similar to the drought values from 1962 to 1966 when the precipitation deficit ranged from 23% to 35% below the long-term normal and cumulatively over the five-year period with a deficit of 29%.

Assuming groundwater recharge decreases at the same rate as precipitation during periods of diminished rainfall, the estimated average recharge rate would decrease about 31% to approximately 507,600 gpd during a 1 year-in-30 drought or 352.5 gpm. This drought recharge rate exceeds the average water demand of the proposed 600 four-bedroom units with 300 one-bedroom and 300 two-bedroom accessory apartments and associated swimmers of 377,400 gpd or 262.1 gpm if connected to the Village's water supply system or average water demand of the proposed 600 four-bedroom units with associated swimmers of 273,600 gpd or 190 gpm if not connected to the Village's water supply system.

3.8ii.3 Mitigation

Given the fact that there would be surplus water under both the scenario when the Project interconnects its wells with the Village or when the Project would have its own water supply system, no significant adverse impact or changes in hydrology, surface, or groundwater quality/availability would be generated by the Project. As detailed in 3.8i above and in Appendix H, the Project has been designed to incorporate stormwater management facilities and best practices. Therefore, no further mitigation would be necessary.