3.9 WATER AND SEWER INFRASTRUCTURE

This section examines the potential for significant adverse impacts and the capacity to adequately serve the Project's need for water supply, which is discussed in 3.9i and sanitary wastewater treatment discussed in 3.9ii. The analyses confirm that the Project would not have the potential to generate any significant adverse impacts regarding water supply and wastewater treatment. Therefore, no mitigation would be necessary.

3.9i Water Supply Infrastructure

The analysis below includes a description of the required infrastructure for the water supply and summarizes the findings of the Project's Water Supply Report and Node Analysis.

3.9i.1 Existing Conditions

As detailed in Section 3.8ii.2, if the Project's wells are not connected to and not incorporated as a part of the Village's municipal water supply system, the Project's wells would have sufficient capacity to supply water for 600 four-bedroom single-family dwelling units and associated swimmers, which would be 273,600 gpd or 190 gpm. The Project's wells would be able to supply more than twice the average water demand of 547,200 gpd or 380 gpm, in accordance with NYSDOH water supply system requirements.

If the Project's wells are connected to and incorporated as a part of the Village's municipal water supply system, the Project's best well would not be excluded and the Project's wells would be able to supply water for 600 four-bedroom homes and a maximum of 600 accessory apartments (300 one-bedroom accessory units and 300 two-bedroom accessory units) and associated swimmers (two swimmers per primary unit and one swimmer per accessory unit) of 377,400 gpd or 262.1 gpm. The Project's wells would be able to supply more than twice the average water demand of 754,800 gpd or 524.2 gpm, in accordance with NYSDOH water supply system requirements.

Several existing wells were examined and the results of their tests are found in the Water Supply Report and Node Analysis included in G-2 of Appendix G. 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.

3.9i.2 Potential Impacts

The Scoping Document requested the following information regarding potential impacts to water quality and supply:

(a) Development of required domestic and fire protection demands as based on the projected population data and proposed project development.

A full well development and water taking analysis has been prepared and is included in Appendix F and detailed in Section 3.8ii. Wells have been drilled on the Project Site and a 72-Hour Water Well Pumping Test was performed.

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 were measured at 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 was measured at a pumping rate of 163 gpm or 234,720 gpd. The total combined yield of the six wells is a rate of 545.5 gpm or 785,520 gpd.

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.

As detailed in Section 3.8B.2, if the Project's water wells are connected to and incorporated into the Village's Water Supply System, the Project's water demand for 600 single-family homes, plus 300 one-bedroom and 300 two-bedroom accessory apartments and associated swimmers would total 377,400 gpd. The system's maximum daily demand, calculated in accordance with the NYSDOH requirement that a new water system have the capacity to supply at least twice the average water demand) would be 754,800 gpd or 524.2 gpm. The Project well's combined yield of 785,520 gpd under this scenario would supply sufficient water to meet this demand.

If the Project's wells are not connected to and incorporated into the Village's Water Supply System, the Project's water demand for 600, four-bedroom single-family units and associated swimmers would total 273,600 gpd or 190 gpm. The system's maximum daily demand, calculated in accordance with the NYSDOH requirement that a new water system have capacity to supply at least twice the average water demand), would be 547,200 gpd or 380 gpm. The Project well's combined yield of 550,800 under this scenario with the best well out of service would supply sufficient water to meet this demand.

(b) Water model to demonstrate provision of adequate flow and pressure to all proposed services.

A node analysis has been prepared for the preliminary water distribution system under normal, or domestic, flow conditions and is included in the Water Distribution System Engineer's Report in Appendix G-2. Included in the analysis are all hydrants, tee's, low points and high points in the system. Water distribution would consist of 8", 10" and 12" PVC pipe. A minimum pressure of 35 psi would be provided to all locations in the system with the majority of the system operating at 60-80 psi. Pressure reducing valves would be incorporated where needed in the lowest portions of the system to keep system pressures from exceeding 100 psi.

(c) Fire protection analysis to demonstrate adequate available fire flow to serve the development as well as provide adequate residual system pressures.

A node analysis has been prepared under fire flow conditions and is included in the Water Distribution System Engineer's Report in Appendix G-2. Pursuant to Insurance Services Office (ISO) standards, the needed fire flow within the system is taken to 1,000 GPM under fire flow conditions with the system being capable of providing the needed fire flow for a period of two hours. Included in the analysis are all fire hydrants. Water distribution to the hydrants would consist of 8", 10" and 12" PVC pipe. A minimum pressure of 20 psi would be provided to all locations in the system over the duration of needed fire flow.

(d) Compliance with NYSDOH regulations as well as Recommended Standards for Water Works (10 States Standards), year of latest revision.

Water source, storage and distribution facilities would be constructed of materials, and be of such workmanship, as to be in conformance with NYS Department of Health Standards Appendix Part 5D Standards and the Recommended Standards for Water Works (10 State Standards), latest revision. Minimum separation distances for water supply wells would be maintained. Distribution piping would maintain minimum ten-foot horizontal separation and 18 inches of vertical separation from storm drainage and sanitary sewer piping. Hydrants would be placed no further than 500 feet apart with valving to be placed at intervals not to exceed 800 feet. The Project would comply with all applicable NYSDOH standards.

The Groundwater Well Investigation summarized in Appendix F concludes the Project's water supply system and associated six wells that would be used to provide water supply to the Project would not adversely impact the aquifer or nearby water wells. Accordingly, there would be no significant adverse environmental impacts from this method of water supply.

3.9i.3 Mitigation

As summarized above and detailed in Appendices F and G, no significant adverse environmental impacts on water quality or supply would result from the Project's proposed water supply system

infrastructure. The short-term construction impacts caused by drilling the wells were completely mitigated by incorporating erosion and sediment controls. A node analysis found in the Water Distribution System Engineer's Report was performed and likewise determined there would be no significant adverse impacts from the Project. Accordingly, no mitigation is necessary.

3.9ii Wastewater Infrastructure

The analysis below includes a complete description of the required infrastructure for the sewage collection and treatment system for the Project.

3.9ii.1 Existing Conditions

The Project would be served by a new central wastewater treatment facility designed to treat and dispose of an average of up to 273,600 gallons of effluent per day in accordance with the Recommended Standards for Wastewater Facilities (10 State Standards) and the 2014 NYS Design Standards for Intermediate Sized Wastewater Treatment Systems and and would meet the effluent requirements set forth by the NYS SPDES Permit that will be issued for the Project. Treated water from the WWTP would discharge into an on-site tributary to Satterly Creek.

Raw sanitary sewer discharge from residential units would be collected by means of a minimum 4-inch diameter building sewer. Community Center and swimming pool facilities would be served by a minimum 6-inch diameter building sewer. Building sewers would connect to laterals of the same diameter with the laterals conveying the sewage to the sewer main. For the Project, gravity sewer mains would generally be located within the street right-of-way.

Sewer mains would be a minimum of 8-inch diameter PVC pipe having a minimum slope of 0.4%. All mains would be straight runs connected by sewer manholes. Manholes would be precast, reinforced concrete having a minimum inside diameter of 4 feet. Manhole spacing would be as needed for sewer alignment but no greater than 400 ft. The placement of all sewer mains would be such that a minimum of 10 feet of horizontal separation is provided from water system mains. At crossings with water mains a minimum of 18 inches of vertical separation would be provided. All sewer collection appurtenances would be tested for water tightness prior to being placed into service.

A portion of the Project's gravity sewer collection system would discharge flow toward the proposed WWTP. The remainder of the gravity collection system would flow toward one sewer pumping station. The sewer pumping station would be a wet well type pump station fitted with a minimum of two pumps. Each pump would be capable of handling the design peak hourly flow. Prior to entering the pump station, incoming raw sewage would pass through a grinder device which would grind sanitary wipes and other deleterious materials to prevent pump fouling.

The sewer pump station would be fitted with a gas-powered backup power supply. A 4-inch diameter force main would be routed from the pumping station to the nearest sewer manhole that is capable of conveying the pumped effluent via gravity to the WWTP.

The WWTP is shown in Figure 391. This direction was chosen after studying two different approaches; connection to an existing wastewater treatment and disposal system and developing an independent system for the Project. The initial design of the WWTP accommodated approximately 420,000 gpd. However, according to the Project's water demand and yield data detailed in Section 3.8ii, the Project's wells have a yield able to accommodate up to 275,400 gpd without the best well in service.

Therefore, the WWTP's design was revised to accommodate a daily capacity of 280,000 gpd, which would be sufficient capacity for the demand of 273,600 gpd as detailed above. Should the Project interconnect its wells with the Village and utilize the yield from its best well, the Project would either request the Village release its excess sewer capacity from the Orange County Sewer District No. 1 or extend the service capacity of the Project's WWTP up to the initial 420,000 gpd.

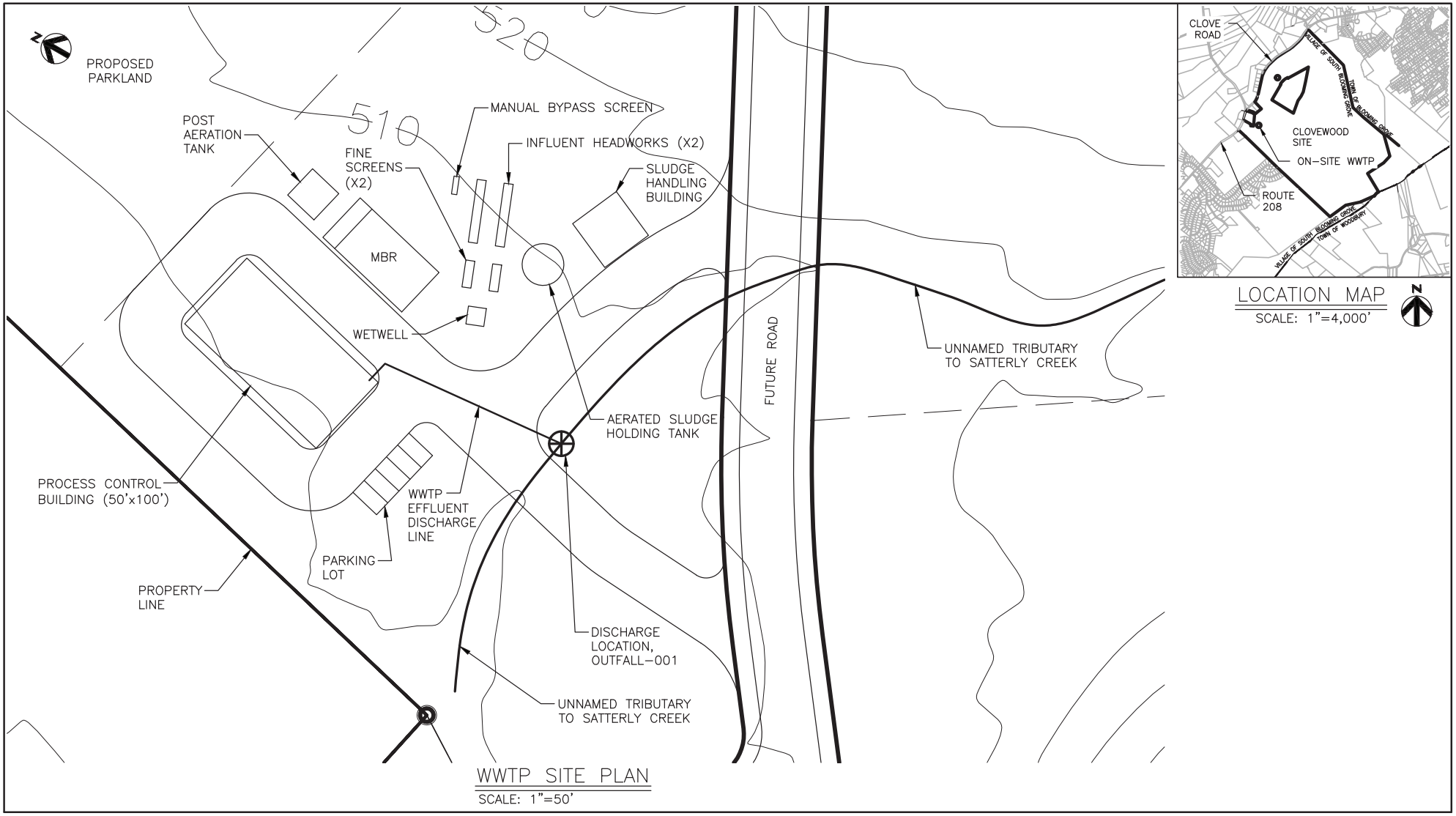
Portions of the Village are currently served by municipal sewer, as they lie within the Village of South Blooming Grove Consolidated Sewer District #1 ("SBGCSD#1"). The service area generally consists of existing residential developments on the north and south sides of NYS Route 208, generally ending at Merriewold Lane to the east and Duelk Avenue to the west. Six commercial properties are located within Sewer District #1. The sewer district touches the Project at the southwesterly and central portions of the Site, in the area of Virginia Avenue and Arlington Drive.

Currently, SBGCSD#1 utilizes the Harriman WWTP, which is part of Orange County Sewer District #1 ("OCSD#1). The current capacity allotted to the Village by OCSD#1 for use of the Harriman WWTP is 0.490 mgd. An average 12-month usage by the Village for the 2014 calendar year was approximately 0.267 mgd. The available capacity within the Village's allotment is approximately 0.223 mgd. In total, the Harriman WWTP's average 12-month usage for 2014 was 4.375 mgd. The available capacity at the Harriman WWTP is approximately 1.625 mgd.

Given the above, there would be available capacity at OCSD#1's Harriman WWTP to accommodate the sewer needs of the Project. However, a connection to the County WWTP through the Village's infrastructure would result in the need for an increase in the allotment to the Village, and the Village to apply for the same.

Requests were submitted to the Village to confirm with the Village whether the remaining balance of the sewer surplus capacity would be available for the Project. It is important to note that in September 2016, Orange County released a study conducted by Delaware Engineering, which

Figure 391: Proposed WWTP Site Plan



HDR

PROJECT TITLE	CLOVEWOOD WASTEWATER TREATMENT PLANT
SHEET TITLE	**PROPOSED WWTP SITE PLAN**
PROJECT NUMBER	244319
PROJECT MANAGER	B. LEE
DATE	10/2/2015
REFERENCE SHEET	-
REFERENCE DOCUMENT	-
EXHIBIT NUMBER	-

suggested a major upgrade of the Harriman WWTP to increase its longevity. It also recommended that sewage flow be diverted to the WWTP from the Village of Chester, a portion of the Town of Chester, and potentially South Blooming Grove. Such a diversion of flow would free up one-third of the treatment capacity at the Harriman WWTP.

However, to date, the Village has been unwilling to provide its surplus sewer capacity to serve the Project (see Section 3.9ii.4). Based on the assumption that the Village Board may not expand the existing Sewer District to include the Project, the Applicant developed plans for a new sewage collection system and WWTP. Such a new system would offer additional advantages over the use of County's WWTP. Use of the Harriman WWTP would result in inter-basin wastewater transfers out of the Moodna Creek watershed and into the Ramapo Creek watershed, potentially impacting stream flows. In contrast, a new system created by the Project would not impact stream flows.

Alternatives regarding the type of system to be used to treat wastewater are summarized below and in more detail in Appendix I for the purpose of identifying the applicable biological treatment technology that would meet the preliminary effluent stream limits issued by NYSDEC.

Two activated sludge configurations such as sequencing batch reactors ("SBRs") and membrane bioreactors ("MBRs") were compared during this evaluation. Additional biological treatment configurations such as conventional activated sludge, moving bed bioreactor ("MBBR") and the STM Aerotor process were initially reviewed and screened with CPC and the alternatives were shortlisted to focus on SBR and MBR processes. A conceptual design would be completed by HDR for the selected treatment system.

As part of the alternatives evaluation, a comparison of the advantages and disadvantages and life-cycle cost estimates were prepared for the two biological treatment scenarios. Non-cost factors such as footprint, expandability to accommodate future wastewater flows, sustainability, operation and maintenance ("O&M") requirements, ease of operation, process control and reliability were also evaluated and incorporated into the alternatives selection process.

The evaluation concluded the following: Alternative 1 (MBR) had a capital cost of $15.12/gallon and O&M cost of $1.05/gallon and Alternative 2 (SBR) had similar costs to the MBR alternative, with a capital cost of $17.23/gallon and O&M cost of $1.19/gallon. Both alternatives' capital costs would be relatively close. Therefore, the Project Sponsor elected to proceed with the conceptual design for the MBR system, as it generates the highest quality effluent to consistently meet preliminary SPDES discharge limits as proposed by DEC for intermittent streams. The Project's wastewater engineer prepared a conceptual design for the selected treatment system.

A Sewage Works Corporation ("SWC") would be established under the Transportation Corporations Law of the State of New York. A copy of the documentation submitted to the Village

in order to create an SWC is included in Appendix I-3. The documentation for the establishment of the Transportation Corporation for both water and sewage works has been submitted to the Village but has not been acted upon as of yet by the Village. The service area for the SWC would be the Project Site. Consent for incorporation, including a review of the proposed rate structure, would be sought and received by the Applicant from the applicable agencies.

3.9ii.2 Potential Impacts

The Scoping Document adopted by the Co-Lead Agencies requested information on the following potential impacts of the proposed wastewater infrastructure associated with the Project. Responses to requests (a), (c), (d) and (e) are provided in an "Application for State Pollutant Discharge Elimination System and Approval Plans for a Wastewater Disposal System for the Clovewood Wastewater Treatment Plant, and an accompanying Wastewater Treatment Engineering Report," prepared by HDR and attached as Appendix I. The Response to (b) is found in the SWPPP included in Appendix H. The following Table 391 references the relevant sections Appendices H and I where the detailed analysis can be found, and a summary is provided below.

Table 391
Location Summaries for Appendices H and I

Scoping Document Item	Referenced Sections in Appendix H: SWPPP & Appendix I: Wastewater Treatment Engineering Report
Chapter 3.9ii.2(a)	**Appendix I**
Hydraulic Demands	Section 5.1 Design Flow, Table 5-1 Average Design Flow Calculation, Section 7.3 Hydraulic Analysis
Biological Sewage Demands	Section 5.2 Influent Wastewater Characteristics, Table 5-2 Influent Wastewater Characterization,
Chapter 3.9ii.2(b)	**DEIS Section 3.9ii.2(b)**
Design Criteria	Recommended Standards for Wastewater Facilities (Ten State Standards)
Chapter 3.9ii.2(c)	**Appendix I**
Design Criteria Appendix I	Section 5.0 Development of Treatment Facility Design Parameters Section 7.0 Design of Treatment System Section 7.2 Process Sizing and Descriptions
• *Influent Headworks*	Section 7.2.1, Table 7-1
• *Fine Screens*	Section 7.2.2, Table 7-2
• *Membrane Bioreactor Tanks*	Section 7.2.3, Tables 7-3, 7-4, 7-5, 7-6, 7-7, 7-8, 7-9 and 7-10
• *Post Aeration System*	Section 7.2.4, Table 7-11
• *Ultraviolet Disinfection System*	Section 7.2.5, Table 7-12
• *Solids Handling*	Sections 7.2.6,7.2.7, 7.2.11, 7.4 and Tables 7-13 and 7-14
• *Odor Control*	Section 7.2.9
Chapter 3.9ii.2(d)	**Appendix I**
Anticipated Effluent Water Quality	Section 8.0 Final Effluent Characteristics, Section 8.1 Mass Balance Summary, Figure 8-1, Estimated Final Effluent Mass Balance based on Average Design Flow
Impacts to Receiving Stream	Addressed in Items 1, 2 and 3 above
Chapter 3.9ii (e)	**Appendix I**
Compliance with NYSDEC Standards	Section 5.0
Source: Appendices H & I	

(a) Development of required hydraulic and biological sewage demands for the proposed development.

The sewage demands for the Project were developed according to 2014 NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems as detailed in 3.8ii.2 and 3.9i.2 above totaling 273,600 gpd for the 600 four-bedroom homes and associated swimmers. Therefore, the selected design average daily flow is 280,000 gpd. This is detailed in Appendix I, Section 5.1 Design Flow, Table 5-1 Average Design Flow Calculation, Section 7.3 Hydraulic Analysis. The Biological Sewer Demands are detailed in Appendix I, Section 5.2 Influent Wastewater Characteristics, Table 5-2 Influent Wastewater Characterization. Should the Project interconnect its wells with the Village and utilize the yield from its best well, the Project would either request the Village release its excess sewer capacity from the Orange County Sewer District No. 1 or extend the service capacity of the Project's WWTP up to the initial 420,000 gpd.

(b) Design criteria for sewage collection system components including gravity sewer mains, sewage pump stations, and sewage force mains.

The design criteria for the Project's sewage collection system components, including gravity sewer mains, sewage pump stations and sewage force mains has been developed based on guidelines and standards from the NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems, March 2014 (ISWTS); Recommended Standards for Wastewater Facilities (Ten State Standards); as well as the applicable standards from Orange County Sewer District No. 1.

(c) Design criteria for wastewater treatment facility including typical components such as solids handling, secondary and tertiary treatment, disinfection, and odor control.

The development of the design basis and has been developed based on guidelines and standards from the following references: NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems, March 2014 (ISWTS); Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMBR) Recommended Standards for Wastewater Facilities (Ten State Standards), 2014 Edition; New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works –Technical Report-16 (TR-16), 2011; and Wastewater Engineering, Metcalf & Eddy, 2004.

The raw wastewater would flow from the sewer collection system to the head of the WWTP by gravity or pump as mentioned above. The influent headworks facilities would provide pretreatment to remove large particles in the influent to protect downstream pumps, valves, pipes, and other appurtenances from damage and clogging.

A combined headworks system would provide two-stage influent screening, screenings dewatering and aerated grit removal. Two units of combined headworks system would be installed; each with the ability to handle the design peak hourly flows with the inclusion of any WWTP drainage or return flows. An emergency bypass to a manually cleaned bar screen would be provided.

The influent headworks would consist of the following components: mechanically cleaned influent screen; manually cleaned bar screen; aerated grit removal tank; screenings and grit dewatering system; utility water connection and hose station for washdown; and dumpster area. Screenings and dewatered grit would be discharged to dumpsters located on a concrete pad adjacent to the headworks facility. An access platform for inspection and maintenance of the screens would be provided. The design criteria for the headworks are presented in Table 7-1 of Appendix I, as is an equipment cut sheet. Tables 7-1 through 7-14 in Section 7 of Appendix I further detail data related to the WWTP's influent headworks, fine screens, membrane bioreactor tanks, post aeration system, ultraviolet disinfection system, solids handling and odor control.

(d) Anticipated effluent water quality and potential impacts to the receiving stream;

Based on literature information provided from vendors and a WWTP simulation using EnviroSim BioWin the estimated removal rates and residuals production through the proposed WWTP were calculated and effluent quality was estimated. Figure 8-1 in Appendix I presents a mass balance for the proposed wastewater treatment processes based on the average design flow.

Because the proposed Project wastewater treatment facility would be designed to meet effluent limits established by NYSDEC, stream quality would not be degraded and no significant adverse environmental impacts would arise from the wastewater components of the Project. Implementation of erosion and sediment controls would prevent any significant adverse impacts from construction of the WWTP.

(e) Compliance with NYSDEC regulations as well as Recommended Standards for Wastewater Treatment Works (Ten State Standards), year of latest revision.

The design basis was developed based on guidelines and standards from the following references: NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems, March 2014 (ISWTS); Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMBR) Recommended Standards for Wastewater Facilities (Ten State Standards), 2014 Edition; New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works –Technical Report-16 (TR-16), 2011; and Wastewater Engineering, Metcalf & Eddy, 2004.

3.9ii.3 Mitigation

There would not be significant adverse environmental impacts from the wastewater collection and treatment or stormwater components of the Project, as confirmed by the consideration of wastewater treatment and collection design alternatives and studies of stream wastewater assimilative capacity. The selected wastewater collection and treatment system would meet NYSDEC effluent limits, and ensure protection of stream quality. Any short-term construction impacts stemming from construction of the WWTP and collector system would be adequately mitigated by incorporating the erosion and sediment controls. Therefore, no mitigation would be necessary.

3.9ii.4 Alternative Wastewater Option

Requests were submitted to the Village to confirm whether the Village Board would authorize the remaining balance of the Village's surplus sewer capacity to be allocated to the Project. In September 2016, Orange County released a study conducted by Delaware Engineering, which recommended a major upgrade of the Harriman WWTP to increase its longevity. It also recommended that sewage flow be diverted to the WWTP from the Village of Chester, a portion of the Town of Chester, and potentially South Blooming Grove. Such a diversion of flow would free up one-third of the treatment capacity at the Harriman WWTP. However, to date, no confirmation has been received from the Village regarding the feasibility of connecting the proposed Project to the existing Village sewer infrastructure. Connection to the system by new out-of-district users was discouraged by the Village Engineer as shown in the following documentation. Unless the Village Board recommends extension of the existing sewer district to serve the Project or recommends authorization for the Project to be served as an out-of-district user, these alternatives are not viable.