Cricket Valley Energy

Draft Environmental Impact Statement – Volume 2
Cricket Valley Energy Project

Dover, Dutchess County, New York

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Section 5 – Water Resources

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Appendices

List of Acronyms and Abbreviations – Section 5

%	percent
7Q10	The lowest stream flow for seven consecutive days that would be expected to occur once in ten years, representing a "low flow" characteristic used in hydrology and water resource assessment
BMP	Best Management Practice
$Ca(OH)_2$	Calcium Hydroxide
CAD	Computer-Aided-Design
CEA	Critical Environmental Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
Chazen	The Chazen Companies
ConEd	Consolidated Edison Company of New York
CUA	Copake gravely silt loam
CVE	Cricket Valley Energy Center, LLC
DCDOH	Dutchess County Department of Health
EDI	Electrodeionization
°F	degrees Fahrenheit
$FeCl_3$	Ferric Chloride
GIS	gas insulated switchgear
gpd	gallons per day
gpm	gallons per minute
HCl	hydrochloric acid
HRSG	heat recovery steam generator
HSG	Hydrologic Soil Group
Iroquois	Iroquois Natural Gas Transmission System LP
$KMnO_4$	potassium permanganate
Laydown Site	30-acre construction worker parking and laydown site
mgd	million gallons per day
msl	above mean sea level
Na_2CO_3	sodium carbonate

NaOH	sodium hydroxide
$Na_2S_2O_5$	sodium metabisulfite
NFPA	National Fire Protection Association
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NWP	Nationwide Permit
NYCRR	New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
Pg	Pawling silt loam
Project Development Area	The 57-acre portion of the 131-acre Property proposed for development
Property	The 131-acre property optioned by CVE
psi	pounds per square inch
Q50	The stream flow which is exceeded 50 percent of the time on average during a year
Q90	The stream flow which is exceeded 90 percent of the time on average during a year, representing a “low flow” characteristic used in hydrology and water resource assessment
RCP	reinforced concrete pipe
RO	reverse osmosis
SCS	Soil Conservation Service
SMP	Stormwater Management Practices
SPDES	State Pollutant Discharge Elimination System
Su	Sun silt loam
Summer Period	The period during the year when the outdoor ambient air temperature is at or above 59ºF, occurring from mid-May to mid-September (four months)
SWPPP	Stormwater Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
TR-20	Natural Resources Conservation Service Technical Release 20
TR-55	Natural Resources Conservation Service Technical Release 55

TSP	total suspended particulates
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Winter Period	The period during the year when the outdoor ambient air temperature is below 59ºF, occurring from mid-September to mid-May (eight months)
WQC	Water Quality Certification
WQv	Water Quality Volume
Wy	Wayland silt loam
ZLD	zero liquid discharge

5. WATER RESOURCES

This section evaluates the potential effects of the proposed Cricket Valley Energy Center, LLC (CVE) project on water resources in the project vicinity. Potential impacts to these resources from construction and operation of the project are described and measures to avoid, minimize, or mitigate potential impacts are provided. Also included is a description of existing conditions, including surface waters, hydrogeology, topography, soils, and groundwater resources.

Project plans incorporate advanced and proven technologies to minimize water use to the greatest extent practicable, including air cooled condensers, which utilize air instead of water for cooling (see Section 1.5.1.3.4), and a water treatment system that includes a Zero Liquid Discharge (ZLD) system to recycle process water (see Section 5.5.2). These technologies reduce water demand by approximately 98 percent when compared to an equivalent water-cooled facility. The use of a ZLD system will also ensure that no wastewater is discharged from the site to nearby surface waters. As discussed in Section 5.6, the project will incorporate Best Management Practices (BMPs) using the latest New York State Department of Environmental Conservation (NYSDEC) stormwater guidelines to control stormwater runoff during construction and operation. Use of these BMPs will minimize and mitigate potential impacts from stormwater runoff to local surface waters, which ultimately drain to the Swamp River.

The project proposes to use on-site, bedrock water supply wells (each well is approximately 600 – 800 feet in depth) to meet water needs and, as discussed in Section 5.4, the project has conducted long-term aquifer pump tests to ensure that neither neighboring wells nor the Swamp River and associated wetlands will be adversely affected from the withdrawal, even during 100-year drought conditions.

5.1 Applicable Laws, Regulations, and Policies

The Property (the 131-acre parcel optioned by CVE) contains New York State-regulated wetlands subject to the NYSDEC Freshwater Wetlands Program, regulated under Article 24 of the Environmental Conservation Law and Regulations (6 New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York [NYCRR] Parts 663, 664 and 665). The Property also contains federal jurisdictional waters of the U.S. and wetland areas subject to Sections 401 and 404 of the Clean Water Act, Water Quality Certification (WQC) Program, as well as the U.S. Army Corps of Engineers (USACE) Section 404 General, or Nationwide Permit (NWP) Program. Each of these programs is described in detail in Section 3.

Developments that disturb one or more acres of land are subject to federal stormwater regulations under the National Pollutant Discharge Elimination System (NPDES) program. The NYSDEC has been delegated by the United States Environmental Protection Agency (USEPA) to implement this program in New York State pursuant to the Clean Water Act under the State Pollutant Discharge Elimination System (SPDES) program. The SPDES permit program regulates point-source and non-point source discharges into waters of the State which, in New York, includes groundwater.

The project is eligible to seek authorization to discharge stormwater during construction and operation under the NYSDEC's General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-08-001). Obtaining general permit coverage requires filing a Notice of Intent (NOI) with the NYSDEC. As the site disturbance exceeds 5 acres, the project will be subject to either a 60-day review for the NOI under Stormwater General Permit GP-0-08-001, or the granting of a waiver for this requirement. Coverage under either permit requires the preparation of a Stormwater Pollution Prevention Plan (SWPPP) as described in detail in Section 5.6. A preliminary SWPPP for construction and operation has been developed and is included in Appendix 5-A.

As discussed in Section 5.4, CVE proposes to complete development of an on-site well system to supply water from the bedrock aquifer. As such, it will be required to obtain local permits from the Dutchess County Department of Health (DCDOH) for water well construction, septic system approval, and if applicable, abandonment of unproductive water wells (see Article 16 of the Dutchess County Sanitary Code). In addition, review and approval will be required from the Town of Dover Planning Board for the control of Erosion and Sedimentation per Chapter 65 of the Dover Town Code (Town of Dover, 1999).

5.2 Existing Conditions

The Project Development Area (the 57-acre portion of the 131-acre Property proposed for development), described in Section 1.2, is located to the east of the Metro-North rail line. This portion of the 131-acre Property has a long history of industrial use and numerous dilapidated, vacant industrial structures and associated debris are located in that area. Within the Project Development Area, approximately 30 acres will be developed. This section discusses existing site conditions including nearby surface waters of New York State (NYS); surface waters of the United States; site geology; site topography; and both on- and off-site soil conditions and how they relate to aquifer recharge. Understanding the sources of aquifer recharge is a key component in the determination of a sustainable groundwater supply.

5.2.1 Surface Waters

This section focuses on the surface waters within and adjacent to the Property and all off-site interconnections and improvements. Potential impacts to these surface waters will be identified and reasonable mitigation measures, including the use of alternative technologies, will be discussed.

The Property lies adjacent to the Swamp River (located west of the Project Development Area), which originates at the Great Swamp (located south of the Property) and flows northward to its confluence with the Ten Mile River, north of the Property. The entire Property is located within the Ten Mile River watershed, as shown in Figure 5-1. These three surface waters, as well as associated on-site jurisdictional wetlands are discussed below.

5.2.1.1 The Great Swamp

The Great Swamp, located in the eastern New York counties of Dutchess and Putnam, is the second-largest freshwater wetland system in the state, and covers approximately 6,700 acres along a 20-mile corridor. Spanning two watersheds of a combined 63,000 acres, the swamp serves as the headwaters for both the Swamp River to the north, which flows into the Ten Mile River and eventually into Long Island Sound, and the East Branch Croton River to the south, which feeds New York City's Croton Reservoir System (Friends of the Great Swamp, 2010). The Great Swamp has been designated as a Critical Environmental Area (CEA) by the NYSDEC, identified as an Important Bird Area by Audubon New York, listed as a Priority Project in the 2001 New York State Open Space Plan, and continues to be a valued natural resource as well as an important destination for bird-watching, hiking, canoeing, hunting and other recreational activities (Friends of the Great Swamp, 2010).

The Property falls north of the Great Swamp, along the north-flowing Swamp River. Approximately 20 percent of the Great Swamp's flow is directed north to the Swamp River, while approximately 80 percent flows south, feeding the Croton Reservoir System (Friends of the Great Swamp, 2010).

5.2.1.2 The Swamp River

The Swamp River is part of the Ten Mile River watershed, which comprises approximately 203 square miles and covers roughly 25 percent of Dutchess County (The Chazen Companies [Chazen], 1999). The Swamp River runs approximately 15 miles, originating in the town of Pawling, and flowing north to the Ten Mile River in the Town of Dover. While there is no United States Geological Survey (USGS) flow gauging station on the Swamp River, stream gauging has been conducted by The Chazen Companies (Chazen) as part of the *Water Resource Assessment for the Town of Dover* (1997), the annual *County Groundwater Monitoring Report* (2002 and 2005), and again in July 2010 for this project (see Figure 5-2).

The Swamp River basin is a hydrogeologic discharge environment, meaning that the groundwater in the area of the Swamp River discharges into the Swamp River, making it a "gaining stream" under most climatic conditions (severe drought may be an exception). The presence of viable and extensive riparian wetlands needing a constant water supply along most of this distance attests to persistent groundwater discharges along the full length of the Swamp River.

There are no known specific baseflow separation studies of the complete Swamp River to distinguish between overland runoff and groundwater discharges supporting this river's flow. However, in 2006, Chazen conducted evaluations of overall Ten Mile River flows to identify the average percentages of groundwater flow into the Ten Mile River, concluding that 53 percent of flow during average years comes from its underlying aquifers. To obtain this estimate, Chazen used a conservative baseflow separation method, which discounts the shallowest subsurface flows entering streams (sometimes recognized separately as interflow). Examples of interflow include groundwater following clay lenses or soil/bedrock boundaries into streams without formally entering deeper aquifer formations. If interflow were to be included in baseflow studies, investigators would likely attribute up to 35 percent more flow to groundwater source estimates. During extreme dry summer periods, all investigation methods would conclude that nearly 100 percent of stream flow is attributable to groundwater sources while during wetter seasons, rivers would contain larger percentages of direct overland runoff.

Stream gauging along the Swamp River conducted by Chazen on December 4, 1997 identified 29.67 cubic feet per second (cfs) (13,316 gallons per minute [gpm]) of flow at the Chippewalla Road bridge, approximately 0.5 mile upstream (south) of the Project Development Area. Downstream of the Project Development Area, approximately 3 miles north, a flow of 54.79 cfs (24,590 gpm) was recorded where the Swamp River flows under NYS Route 22 (Chazen, 1998, Table 6[a]). The flow increase between the two bridges was 25.12 cfs (11,274 gpm). The Swamp River flow at NYS Route 22 on December 4, 1997 was similar to the historic "Q50" (flow exceeded 50 percent of the time) flow condition of 43 cfs identified by USGS (Ayer and Pauszek, 1968) using statistical analysis of the 1931-1960 flow period. This means the flow conditions documented in December of 1997 were typical of average flow conditions in the Swamp River and that significant growth in flow was occurring along the stretch of the Swamp River passing the Property.

Chazen staff gauged streams throughout Dutchess County in late 2001, 2002 and 2005. During these events, flow in the Swamp River was recorded downstream of NYS Route 22 where the Swamp River flows into the Ten Mile River by County Route 6. Flow during early November 2001 was 5.05 cfs (2,266 gpm), flow during mid-August 2002 was 3.98 cfs (1,786 gpm), flow during late September 2002 was 2.27 cfs (1,019 gpm) and flow during early October 2005 was 1.66 cfs (745 gpm). For reference purposes, the historic Q90[1] and 7Q10[2] flow values for the Swamp River at NYS Route 22 are 6.6 cfs and 1.6 cfs, respectively, suggesting that these recording events captured flow conditions lower than the Ayer and Pauszek's Q90 conditions and one event near Ayer and Pauszek's 7Q10 condition. The data confirm that, during all recent drought periods, discharge was maintained by the Swamp River into the Ten Mile River.

Gauging conducted by Chazen on July 13, 2010 focused on the Chippewalla Road bridge crossing and the NYS Route 22 bridge crossing, replicating 1997 sampling under significantly drier conditions than the 1997 event. On July 13, 2010, flow at the Chippewalla Bridge was 2.20 cfs (987 gpm) and flow by the Route 22 bridge was 8.71 cfs (3,909 gpm), identifying a gain in flow of 6.51 cfs (2,922 gpm) along the stretch of the Swamp River passing the Property. This indicated that 75 percent of the flow passing under the NYS Route 22 bridge entered the Swamp River between Chippewalla Road and NYS Route 22. This finding points to a robust base flow contribution from the aquifer near the Property. It is expected that most of this gain comes from the sediments and geologic formations under the valley bottom near the Property since geologic formations to the west which make up the steep hillsides west of Dover's central valley are of low-permeability and less easily recharged bedrock formations.

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[1] Q90 refers to the stream flow which is exceeded 90 percent of the time on average during a year. It represents a "low-flow" characteristic used in hydrology and water resource assessment.

[2] 7Q10 refers to the lowest stream flow for seven consecutive days that would be expected to occur once in ten years. It represents a "low-flow" characteristic used in hydrology and water resource assessment.

In sum, the stream gauging studies conducted by Chazen document that particularly significant stream flow gains, in excess of groundwater discharge consumed by riparian vegetation, enter the Swamp River in the vicinity of the Property.

As discussed further in Section 5.4.2, the project has chosen not to pursue water withdrawal from the Swamp River, but has proposed development of an on-site well system using the bedrock aquifer. In addition, as discussed in Section 5.6, the only water discharged to the Swamp River watershed will be stormwater controlled and mitigated using BMPs.

5.2.1.3 The Ten Mile River

As noted above, the Property lies in the Ten Mile River watershed, which comprises a drainage area of 203 square miles above the USGS gauging station near Taylorsville, Connecticut (Chazen, 1999). The watershed lies in Dutchess County and part of the state of Connecticut. The Ten Mile River runs predominately north to south approximately 33 miles, originating in the town of North East, New York before emptying into the Housatonic River in Gaylordsville, Connecticut. Major tributaries of the Ten Mile River include the Wassaic Creek, which lies in the western portion of the watershed; the Webatuck Creek, which lies in the eastern portion of the watershed; and the Swamp River, which is located in the southern end of the watershed. The Property is located adjacent to the Swamp River, approximately 2.5 miles south of its confluence with the Ten Mile River.

Chazen conducted stream gauging in the Ten Mile River watershed during 1997, and summarized these findings in its 1999 Harlem Valley Watershed Investigation (Chazen 1999); however, data collection was focused north of the Property in the towns of Amenia and North East. The nearest USGS flow gauging station on the Ten Mile River is located at Gaylordsville, Connecticut. An important conclusion of the 1999 report was the development of a framework for an inter-municipal protocol allocating suggested "safe yield" groundwater shares between the towns which occupy the majority of the Ten Mile River watershed. The Town of Dover recommended safe consumptive limit of 2.3 million gallons per day (mgd), equivalent to 1,597 gpm, was developed to ensure that overall groundwater consumption would not be depleted by more than half the 7Q10 drought level flow.

5.2.1.4 Jurisdictional Wetlands

As discussed in Section 3.2, the Property contains state and federal waters and associated state and federal jurisdictional wetlands. Delineation and mapping of these wetlands were conducted in April 2009, resulting in five areas identified as wetlands on the Property, three of which are state or federal jurisdictional wetlands. The two largest wetlands (Wetlands 4 and 5 – totaling approximately 45 acres) are located within the Great Swamp CEA between the railroad line and Swamp River. These wetlands will remain undisturbed by the project. The three smaller wetland areas (Wetland 1 – 1.7 acres; Wetland 2 – 8.7 acres; and Wetland 3 – 0.6 acres) are located within the Project Development Area. Section 3.2.2 provides descriptions of the five identified wetland areas and Table 3-7 provides a summary of projected impacts to the five wetland areas. Figure 3-7 provides an aerial image of jurisdictional wetland boundaries. Photographs of the identified wetlands are provided in Section 3 as Figures 3-2 through 3-6. Details of the observed field characteristics that defined each wetland boundary are presented in Appendix 3-B.

Most of the Property lies to the east of the Swamp River, and includes both high-quality and degraded wetlands. Approximately 74 acres of the Property, which lie to the west of the railroad track, are designated as within the Great Swamp CEA, and include forested wetlands with a fringe of emergent wetlands along the Swamp River. Those 74 acres are undeveloped, with the exception of a small pump house and associated access road, from which site activities have historically obtained a significant portion of their water supply. Project development activity will be restricted to the Project Development Area east of the railroad tracks, and will not use the existing pump house for any purpose to ensure this contiguous portion of the Great Swamp CEA will remain undisturbed.

5.2.1.5 Off-Site Interconnections

Since the project is located immediately adjacent to both the Consolidated Edison Company of New York (ConEd) 345-kilovolt electric transmission right-of-way and the Iroquois Natural Gas Transmission System LP (Iroquois) natural gas pipeline right-of-way, infrastructure improvements will be contained within the ConEd right-of-way and the Property as discussed in Section 1.5.10. Off-site improvements within the ConEd or Iroquois rights-of-way are not expected to impact any waters of NYS or the United States. On-site improvements to bring these utilities to the Project Development Area are expected to impact one of the five wetlands (Wetland 1) identified in Section 3.2.2. The impact would be limited to maintaining vertical clearance from vegetation between the wetland and the overhead utility lines. There is no proposal to install utility poles or structures within Wetland 1.

5.2.1.6 Temporary Construction Worker Parking and Equipment Laydown Site

An off-site location approximately 2.5 miles north of the Project Development Area will be used for temporary construction worker parking and equipment laydown (Laydown Site). The 30-acre Laydown Site, to be used during the approximately three-year construction phase for the parking of vehicles and the receiving, storage, and management of materials and equipment, consists of active agricultural fields historically associated with a farming operation, and is a portion of a larger parcel (see Figure 1-10). The parking area would be sized for approximately 800-850 vehicle spaces, shuttle bus parking, oversized vehicles, and space would be allocated for snow management. As the soils that comprise the Laydown Site are considered "prime farmland," protective measures will be taken to ensure that no negative long-term impacts to this site will occur. After the top soil is scraped back and stockpiled at the site (as described in Section 2.3.4), the parking and storage area will be graded, compacted, and covered with geotechnical fabric and granular material. The compacted subsoil and granular materials would be a temporary and safe surface to support parking and unloading/loading/movement of materials and equipment. A temporary earth berm would be created along the north side of the Laydown Site from the stockpiled topsoil and serve as a visual barrier toward the northern residents. Preliminary stormwater plans are described in Section 5.6.4.3 and a Conceptual Stormwater Report for the Laydown Site is included in Appendix 5-B.

Surface waters on or adjacent to the Laydown Site include a tributary stream, with adjacent forested wetlands, that is eventually conveyed to the Ten Mile River.

5.2.2 Hydrogeology and Groundwater Resources

This section describes the geologic and hydrogeologic setting of the project including a discussion of site topography, soils, and underlying geologic formations.

5.2.2.1 Topography and Soils

As discussed in detail in Section 2.2.3, the Project Development Area is located on the western slope of a north-south trending ridge that separates the Swamp and Ten Mile rivers. New York State Route 22, which forms the eastern Property boundary, sits approximately 40 feet higher than the rest of the site, and the entrance to the Project Development Area slopes down across this feature until it reaches the existing site buildings. The Project Development Area itself indicates relatively little topographic relief, although there is a gentle slope towards the west (and towards the Swamp River). Regionally, the site is located within a valley (the Swamp River Valley) with topography increasing significantly to the east of the site (in the area defined as East Mountain) and west of the site (West Mountain).

The Dutchess County Soil Survey (United States Department of Agriculture [USDA], 2008) indicates that the local soils are a mix of gravelly or sandy silt loams. A summary of on-site soil units, range of slopes, hydrological group, and hydric classification is included in Section 2.2.3 as Table 2-1. The soil map units are shown in Figure 2-3. The primary soils to be encountered within the Project Development Area during site development are Galway-Farmington-Urban land complex; Farmington-Galway complex; Udorthents, smoothed; Sun silt loam; and Wayland silt loam.

The percentage of Hydrologic Soil Group (HSG) A, B, C, D, and Other are shown in Table 5-1 and Appendix 5-C and further explained in Section 5.2.2.3.

Table 5-1: Existing Soil Conditions

Soil Group	Area (acres)	Percent of Total
HSG A	0	0%
HSG B	9.3	7%
HSG C	98.4	75%
HSG D	19.1	15%
Other	3.5	3%

The Laydown Site consists of active agricultural fields historically associated with a farming operation. The Laydown Site is flat, sloping from approximately 400 feet above mean sea level (msl) to 385 feet msl where surface runoff ultimately reaches a tributary stream which traverses predominantly west to east. The Dutchess County Soil Survey (USDA, 2008) was also consulted for the Laydown Site, indicating surficial soil conditions that consist of Copake gravely silt loam (CUA), Pawling silt loam (Pg), Sun silt loam (Su) and Wayland silt loam (Wy).

5.2.2.2 Geology

The project is located in the New England Physiographic Province, which largely consists of metamorphic rock (schist, phyllite and metagraywacke) in the mountainous regions. Layers of marble and sedimentary deposits of limestone and dolomite underlie the valleys (USDA, 2008). As shown on Figure 2-2, the mapped bedrock formation underlying the majority of the Property is Stockbridge Marble (Ordovician Age), a calcitic and dolomitic marble. The bedrock on the western edge of the Property, along the Swamp River, is Walloomsac Formation, consisting of phyllite, schist, and metagraywacke.

Since Stockbridge Marble is a carbonate rock, it has a tendency to form solution cavities. Water drawn from marble bedrock tends not to have the colloidal (suspension of particles) turbidity common in water from limestone bedrock, as the bedrock tends to degrade to fine calcareous sand. With time, under constant and even pumping, the amount of sand produced by bedrock wells diminishes and disappears.

The overlying geologic material in the Project Development Area is ground moraine, commonly called glacial till, which is composed of materials derived from the grinding of bedrock by advancing glaciers. Glacial till, primarily consisting of compressed rock flour with sand, gravel, and cobbles imbedded within the finer materials, typically has a low permeability. Permeability, measured in inches per hour, is the ease with which water will flow though sediment, or soil. Within the Project Development Area, the permeability ranges from approximately 0.2 to 6 inches per hour with a majority (75%) of the site in the range of 0.6 – 2.0 inches per hour.

The western side of the Property (i.e., west of the Metro-North railroad line) is underlain by alluvial deposits related to the adjacent Swamp River. The alluvial deposits are associated with the floodplain of the Swamp River and adjacent wetlands and are generally fine silty sand with occasional gravel lenses. Possibly present within the Property, specifically the northwestern portion of the Property, are underlying glacial outwash deposits that have been mapped by the New York State Museum (Cadwell). The possible presence of such deposits would indicate an increased ability to recharge the underlying bedrock aquifer because the higher permeability sand and gravel deposits allow more water to pass into the bedrock aquifer than would lower permeability materials such as silts and clays.

5.2.2.3 Hydrogeology

In 2006, Chazen Companies published research identifying average aquifer recharge rates for soil groups throughout Dutchess County. According to USGS records, Dover typically receives approximately 42 inches of precipitation per year (Chazen, 2006). Varying shares of this precipitation return to the air as evaporation or plant transpiration, as runoff into rivers, and as aquifer recharge which flow slowly toward rivers. Figure 5-3 shows hydrological features in the project area. In Dover, the calculated recharge rates at which rainfall enters aquifers are: 20.2 inches per year into soils assigned by the Soil

Conservation Service to HSG A; 14.7 inches per year into soils assigned to HSG B; 7.6 inches per year into soils assigned to HSG C; and 4.2 inches per year into soils assigned to HSG D. As discussed in detail in Appendix 5-C and shown in Table 5-1, the Property contains soils classified as HSG A, B, C, D or Other. Generally, in wells installed in hilly upland areas, the water table is encountered 15 to 30 feet below grade. Near perennial (year-round) streams and rivers, the water table typically lies 5 to 10 feet below grade. In areas furthest from perennial streams and lakes, water tables rise and fall, most often between 10 to 15 feet as the seasons transition from wet to extended dry periods. Groundwater level fluctuations are more restrained near perennial streams, seldom fluctuating by more than a foot or two, mimicking the height of water in the nearby surface water bodies. Additional detail on the Project Development Area groundwater is provided in Section 5.3.1.

5.3 Potential Construction Impacts

Short-term potential construction impacts to water resources will be limited to the Project Development Area and the associated Laydown Site. The three categories of short-term impacts, each with associated mitigation measures, are: dewatering of shallow groundwater; erosion of exposed soils and potential pollution from construction; and temporary construction near or in wetlands.

5.3.1 Dewatering of Shallow Groundwater

The Project Development Area has relatively shallow groundwater levels, with respect to the existing grade and elevations, as shown in Figure 5-4. The majority of the area where the facility will be constructed has an existing seasonal high ground water level estimated to be 6 to 12 feet below grade. After the facility is completed, the new high ground water level is estimated to be approximately 12 to 15 feet below grade, since additional fill materials will be used to achieve the final grades for development. It is anticipated that dewatering requirements will be limited to deep equipment foundations, stormwater ponds, and utility trenches, and will begin 6 to 12 feet below existing grade, depending on the location and seasonal groundwater table. In the event that dewatering for excavation of construction holes is utilized, the discharge of the water will be managed by the construction stormwater management systems, as detailed in Appendix 5-A.

5.3.2 Erosion of Exposed Soils and Potential Pollution from Construction

During the construction phase, the Project Development Area and Laydown Site will be potentially subjected to disturbed (exposed) soils, vehicle fuels and lubricants, chemicals associated with building construction, and building materials. To mitigate these potential impacts, temporary erosion and sediment control measures and BMPs will be applied during construction, as described in Section 5.6.3. The limits of the construction disturbance area will exceed five acres at any given time; therefore, the project will request NYSDEC approval for soil disturbance of greater than five acres under the Stormwater General Permit GP-0-08-001.

5.3.3 Temporary Construction near Wetlands

In order to prevent soil erosion and sedimentation of on-site wetlands during construction, all project activities will operate in accordance with the design and practices set forth in the SWPPP described in Section 5.6. As described in Section 3.2.2, five areas were identified as wetlands on the Property. Three of those wetlands are located within the Project Development Area. The other two wetlands were identified between the railroad track and the Swamp River, where no project construction activity is proposed to occur. While the extent of change to the site and its surroundings has been minimized by design, some temporary and permanent modifications to the surrounding wetland resources will occur as a result of project construction and final development, as identified in Section 3.3.1. With the proper installation and maintenance of erosion control barriers, BMPs, and other control measures, the extent of any indirect impacts from erosion and sedimentation should be minor to non-existent.

5.4 Water Supply

This section discusses Project Water Demands; local water supply alternatives; the proposed project water source (i.e., on-site bedrock supply wells); and a review of the testing and analyses undertaken to ensure water withdrawal will have no adverse impact on neighboring wells or surface waters.

The Project Water Demand is defined as the total amount of water required for operation of the facility. Project Water Demand, described in Section 5.4.1, is the summation of operation and maintenance water demand required for specific systems' functions within the facility. These functions are divided into two main water demand categories for the facility: Process Water Demand, described in Section 5.4.1.1; and Domestic Water Demand, described in Section 5.4.1.2.

During the initial commissioning of the facility, there will be systems requiring a one-time fill and discharge of water. These are not considered a continuous Project Water Demand and are not included in the total summation described above. The commissioning water would be supplied and managed from the permitted project's water supply and flow rate limits.

5.4.1 Project Water Demand

The project plans to incorporate several water conservation measures to minimize water resources impacts during construction and operation of the facility. The project will be one of the most water-efficient electrical generating facilities in the region. The planned water conservation measures incorporate advanced technologies, management policies and practices, and recycle-reuse processes, and include:

- Combined cycle technology for electrical power generation, which reduces the demand of water compared with typical steam-electric generating plants.
- Air cooled condensers, in lieu of wet-evaporative or once-through cooling. This technology eliminates the need for large amounts of water demand for cooling the steam cycle, typically accounting for the majority of water used at most other power plants.
- Air-cooled fin-fan coolers for auxiliary equipment cooling, in lieu of wet evaporative or once-through cooling.
- A ZLD process to minimize both water demand and wastewater discharge requirements, through recycling of water used in the plant.
- A rain capture system implemented on major building roof tops and outdoor equipment containments to reduce water demand.
- Low and/or zero flow domestic water plumbing fixtures and appliances in the administrative building, as allowed by local zoning.

Water for the facility's fire protection system will be supplied from the 1,000,000-gallon service water/fire water storage tank. The tank and system is filled and charged one time during the initial commissioning of the facility and is not considered a continuous Project Water Demand as explained in Section 5.4.1.3.

5.4.1.1 Process Water Demands

Within the facility, there are individual process water demands that contribute to the majority of total Project Water Demand during operation and maintenance. Some individual process water demands are continuous during operation, while others are intermitted or in batches. The intermittent/batch Process Water Demands occur for short durations and will be supplied by the 1,000,000-gallon water storage tank. The short duration of water use will not require a corresponding instantaneous withdrawal from the external water supply source. Rather, the quantity of intermittent or batch water will be drawn from the service/fire water storage tank during the short duration and then be replenished over a longer period of time. Therefore, intermittent or batch Process Water Demands are expressed as average daily quantity (gallons per day [gpd]) or continuous flowrate (gallon per minute [gpm]) required to replenish the service/fire water tank volume used.

The individual process water demands are presented in the following list and further described below. (Note: The maximum Process Water Demands are based on the facility operating at 100 percent capacity over a 24-hour period).

- Combustion turbines' air inlet evaporative coolers – Continuous
- Steam cycle losses and water quality sampling – Continuous
- Service water for maintenance and housekeeping – Intermittent/batch
- On/off-line combustion turbine water wash – Intermittent/batch
- Water treatment system – Continuous

5.4.1.1.1 Combustion Turbines' Air Inlet Evaporative Coolers

The combustion turbines' air inlet evaporative coolers utilize the latent heat of water evaporation to cool the inlet air drawn into the combustion turbine compressor section. The inlet evaporative coolers are only used during the summer period, defined as ambient temperatures at or above 59^{o}F, when the combustion turbines are in operation. The amount of water evaporated is a function of the ambient air temperature and combustion turbine load. According to the combustion turbine manufacturer, the expected maximum daily average Process Water Demand is approximately 66,384 gpd or an hourly average of 46.1 gpm. The combustion turbines' air inlet evaporative coolers maximum Process Water Demand occurs during the summer season.

During the limited days when the afternoon ambient temperatures exceed the site's daily high average of 83^{o}F, the coolers instantaneous hourly water use could increase up to approximately 97.8 gpm (based on an hourly temperature of 97.5^{o}F). The additional water use of 51.4 gpm (97.5 gpm minus 46.1 gpm) required for these short durations in the afternoon hours will be supplied by the 1,000,000-gallon water storage tank. The instantaneous water use of 97.5 gpm will not require a corresponding withdrawal of 97.5 gpm from the supply source. Rather, the extra water (51.4 gpm) will be drawn from the water storage tank during the short afternoon peak duration and then be gradually replenished during the longer evening to morning period, when night-time temperatures fall into the 60s and 70s^{o}F, at the normal Process Water Demand of approximately 46.1 gpm.

These maximum operating conditions (i.e., summer ambient temperature of 97.5^{o}F) occurs approximately two to five days of the year.

5.4.1.1.2 Steam Cycle Losses and Water Quality Sampling

The steam cycle losses are based on miscellaneous losses from valve stem packing, continuous laboratory sampling of Heat Recovery Steam Generatory (HRSG) water, miscellaneous small ventings between maintenance/repairs, and evaporation from direct spray cooling of continuous HRSG blowdown (via the HRSG blowdown tank). All of these losses occur when the facility's units are in operation and the amount of loss is based on the load condition, including supplemental (duct) firing, which increases the steam cycle flow rate. The losses are replenished with demineralized water produced by the demineralized water system and stored in the 250,000-gallon demineralized water tank located on-site. The tank would be used to control the daily swings of the facility's demineralized water demand (i.e., steam cycle losses) and any maintenance on the demineralized system. The expected maximum daily average Process Water Demand for the steam cycle and sampling is approximately 19,080 gpd, or an hourly average of 13.25 gpm, depending on the facility's operating condition. The steam cycle and water quality sampling maximum Process Water Demand occurs during the winter season.

5.4.1.1.3 Service Water for Maintenance and Housekeeping

Service water will be used for hosing down areas during maintenance and periodic housekeeping. The water is captured by the facility's floor drains, collected, processed, and recycled. However, these wet surfaces will result in some minimal water loss from evaporation. A conservative estimate of the amount of Process Water Demand for service water is approximately 720 gpd or an hourly average of 0.5 gpm.

5.4.1.1.4 On/Off-Line Combustion Turbine Water Wash

On/off-line combustion turbine compressor water washing will occur on a periodic basis, generally weekly or bi-weekly. This is required to clean the compressor blades to maintain operating efficiency and reduce wear and tear. On-line wash water is injected into the operating combustion turbine, quickly evaporated inside the combustion turbine, and exhausted through the HRSG stack as water vapor. Off-line washing is performed when the combustion turbine is not in operation and the rinse water is collected through bottom drains to a collection tank. The collected water is processed off-site at an appropriately licensed facility. On/off-line washing will utilize approximately 10,530 gallons of demineralized water on a bi-weekly basis. This would equate to a continuous maximum daily average Process Water Demand of 752 gpd, or an hourly average of 0.52 gpm.

5.4.1.1.5 Water Treatment System

The proposed water treatment system with its ZLD process technology, though very efficient in recycling waste water, cannot recycle 100 percent of the water from the waste streams. The waste by-products that result from the pretreatment and ZLD processes are two sludge solids, which contain inherent moisture (i.e., water), that will be taken off-site and disposed at an appropriately licensed facility. To make up the water loss from these processes, an additional water supply of approximately 0.17 gpm to 0.54 gpm will be required, depending on the operating condition.

5.4.1.2 Domestic Water Demand

The daily Domestic Water Demand by the facility's employees will be driven by the intermittent use of sinks, toilets, emergency eye wash stations, and showers. The project will incorporate high-efficiency, low or dry plumbing fixtures (i.e., water closets, urinals, lavatory faucets, shower heads, and kitchen sinks) to reduce the potable water demands. Drinking water will be supplied by water cooler dispensers and replaceable water bottles. Based upon the number of plumbing fixtures, usage factor per fixture, and number of employees (28 people, including staff and visitors), the estimated maximum average daily Domestic Water Demand is 500 gpd, or an hourly average of 0.35 gpm. This is equivalent to 17.9 gpd per person.

The proposed landscaping will incorporate indigenous plants to eliminate permanent irrigation requirements; therefore, the average daily landscape irrigation water demand is anticipated to be negligible.

5.4.1.3 Fire Protection Water Demand

The project will be equipped with fire protection and suppression systems designed to satisfy National Fire Protection Association (NFPA) recommendations. Based on *NFPA 850 Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations* and engineering estimates, the maximum, worst-case fire protection water flow demand would be 2,653 gpm for a continuous duration of two hours (total of 318,360 gallons of fire water). The fire water demand will be pumped by emergency fire pumps from the 1,000,000-gallon service water/fire water storage tank. The fire water volume (318,360 gallons) in the service water/fire water storage tank will be dedicated solely for fire protection purposes. The fire suppression systems would be used only during emergencies or during periodic testing of emergency systems, and will be supplied by the 1,000,000-gallon storage tank; therefore, the average daily Fire Protection Water Demand would be negligible.

5.4.1.4 Water Balance

The total Project Water Demand is based on two seasonal periods, a summer period and a winter period. Summer period is defined as the period during the year when the outdoor ambient air temperature is at or above 59°F (Summer Period). Based on the regional historical weather data, the Summer Period would occur from mid-May to mid-September (four months). During the Summer Period, the combustion turbine air inlet evaporate coolers would be in operation, resulting in the maximum Project Water Demand. The winter period is defined as the period during the year when the outdoor ambient air temperature is below 59°F (Winter Period) and would occur from mid-September to mid-May (eight months). During the Winter Period, the combustion turbine air inlet evaporate coolers would not be in operation, resulting in a significantly reduced total water demand.

The water balance diagrams, provided as Figures 1-11 and 1-12 schematically depict flow paths of project water supplies, water recycling, and waste streams. Table 5-2 provides the maximum average water demand, over a 24-hour period, during different facility operating conditions.

Table 5-2: Maximum Daily Average Project Water Demand

	Summer Period gpd *(gpm)*		**Winter Period** gpd *(gpm)*	
Individual Water Demands	**Non-Duct firing**	**Duct firing**	**Non-Duct firing**	**Duct firing**
Evaporative coolers	66,404 *(46.11)*	66,404 *(46.11)*	Off	Off
Steam cycle losses	14,400 *(10)*	18,360 *(12.75)*	14,400 *(10)*	19,080 *(13.25)*
Service water	720 *(0.5)*	720 *(0.5)*	720 *(0.5)*	720 *(0.5)*
Combustion turbine water wash	752 *(0.52)*	752 *(0.52)*	752 *(0.52)*	752 *(0.52)*
Water treatment waste	772 *(0.54)*	772 *(0.54)*	248 *(0.17)*	248 *(0.17)*
Domestic water	500 *(0.35)*	500 *(0.35)*	500 *(0.35)*	500 *(0.35)*
TOTALS	82,548 *(58.02)*	87,508 *(60.77)*	16,620 *(11.54)*	21,300 *(14.79)*

Note 1: The "Peak" Daily/Hourly Project Water Demand occurs during the Summer Period with the facility operating 100% load with duct firing.

According to historical local weather data, the highest daily average ambient temperature would be 83°F. This results in the peak Project Water Demand of approximately 87,508 gpd or an hourly average of 60.77 gpm. To manage the evaporative coolers' peak water usage during short-term afternoon high temperatures, the facility will utilize the 1,000,000-gallon service/fire water storage tank during the intermediate peak, and will refill/recover tank levels during cooler temperatures at night. For daily ambient temperatures between 83°F and 59°F, the total Project Water Demand decreases by approximately 12,384 gpd, or an hourly average of 8.6 gpm.

The maximum winter Project Water Demand is approximately 21,300 gpd, or an hourly average of 14.79 gpm. This is based on the historical lowest average daily ambient temperature of -8°F. For ambient temperatures between -8°F and 59°F, the total Project Water Demand decreases by approximately 1,296 gpd or an hourly average of 0.9 gpm.

During emergencies or temporary operational upsets, up to 60 gpm may be required to supplement the normal operational water supply for boiler chemistry upsets or well maintenance. The need for this additional water supply rate can last for one to up to seven days, depending on the event. The additional water supply would be accomplished by starting backup wells or increasing the main primary well yield. This will require a short-term emergency/operational transient water demand of 172,800 gpd, or an average hourly of 120 gpm.

For the purpose of estimating the maximum annual water demand, a typical base-load dispatch profile of 92 percent (8,059 hours) operation is used, of which 37 percent (3,241 hours) is non-duct firing and 55 percent (4,818 hours) is duct firing. Table 5-3 shows the allocation of the appropriate hours to the respective Summer and Winter Periods as well as the respective water demand during these periods.

Table 5-3: Maximum Average Seasonal Project Water Demand

	Non-Duct firing (hours)	Duct firing (hours)	Annual (hours)	Water Demand (gallons)	Average Water Demand (gpm)
Summer Period	1,028	2,021	3,049	10,952,437	59.9
Winter Period	2,213	2,797	5,010	4,016,216	13.4
Annual	3,241	4,818	8,059	14,968,653	28.48

Note: Annual Major Plant Maintenance Outages occur the 1st weeks in April and October, during the Winter Period, with an annual total outage of three weeks. Annual average water demand is based on 8,760 hours per year.

5.4.2 Water Supply Alternatives

As previously discussed, the project has been planned to significantly minimize water demand through the use of air cooling and a ZLD system (which eliminates the need for wastewater discharge in part by maximizing water recycling and reuse). It is anticipated that the maximum daily average Project Water Demand would be 60.77 gpm in the summer (87,508 gpd).

In order to identify a feasible water source, CVE reviewed available analyses regarding historical water use at the Property and examined secondary data sources to identify potential alternatives. Alternatives considered in this review were:

- Municipal or other existing water supply sources;
- Treated effluent from existing wastewater treatment plants;
- Surface water from the Swamp River;
- Surface water from other potential sources; and
- Groundwater.

An analysis of each proposed water source was conducted as described in the following sections.

5.4.2.1 Municipal or Other Existing Water Supply Sources

No public water supply exists in the vicinity of the site; residents and businesses typically rely on groundwater wells. No significant businesses or industries were identified in the immediate area as potential targets for requesting shared use of an existing developed water supply. Therefore, these options were not considered further.

5.4.2.2 Treated Effluent

A review of USEPA databases did not indicate the location of any substantial wastewater treatment plants (which could be a potential source of treated effluent as water supply) discharging within a reasonable distance from the project. Therefore, this option was not considered further.

The proposed Knolls of Dover project is planned to have a wastewater treatment plant that could, at some future point, provide treated effluent to meet all or a portion of the project's water needs. Approval of that project is still pending. In addition, until that project and its associated wastewater treatment plant is built, the reliability of the quantity and quality of effluent remains uncertain. Therefore, at this time, this option was not further considered.

5.4.2.3 Swamp River Withdrawal

The Swamp River extends through the site, flowing northward, and has historically provided a portion of the site's water needs. Its proximity and historical use for fire protection water via an existing pump house resulted in some additional consideration as a potential water source for the project.

Based upon a review of available information, consideration of direct withdrawal from the Swamp River was eliminated from consideration for the following reasons:

- The Swamp River flows north to its confluence with the Ten Mile River just south of Dover Plains. Portions of the river, including the reach immediately proximate to the site, are located within the Great Swamp CEA.

- No pumping records are available that document site use. However, reports indicate that withdrawals from the Swamp River have been limited to fire protection storage.

- USGS stream flow gauging (downstream of the site) for the period from 1960 – 1968 indicates that mean monthly flows range from 108 cfs in March to 6.2 cfs in September, with some summer days where flows were recorded on the order of 1.0 cfs. Although there is no set regulatory standard for surface water withdrawals in New York, withdrawal of less than 5 percent of the 7Q10 is generally considered acceptable. The project's average summertime water demand would be nearly 8 percent of the 7Q10 (see Appendix 5-C). A withdrawal of this magnitude would likely be unacceptable.

5.4.2.4 Other Surface Water Sources

The project region has been quarried for marble since the mid-1800s. Several quarry ponds have been identified in the area that reportedly maintain substantial water volumes even in dry conditions. The marble formations are somewhat more fractured than any of the surrounding upland geologic formations. The marble is also often in direct contact with overlying saturated glacial sediments. The fractures and glacial sediments together offer highly permeable conduits for groundwater. For this reason, groundwater in the marble formation that underlies the region has a high potential for water supply. The quarry ponds are replenished with direct rainfall, surface runoff and groundwater from their interception of the fractures in the marble layers.

While the quarries represent a potentially sustainable source of water, this option was not considered for the following reasons:

- Since the largest source of water into the quarries is likely to be groundwater from the bedrock aquifer, conventional wells would likely be a more efficient approach.

- The Town of Dover's Master Plan references a strong desire to phase out mining and quarrying operations and reclaim closed quarries and mines with clean fill (Town of Dover, 1993).

- An open quarry pond presents potential contamination liabilities that may be more difficult to manage than conventional bedrock wells.

- The technical investigations necessary to accurately predict a quarry pond's sustainable yield are considerably more complex and more uncertain than for conventional bedrock wells.

- Use of quarry ponds would introduce an additional linear feature (water pipeline), with its associated costs, environmental impacts, and easement issues, to the project, as well as the need for agreements with the quarry owner(s).

For the above reasons, this option was not considered further.

5.4.2.5 Groundwater Sources

Groundwater is anticipated to be the most feasible source of water for the project. The potential for meeting the project's water demand through development of either bedrock or surficial aquifer wells was considered through review of literature and mapping.

5.4.3 Proposed Water Source

For the reasons noted herein and described in further detail in Section 7.9, various water supply alternatives were considered and ultimately rejected, with development of on-site bedrock wells chosen as the preferred water source for the project. Review of aquifer mapping and surficial field reconnaissance confirmed that appropriate subsurface conditions exist to supply project water needs via such wells. Hydrogeologic conditions, as discussed in Section 5.2.2, were mapped and six on-site test well drilling locations were identified.

Bedrock test wells were drilled during the periods of July 28, 2009 to August 6, 2009 and February 8 to 22, 2010 to determine if an adequate and reliable water supply was available on the Property. Wells B-1 and B-2 were drilled to depths of 855 and 630 feet, respectively, and produced insufficient water to be considered for testing (less than 5 gpm). Wells B-3 and B-4 were drilled to depths of 805 feet and 605 feet, respectively, and produced 44 and 70 gpm, respectively, during preliminary tests. The yields of Wells B-3 and B-4, although significant, were not considered sufficient to meet the project's reliability needs and backup criteria; therefore, two additional wells were drilled, Wells B-5 and B-6. Wells B-5 and B-6 were drilled to depths of 957 and 1109 feet, respectively, and produced an additional 30 and 12 gpm, respectively.

The four test wells (Wells 3, 4, 5, and 6), identified in Figure 5-5, were further developed using a standard surging technique to remove sediment from the bedrock fractures and improve connectivity to the aquifer. Initial test yields from the four wells were found to be productive enough to warrant longer-term testing, as detailed in Section 5.4.4. The testing program was intended to demonstrate that the completed wells had sufficient production to supply a continuous 60 gpm, the anticipated summer water demand, and a short-term supply of 120 gpm, the maximum amount required during operational transients and unanticipated upset conditions as discussed in Section 5.4.1.4.

An important consideration of the pumping test program was to demonstrate that the extraction of up to 120 gpm from the bedrock aquifer would not have an adverse impact on: private well water supplies in the areas surrounding the Property (up to 2,500 feet from the Project Development Area); the wetlands within and adjacent to the Property; and the Swamp River.

To facilitate this demonstration, the pumping test program included the installation and monitoring of several piezometers (instruments that record changes in water levels), within and adjacent to the on-site wetlands and the Swamp River. This required that the project obtain a NYSDEC wetlands permit allowing for piezometer installation as well as water discharge into the wetlands and the Swamp River. A freshwater wetland permit application was issued in December 2009, with a date modification occurring in April 2010. This modification allowed for the pump test to be rescheduled to June 2010 so as not to be influenced by heavy rains that occurred during March 2010. A copy of the wetland permit is attached as Appendix 5-D.

Requests for the voluntary participation of nearby property owners in an off-site monitoring program were mailed to property owners within approximately 2,500 feet of the test wells. The request was sent in the form of a letter (sent by mail or hand delivered) detailing the test procedure and including a questionnaire. Letters were sent to 17 well owners, with eight well owners agreeing to take part in the voluntary monitoring program. Additionally, the two closest wells at the Knolls of Dover project were monitored during the pumping test. The approximate locations of nearby wells are identified in Figure 5-5.

Data loggers (an instrument that contains a water level measuring device and an on-board computer to store water-level measurements) were installed to collect water-level information from the neighboring wells, with the initial intention of monitoring water levels for a minimum of 48 hours prior to the start of the pumping test, and for a minimum period of 24 hours after the conclusion of the test. However, given the delay in the start of pumping test, data loggers were installed in early May and monitored until late June, thus providing a robust data set of ten-minute intervals for comparison.

Private wells share a similar function (i.e., delivery of groundwater to a home's plumbing system); however, the systems vary in design components and the underlying geology varies from home to home. Variations in design, components, and geology result in different well responses to homeowner usage and external influences, such as climate and neighboring usage. The most common private well system in the area surrounding the Property is an artesian well with a submersible pump. Less common are artesian wells with jet pumps or water table wells with either jet pumps or submersible pumps. Hand-dug wells exist in the area, but none were part of the monitoring network. Neighboring wells vary in depth from less than 100 feet to greater than 500 feet. The well depths vary due to underlying geology, homeowner requirements, or homeowner (or developer) budgets. A typical four-bedroom home needs about 1/3 gallon per minute averaged over a 24-hour period. However water demand is intermittent and is only used for short periods of time (morning showers, clothes washing, etc.) requiring that the well system produce approximate peak demands of up to 10 gpm. If the home's well is not capable of yields of 5 to 10 gpm on demand, a water pressure tank is used to hold a reserve of water to meet instantaneous demand. Lower yield wells require larger tanks. Well water storage can also be met by the storage inherent in the well shaft, since typical wells have 6-inch diameter bores and can store about 1 gallon per foot of saturated depth. Therefore, the deeper the well below the static water level, the greater the storage of the well.

The size and type of pump used in private wells may also vary depending on the depth of the well, the installation budget, the age of the pump and the design of the system. Most homes use a standard submersible pump that turns on when a pressure switch calls for water and turns off when maximum pressure is reached in the tank. Low yield pumps require greater time to complete a cycle. The size of the tank also effects the cycle duration. Some new wells are equipped with variable rate pumps that do not require large storage tanks and, therefore, have different cycle times. Other factors that affect the pumping cycle duration include the number of residents in the home, the condition of the home's plumbing (leaks), and climatic conditions.

Data loggers are used to record pump cycle duration and amplitude as well as the overall trend of water level in a well. The water level trend is used to determine if a particular well has been impacted by an external pumping test. For this reason, it is important to collect data for an extended period of time prior to the test to determine what the “normal” well response is without the influence of a pumping test so that comparisons can be made.

Review of the well data charts for the private wells reflects the variations discussed above. Example charts are shown on Figure 5-6 with explanations based on the above discussion.

5.4.4 Discussion of Detailed Pump Test Results

The purpose of the CVE long-term pump test program was to demonstrate that the CVE supply wells are suitable to supply the required amount of water that the project requires, and to determine if the use of the on-site supply wells would have an adverse impact on neighboring private wells, on-site wetlands, or the Swamp River. Further, the collected pump test data were used to prepare the project's groundwater recharge and water use budget.

To account for excessive rainfall during March 2010, the pump test program was rescheduled until late June 2010 and divided into two phases:

- On-Site, Wetland, and Swamp River Monitoring Pump Test
- Off-Site Well Monitoring and Aquifer Stress Pump Test

Table 5-4 is a compilation of observed pump test well water level data showing the monitoring start and end times, starting water levels, ending water levels and recovery percentage within 24-hours of test shutdown. Only the recovery of the on-site test wells is included because the off-site monitoring wells and piezometers were not clearly drawn down during the test and, therefore, a recovery cannot be attributed to those wells.

Table 5-4: Pump Test Piezometer Readings

Well	Monitoring start date	Monitoring end date	Starting water level in ft	Ending water level in ft	Recovery % [24 hours]
Well 4	6/14/2010	6/25/2010	26.32	23.245	98
Well 3	6/14/2010	6/25/2010	46.41	36.087	90
Well 5	6/14/2010	6/25/2010	32.55	21.701	93
Well 6	6/14/2010	6/25/2010	49.1	39.07	95
Well 1	5/11/2010	6/25/2010	16.13	17.5	na
Well 2	5/11/2010	6/25/2010	21.53	23.4	na
Cable Vision*	5/18/2010	6/26/2010	49	52	na
MacEntee*	5/19/2010	6/26/2010	42	52	na
Wilson*	5/19/2010	6/26/2010	38	53	na
Baker*	5/19/2010	6/26/2010	34	36	na
Nash*	6/11/2010	6/26/2010	21	22	na
Mill Farm*	5/19/2010	6/26/2010	93	98	na
Vincent *	5/19/2010	6/26/2010	44	44	na
Gast*	5/19/2010	6/26/2010	8	11	na
Knolls/Dover 2*	6/13/2010	6/26/2010	38	39	na
Knolls/Dover 1*	6/13/2010	6/26/2010	41	41	na
PZ3	5/11/2010	6/25/2010	3.2	3.7	na
DEC north shallow	5/11/2010	6/25/2010	8.3	8.05	na
DEC west shallow	5/11/2010	6/25/2010	6.9	7.3	na
DEC west deep	5/11/2010	6/25/2010	12.3	12.9	na
PZ1a	5/11/2010	6/25/2010	2.3	2.5	na
PZ1b	5/11/2010	6/25/2010	2.5	2.7	na
PZ2a	5/11/2010	6/25/2010	2.3	2.5	na
PZ2b	5/11/2010	6/25/2010	2.6	3	na
PZ4 shallow	5/11/2010	6/25/2010	3.5	3.85	na
PZ4 surface	5/11/2010	6/25/2010	3.1	3.43	na
PZ5a	5/11/2010	6/25/2010	2.5	2.9	na
PZ5b	5/11/2010	6/25/2010	2.8	3.2	na
PZ6 shallow	5/11/2010	6/25/2010	3.3	3.9	na
PZ6 surface	5/11/2010	6/25/2010	3.5	4.3	na
*Water Level Measurement Rounded to Nearest Foot					

5.4.4.1 Pump Test Protocol

The on-site pump test consisted of the pumping of Wells B-3, B-4, B-5, and B-6 and monitoring of the on-site wells, off-site wells, wetlands, and the Swamp River. The objective of this test was to determine if any hydrological interactions exist between the proposed bedrock well aquifers and the on-site surface waters (e.g., the Swamp River and on-site wetlands) and shallow aquifers.

Although these supply wells are not public water supply wells, the New York State Pumping Test Guidelines (Appendix 10, TOGS 3.2.1) were used as a guide. The test was conducted for 72 hours, after aquifer stabilization, to obtain a meaningful, measurable response. Wells were simultaneously pumped at a combined rate equal to the anticipated maximum, short-term, groundwater withdrawal rate of 120 gpm, as detailed in Section 5.4.1.4.

The pump test configuration consisted of each wellhead connected to a 4-inch diameter flexible hose. Generated waters were sampled and tested prior to the pump test to ensure constituents did not exceed regulatory thresholds and health standards. Sample results are presented in Appendix 5-E. During the pump test, the collected water was pumped via industrial hose to the northern portion of the Project Development Area and released into an area outside the controlled test boundary. The water discharging from the hose was controlled with a temporary check dam, per New York Standards and Specifications for Erosion and Sediment Control for the prevention of erosion into the surrounding area (See Appendix 5-F). After percolating through the check dam, the water drained into a small tributary feeding the Swamp River, downstream and outside of the controlled test boundary.

The pumping test was started with Well 4 running at 90 gpm and Well 5 running at 30 gpm. It became clear within several hours of the test start that Well 4 had improved considerably, due to the well development, and it was not significantly stressed at the 90 gpm rate. Therefore, at the 24-hour point in the test, Well 5 was shut down (re-designated as a back-up well) and the pumping rate for Well 4 was increased to 120 gpm. During pumping of Well 4, the back-up wells (Wells 3, 5, and 6) were monitored for interaction. The test was extended by 24 hours so that the 120 gpm rate could be maintained for a 72-hour test. At the end of the 96-hour test period (June 14-18, 2010) the Well 4 pump was shut down for three days to allow full recovery.

The back-up well set (Wells 3, 5, and 6) was then tested simultaneously for 72 hours from June 21-24, 2010. Well 3 was tested at 45 gpm, Well 5 was tested at 30 gpm, and Well 6 was tested at 25 gpm, for a total of 100 gpm. Well 4 was not pumped, but was monitored for interaction during the second test. After completion of the back-up well test, Well 4 was tested at 60 gpm to determine the well's behavior during normal summer operation (see Appendix 5-E).

Data were recorded each minute during the pretest period, the test period and the recovery period using digital data loggers. Flow rates from each pumping well were measured using a combination of flow meters and periodic bucket/stopwatch readings. Water level data were based on drawdown and referenced to a depth-to-water level from a convenient measuring point.

5.4.4.2 On-Site, Wetland, and Swamp River Monitoring

Given the project's proximate location to the Swamp River and its associated wetlands, it was important to demonstrate that project water withdrawal would not have an adverse impact on the system of wetlands within the project area, including wetlands associated with the Swamp River. A series of temporary piezometers were installed in monitoring wells to record water level changes in the wetlands and Swamp River before, during and after the pump test. The piezometers were installed in nested well pairs at most locations to allow for the differential monitoring of surface and subsurface water. A nested well pair is a set of monitoring wells completed in a way that one of the wells monitors the upper portion of the water table and the second well monitors the lower portion of the same water bearing formation, approximately 25 feet below the water table surface.

The piezometers were installed using a truck-mounted auger, where access was available, and by hand auger in areas that did not have access to motorized vehicles. NYSDEC wetland access permits were obtained prior to the installation of the piezometers. In locations where existing on-site wells were available (i.e., NYSDEC monitoring wells installed for prior site uses), shallow monitoring wells were installed adjacent to them to allow for differential monitoring of nested well pairs.

The Swamp River was monitored by using a well point driven at least 18 inches into the sediment. A data logger was placed inside the well point and a matching data logger placed on the outside of the well point. The data loggers were compared to determine if there was a detectable hydraulic gradient between the water in the sediment under the stream and the stream.

Monitoring of the wetland and Swamp River piezometers for the period starting May 11, 2010 and continuing to June 25, 2010 showed no observable impact to the monitored water levels due to the pumping test. Water level changes observed were all due to climatic conditions such as warm dry periods and sporadic, isolated rain events typical of late spring and early summer.

As stated in Section 5.2.1.2, the Swamp River basin is a hydrogeologic discharge environment, meaning that the groundwater in the area of the Swamp River discharges into the Swamp River, making it a “gaining stream” under most climatic conditions (severe drought may be an exception). The pumping test discharged the well water indirectly into the downgradient portion of the river, as discussed above. This discharge was not expected to significantly affect the river level given the small percentage of well water flow relative to the Swamp River’s normal flow. Therefore, the river level with respect to the surrounding ground water level was not expected to change. To confirm these assumptions, nested well pairs were installed on existing trails within the wetlands adjacent to the Swamp River (see Appendix 5-E).

Digital data loggers were installed in the piezometers during the second week of May, 2010. The pumping test was started mid-June; therefore, the piezometers were monitored for an extended period, exceeding one month, providing an extensive background record.

The set of well monitors (piezometers) described earlier were monitored for an extended period prior to the start of the pumping tests. The data show that for the surficial deposit wells and the surface water monitoring points, the range of daily fluctuation in water level change was limited to less than 0.75 feet, most likely due to diurnal temperature and barometric fluctuations. The longer-term fluctuations generally appear to be related to sporadic rainfall during the monitoring period.

The piezometers that monitored the bedrock aquifer (NYSDEC West, Well 1, and Well 2) showed a gradual water level decline through the monitoring period that mirrored water levels in several of the private wells that were monitored. The seasonal transition from spring to summer includes warmer temperatures and increased evapotranspiration that translates into reduced recharge.

The pump tests on the project wells do not appear to have had any significant impact on the on-site piezometers or off-site private wells. A review of the on-site monitoring charts shows that at the end of the second pumping test there is an upward deflection of the water level in most of the results. This deflection could indicate that the shutting down of the pumping test resulted in a general water level rise. However, closer inspection shows that the same upward deflection exists in the upstream Swamp River chart indicating that the rise in water level is separate from the pumping test since the pumping test could not have influenced an upstream portion of the Swamp River to the observed level of 0.2 feet.

5.4.4.3 Off-Site Well Monitoring and Aquifer Stress

The off-site well monitoring program started in mid-May, 2010, several weeks before the start of the pumping tests on the project production wells. Generally, all of the wells monitored showed a seasonal decline ranging from about 2 feet (for most wells) to as much as 16 feet. During the pumping test period, there were no significant impacts on the offsite wells. Review of the monitoring charts shows that there were no effects on the offsite wells monitored during the 120 gpm Well 4 test.

As shown in Appendix 5-E, during the second test (i.e., Wells 3, 5 and 6 at 100 gpm), there appeared to be a downward deflection on three of the off-site well results; a maximum water level deflection of 4 – 5 feet was seen on one of the three wells over 3,000 feet away. These deflections cannot be considered significant since, in all cases, the water level changes were substantially less than those caused by the owner's use of the well. For the wells 3,000 feet away, normal use by homeowners causes a typical water level deflection of 20 – 25 feet, much greater than the 4 – 5 feet observed during the second test.

As discussed in Section 5.4.3, typical private well pumps operate using a pressure switch in the home's water pressure/storage tank. The switch is generally set to turn the pump on when the pressure in the tank falls below 30 pounds per square inch (psi) and turns the pump off when the pressure reaches 70 psi (these are general settings and can differ from home to home). The on-off cycling of the pump depends on the size of the storage tank in the home and the amount of water usage in the home.

The pump cycling can be observed on the private well's charts as individual, short term cycles (many per day) as seen in Appendix 5-E. In the three wells that had possible hydraulic connection to the pumping test wells, the amount of possible effect on the wells due to the test is significantly less than the individual (homeowner pump) cycle amplitude. This suggests that the CVE back-up well's effect on the off-site wells will be within the current usage range of the private wells and, therefore, should neither adversely affect the private wells nor even be noticed by the homeowners. Additionally, the back-up wells are not expected to be used for normal operation except under emergency conditions or during Well 4 maintenance.

5.4.4.4 Hydrogeologic Water Budget

Review of the site's topographic setting suggests that groundwater recharged on higher-elevation lands northeast of the Project Development Area may be expected to migrate naturally toward and under the Property, contributing to available groundwater resources available to CVE (see Figure 5-2). The pumping test results discussed in detail in Sections 5.4.4.2 and 5.4.4.3 indicate that site pumping does not draw down groundwater in these areas but natural groundwater migration will bring water from these areas onto the site. Using acreages of each soil type in this expanded recharge area, and conservatively removing from consideration 3.4 acres of roof-top capturing stormwater runoff, average daily aquifer recharge flow on and onto the site is 54.9 gpm (calculations are included in Appendix 5-C).

These budget calculations indicate that the site is fully capable of supporting its proposed average water consumption budget under both average and drought conditions, and that the site's overall water budget needs are, therefore, self-sufficient and would generate no permanent off-site drawdown impacts of any type. For further discussion, see Appendix 5-C.

5.4.4.5 Discussion of Primary and Back-Up Well Systems

The CVE well system is comprised of four wells. Well 4 is the primary well with Wells 3 and 5 acting as the system back-up wells and Well 6 held in reserve.

The test of Well 4 has demonstrated that the well can be operated indefinitely at the design rate of 60 gpm (assuming normal well maintenance and redevelopment). Further, the well test has shown that Well 4 could be pumped at the higher rate of up to 120 gpm for extended periods. The 180-day drawdown projection for this well indicates that at the end of 180 days without recharge and pumped at a rate of 120 gpm, Well 4 will have a water level drawdown of 170 feet. Considering that the static water level for this well was 26 feet, the 180-day projected water level would be 196 feet, well above the anticipated pump setting of 250 feet.

It has been demonstrated that Well 3, Well 5 and Well 6 can be pumped at 100 gpm for an extended period and pumped at a combined rate of 60 gpm indefinitely. Well 3 can be pumped, in conjunction with Well 5 and Well 6, at a rate of 45 gpm indefinitely. The 180-day projection for this well indicates a drawdown of 160 feet with the anticipated pump setting at 240 feet below the static water level for the well. Well 3, however, is hydraulically connected to Well 6, so will produce more water if pumped without Well 6. Similarly, Well 5 will also produce more water (causing less drawdown at the same pumping rate) if it is pumped without Well 6.

Well 6 can be pumped at a rate of 25 gpm, in conjunction with the pumping of Wells 3 and 5, indefinitely. The 180-day projection for this well indicates that the drawdown at the end of 180 days will be 220 feet, with an anticipated pump setting at approximately 640 feet below the static water level, well within the safety margin. Well 6 will be held in reserve for future (possible) use and will not be included as part of the back-up system.

Well 5 was tested in conjunction with Wells 3 and 6 at a rate of 30 gpm. Although the pumping test has shown that this well could be pumped for an extended period, the 180-day projection for this well, at 30 gpm, produced a drawdown of 200 feet. Considering the static level for this well is 32 feet, the final 180-day water level is 32 feet below the anticipated pump setting for this well. This means that this well cannot be pumped in conjunction with Wells 3 and 6 at a rate of 30 gpm for a period exceeding 6 months. However since Well 6 is not included as part of the back-up system, Well 5 is expected to have significantly less drawdown at the 30 gpm pumping rate, which will likely raise the drawdown intercept point on the 180-day projection. Also, it should be noted that the projection is based on a combined pumping rate of 100 gpm, which is 40 gpm higher than the anticipated design operating rate for these wells.

The Well 4 test at 120 gpm did not produce any discernable effects on any of the off-site private wells monitored, nor any of the on-site monitored wetland piezometers. This well is expected to operate normally at 60 gpm in the summer and significantly lower in the winter with only occasional, intermittent, periods of operation at higher rates not to exceed 120 gpm. For these reasons, it will be used as the primary well system for the facility.

The pump test of Wells 3, 5 and 6, at a combined rate of 100 gpm, also did not have any discernable impact to the Swamp River and the adjacent wetlands. In addition, the 100 gpm test on these wells did not have a significant impact to the off-site wells. Three off-site wells did show some minor indication that they were influenced by the pumping test, but the influence can be considered minimal since the effect from the pump test was smaller than the effect from the well owners' own usage. It can, therefore, be concluded that operation of the system back-up wells (Wells 3 and 5) for the relatively short periods necessary to affect repairs on the primary well (Well 4) will not have any noticeable impact on any of the offsite wells that were monitored.

5.4.4.6 Contingency

In the event the proposed water supply is interrupted for either a short-term or long-term duration, the project has incorporated a contingency plan to ensure project water use can be maintained at appropriate levels.

5.4.4.6.1 Short-Term Interruption

In the event that the primary supply well is disrupted on a short-term basis, the three back-up wells (Wells 3, 5, and 6), as discussed in Section 5.4.4.1, will be utilized. If the back-up wells are not available during a short interruption, the facility will have the capability to run at full capacity, without water supplies, for approximately 10 days utilizing the water stored in its raw water and demineralized water storage tanks maintaining 318,360 gallons for fire suppression.

5.4.4.6.2 Long-Term Interruption

For long-term interruptions to both the primary and back-up wells, the facility can reduce water use during the summer months by reducing inlet evaporative cooling to the gas turbines and reducing plant output capability. This will effectively reduce water consumption to the winter level of approximately 11.5 gpm. At this use level, the plant is able to operate for more than 56 days on water stored in the storage tanks maintaining 318,360 gallons for fire suppression. In the highly unlikely event that an interruption extends beyond 58 days, the facility can bring in additional water supplies by tanker truck. Minimum consumption rates can be met with nearly two 8,000 gallon trucks per day supplying water to the facility.

5.4.4.6.3 Rooftop Rain Water Capture

The facility will incorporate a rain capture and recycle system from the building roof tops and equipment containment area, as further described in Section 5.6. This captured rain will be filtered, treated, and stored in the facility's service water tank to contribute to meeting the Project Water Demand. The total area of the rain capture area is 148,512 square feet. The average annual rainfall in Dutchess County is 41 inches per year (Chazen, 2006) (Summer Period = 14 inches and Winter Period = 27 inches). This equates to the following capture volumes:

- Summer Period Rain Capture (Mid-May to Mid-September) = 1,296,101 gallons
    - Average Summer Supply Rate = 7.35 gpm
- Winter Period Rain Capture (Mid-September to Mid-May) = 2,499,624 gallons
    - Average Winter Supply Rate = 7.16 gpm
- Annual Total Rain Capture = 3,795,725 gallons
    - Average Annual Rain Supply Rate = 7.22 gpm

Rain capture will allow the facility to reduce its Project Water Demand on a daily, seasonal, and annual basis. Table 5-5 summarizes the benefits of rain capture for the facility.

Table 5-5: Project Water Demand with Rain Capture

Period	Project Water Demand with Rain Capture		Water Savings with Rain Capture		
	Flow Rate (gpm)	Volume (gallons)	Flow Rate (gpm)	Volume (gallons)	% of Water Saved
Summer Period					
Max. Daily Average	53.45	76,972	7.35	10,580	12.1%
Seasonal Average	52.78	9,656,336	7.08	1,296,101	11.8%
Winter Period					
Max. Daily Average	7.64	11,004	7.16	10,308	48.4%
Seasonal Average	5.05	1,516,592	8.32	2,499,624	62.2%
Annual					
Max. Daily Average	23.73	34,177	7.22	10,399	23.3%
Annual Average	23.11	11,172,928	7.85	3,795,725	25.4%

5.5 Water and Wastewater Treatment

5.5.1 Water and Wastewater Treatment Requirements

The facility's process and fire protection water must meet many different levels of water quality to protect against scale formations and minimize corrosion of internal system components. To control the process water quality, CVE proposes a water treatment system that will include following subsystems (as shown in Figures 1-11 and 1-12), located in the water treatment building:

- Pretreatment System and Storage
- Demineralization System and Storage
- ZLD System

The pretreatment system will be designed to control water quality (e.g. levels of iron, manganese, and suspended solids) from the combined influents of the following:

- Untreated/raw well water
- Evaporative cooler blowdown
- HRSG blowdown that has been quenched with service water
- Demineralization reverse osmosis (RO) blowdown
- Rain and stormwater from roof tops and controlled areas that has been treated in an oil/water separator
- Water from building floor drains that has been treated in an oil/water separator
- Facility process wastewater treatment (recycled via the ZLD system)

Solutions of sodium carbonate (15%-Na_2CO_3), ferric chloride (40%-$FeCl_3$), hydrochloric acid (37%-HCl), and calcium hydroxide (35%-$Ca(OH)_2$) will be added in the pretreatment system to control pH levels, organics, solids, and hardness. The treated water from the pretreatment system will be stored in the 1,000,000-gallon service and fire protection water tank. The storage tank will be used to control the daily swings or peaks of the facility's Process Water Demand. The suspended solids removed from the influent water will be squeezed in a hydraulic filter press to remove additional water for recycling, before hauling the remaining solids to a licensed disposal facility.

The demineralization system, which occurs after pretreatment (as detailed in Figures 1-11 and 1-12), will consist of multi-stage RO and electrodeionization (EDI) to produce high purity water to meet project water quality requirements (i.e., HRSG steam cycle and combustion turbine evaporator cooler makeup). Solutions of sodium metabisulfite (38% $Na_2S_2O_5$), sodium hydroxide (25%-NaOH), and hydrochloric acid (37%-HCl) will be added to the system to control chloride, halogens, and pH levels for the protection of the RO system. The demineralized product water will be stored in the 250,000-gallon demineralized water tank and used to control the daily swings of the facility's demineralized water demand and any maintenance on the demineralized water system.

Based on the turbine manufacturer's water quality requirements, the water supply to the combustion turbine evaporative coolers will be a blend of pretreatment influent water and RO permeate effluent. The pretreatment influent water will be treated with a solution of potassium permanganate (3%-$KMnO_4$) filtered with a manganese green filter to control iron and manganese levels. The blended water will require pH adjustment with a solution of sodium hydroxide (25%-NaOH) to ensure there is adequate alkalinity.

The domestic water system will utilize the same well water influent as the process water treatment system to produce potable water. The potable water will comply with the applicable performance standards and maximum containment levels set forth in the New York State Sanitary Code and by the Dutchess County Commissioner of Health. Based upon the number of plumbing fixtures, usage factor per fixture, and number of employees (28 people, including staff and visitors), the estimated maximum average daily Domestic Water Demand is 500 gallons or an hourly average of 0.35 gpm. This is equivalent to 17.9 gpd per person.

5.5.2 Anticipated Wastewater Volumes

The project has incorporated technologies to minimize water use and recycle process wastewater to the greatest extent possible, including: air cooled condensing for main system cooling; a fin-fan cooler for auxiliary cooling; internal reuse and recycling of process wastewater; and a ZLD system to eliminate discharge of process wastewater from the project. The project's peak water requirements correspond with summer operation of combustion turbine inlet evaporative coolers (discharged as water vapor from the facility's stacks) and ZLD operation of recycling process wastewater (the bonded moisture in the non-hazardous waste solids after extracting water). A project water balance is illustrated in Figures 1-11 and 1-12 representing water demand for winter and summer conditions, respectively.

Other periodic wastewater volumes generated during cleaning and maintenance cycles, collected in a designated holding tank, and disposed of off-site by a licensed contractor will include:

- RO membrane spent cleaning solution
- Off-line combustion turbine compressor wash water

The RO membranes will require periodical chemical cleaning to maintain efficient performance. The RO manufacturer would typical supply the cleaning solution, which will include acid solutions (such as citric acid), caustic solutions (such as sodium hydroxide), detergent solutions, and chelant solutions. The spent cleaning solution, approximately 150 to 300 gallons will be collected in a designated holding tank for off-site disposal at a suitable licensed facility. Chemical cleaning is anticipated to occur on a monthly or bi-weekly basis, depending on the water quality and usage.

Off-line washing of the combustion turbine compressor is the process of injecting cleaning solution into the compressor while it is being turned at cranking speed. The cleaning solution will consist of a mixture of detergent and demineralized water. During the soaking period of the compressor, the cleaning solution will remove fouling deposits accumulated over a period of operation and restore performance (i.e., efficiency and power output). At the end of the cleaning cycle, the wash water will be collected through the compressors bottom drains into a designated holding tank for off-site processing at an appropriately licensed facility. The facility's off-line wash wastewater volume would be approximately 10,530 gallons of demineralized/detergent mixture on a bi-weekly basis (equivalent to a continuous demand of 0.52 gpm).

5.5.3 Zero Liquid Discharge System

Zero Liquid Discharge describes a process that completely eliminates liquid discharge from a system. The goals of any well-designed ZLD system are to minimize the volume of wastewater that requires treatment; process wastewater in an economically feasible manner; and produce a clean water stream suitable for reuse elsewhere in the facility.

The ZLD system will remove dissolved solids from the RO reject wastewater stream and return distilled water to the pretreatment influent through evaporation and crystallization methods. Only a small portion, approximately 10 percent, of the RO reject stream will require processing in the ZLD system. The ZLD process may use falling film evaporation, which is an energy-efficient method of evaporation, typically used to concentrate water up to the initial crystallization point. The resultant brine then enters a forced-circulation crystallizer where the water concentrates beyond the solubility of the contaminants and crystals are formed. The crystal-laden brine is dewatered in a filter press and the filtrate or centrate is recycled to the crystallizer. The collected condensate (i.e., clean water) is returned to the process, eliminating the discharge of process wastewater. The dewatered crystal solids are transported off-site for reuse or disposal at an appropriately licensed facility.

During the maximum summer daily water balance, the ZLD system will process approximately 3.6 gpm of RO reject wastewater on a daily basis and return 90 percent (3.6 gpm) of the wastewater as clean condensate to the pretreatment influent. The remaining 10 percent of the wastewater will remain in the crystal solids as inherit moisture (0.36 gpm loss). The potential volume of crystal solids generated would be 14.25 cubic yards per month during the Summer Period and 5.19 cubic yards per the Winter Period.

CVE has identified two potential options for handling the crystal solids. The first option would be to transport the material to a licensed third party for a marketable by-product, such as road salt. If an agreement with a third party processing facility cannot be reached, the second option would be to transport the material to a licensed off-site solid waste handling facility. During the initial phases of commissioning and operations of the facility, a USEPA Toxicity Characteristic Leaching Procedure (TCLP) would be designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic waste. The TCLP analysis simulates landfill conditions and would verify the waste is not toxic, under the Resource Conservation and Recovery Act (40 Code of Federal Regulations [CFR] Part 261) of D004 through D052.

5.5.4 On-site Sanitary Waste

Based upon a review of Dutchess County soil mapping, anticipated wastewater quantities of 500 gpd (equal to the Domestic Water Demand), and previous soil borings, it is recommended that on-site sanitary waste be treated through a preliminary subsurface treatment using a fill pad.

According to the DCDOH Water and Wastewater Systems Design and Construction Standards, if rock or unsuitable material is less than 6.5 feet and high seasonal groundwater is less than 5.5 feet, but in either case not less than 2.5 feet, an area may be improved by fill material in accordance with the following conditions for a conventional fill pad:

- A satisfactory percolation rate at 24 inches in natural soil.

- Fill material is allowed to settle and stabilize for a period of six to nine months; or, if sand and gravel, mechanically compacted in 6-inch layers in a manner which will allow adequate percolation.

- The fill material shall extend 3 feet from the center of a trench, followed by 7 feet of additional soil, with the final 2 feet being impervious soil with a slope of one vertical to three horizontal.

- Deep tests and percolation tests shall be required in the fill after settling and stabilization, except in sand and gravel that has been compacted in accordance with the first item above. Percolation rates shall be equivalent to or less than the percolation rate of the virgin soil and shall be no more than 15 minutes per inch of stabilization.

- Prior to the placement of fill, the area of sewage disposal system shall be cleared of brush, debris, trees, etc. cut to the level of the virgin ground.

- A 100 percent expansion area shall be required. The design engineer shall complete a fill certification application as required by the DCDOH prior to obtaining a Certificate of Occupancy from the Town.

- The fill, including location, material, and dimension, must be in place and certified by a professional engineer as being suitable for the installation of a sewage disposal system.

5.6 Stormwater Management

Stormwater runoff from impervious surfaces is recognized as a significant contributor of pollution that can adversely affect the quality of receiving water bodies. Therefore, treatment of stormwater runoff is important since most runoff related water quality contaminants are transported from land, particularly from impervious surfaces, during the initial stages of storm events.

The only water that will be discharged from the site will be rain/stormwater runoff controlled through the designed and permitted stormwater management systems into the existing stormwater swale.

The recommended stormwater measures outlined herein have been designed to provide both quality and quantity controls by treating and detaining runoff prior to its discharge off site. Pre- and post-development surface runoff rates have been evaluated for the 1-year, 10-year, and 100-year 24-hour storm events. The design intent is to attenuate runoff generated during the 1-year, 10-year, and 100-year 24-hour rainfall events such that post-development peak rates will not exceed the rates that existed prior to development of the project. These measures have been designed and evaluated in accordance with the following standards and guidelines:

- New York State Stormwater Management Design Manual (April 2008)
- Draft New York State Stormwater Management Design Manual (November 2009)
- New York State Stormwater Management Design Manual (August 2010)

As described in Section 5.4.1, the project plans to incorporate technologies to minimize water use to the greatest extent possible, including advanced dry cooling air cooled condensers, which utilize air instead of water for cooling, and a water treatment facility with a ZLD system to recycle process water. These advanced technologies reduce water use by approximately 98 percent when compared to an equivalent water-cooled facility. With the implementation of these advanced features, there will be no discharge from a point source that conducts industrial activities identified within 49 CFR Part 122.26(b)(14)(i) through (x). As this project will not discharge process wastewater, it is not subject to an Individual SPDES Permit or SPDES Multi-Sector General Permit. The project will, however, be subject to a SPDES General Permit for Stormwater Discharges from Construction Activity as described below.

Erosion and sediment control measures, designed to minimize soil loss and intended to retain eroded soil and prevent it from reaching water bodies or adjoining properties, have been recommended in accordance with the following documents:

- NYSDEC SPDES General Permit for Stormwater Discharges From Construction Activity, Permit No. GP-0-010-001 (effective January 29, 2010 through January 28, 2015) (The General Permit)
- New York State Standards and Specifications for Erosion and Sediment Control, NYSDEC (August 2005)
- Town of Dover Erosion and Sediment Control Ordinance

With these regulations in mind, CVE has developed a preliminary SWPPP with the primary goals of: analyzing the peak rate of runoff under pre- and post-development conditions; maintaining the pre-development rate of runoff in order to minimize impacts to adjacent or downstream properties; applying runoff reduction methods; and minimizing the impact to the quality of runoff exiting the site.

The preliminary SWPPP and accompanying plans (see Appendix 5-A) identify and detail stormwater management, pollution prevention, and erosion and sediment control measures necessary during and following completion of construction. The SWPPP considers the impacts associated with the proposed development with the purpose of:

- Maintaining existing drainage patterns as much as possible while continuing the conveyance of upland watershed runoff;
- Controlling increases in the rate of stormwater runoff resulting from the proposed development so as not to adversely alter downstream conditions;
- Implementing volume reduction techniques to manage, reduce, and treat stormwater and maintain and restore natural hydrology by infiltration, evapo-transpiration, and capture and reuse of stormwater; and
- Mitigating potential stormwater quality impacts and preventing soil erosion and sedimentation resulting from stormwater runoff generated both during and after construction.

5.6.1 Existing Stormwater Runoff

Since no project activities will occur west of the railroad track, the modeling of pre- and post-development stormwater was limited to the Project Development Area. As described in Section 2.2.3, the Project Development Area is located near the bottom of a western facing slope, along a small north-south trending ridge that separates the Swamp River and the Ten Mile River. Although the Project Development Area is relatively flat, there is a westerly trending slope toward the active commuter rail line and the Swamp River. Several wetland areas are located outside of the developed portions of the Project Development Area. The eastern side of the Project Development Area rises steeply (~30-40 feet) to the elevation of NYS Route 22, and consists of rock outcropping, vegetation, and sparsely to thickly populated trees. Site elevations range from approximately 418 feet msl to 490 feet msl.

As described in Section 2.2.3, the USDA Soil Conservation Service (SCS) Soil Survey for Dutchess County was reviewed and provided surficial soil conditions for the study area.

The Property is located over the Carbonate Rock aquifer, which is not designated as a sole source aquifer.[3] Thus, additional separation requirements to groundwater are not required for proposed stormwater measures. This aquifer is identified as a principle aquifer in the GIS data set obtained from the USGS, entitled "Principal Aquifers of New York State States, Polygon (Shapefile: 1998).

A site visit was conducted by Chazen personnel on January 15, 2010 to verify pre-development watershed conditions at and around the Property. As part of the site visit, the pre-development watershed boundaries were identified (based upon the project's topographic survey map and Dutchess County mapping), as were ground-cover conditions, and design points. Overall, it was found that the contributing pre-development watershed area was comprised of two large subcatchments, labeled in the pre-development stormwater modeling calculations as ES-1 and ES-2 (see Appendix 5-A, Figure 4).

[3] Sole Source Aquifers are designated by the USEPA as the sole or main source of drinking water for a community, under provisions of the Federal Safe Drinking Water Act.

As outlined in Figure 4 of Appendix 5-A, the Subcatchment ES-1 is approximately 91.27 acres and comprises the northern portion of the Project Development Area and an area west of NYS Route 22. ES-1 largely comprised of wooded areas with scattered brush areas in its northern, eastern and western sections. Also found in the northern and eastern sections of the subcatchment are NYS Route 22 and supporting secondary roads as well as a few residential homes. The west side of the subcatchment is bordered by the Metro-North rail line. The southern section of ES-1 contains the majority of the Project Development Area, which consists of several large, abandoned manufacturing/industrial buildings, as well as associated on-site roadways which have been overgrown with scattered vegetation. A NYSDEC-jurisdictional wetland, EW-1 (identified as Wetland #2 in Section 3.2.2) is also found in the northwest portion of ES-1. This wetland serves as the design discharge point (defined as "Design Point #1") for this subcatchment, as all areas within ES-1 drain to this wetland.

Subcatchment ES-2 is approximately 38.94 acres and also largely comprised of wooded areas in its east, south and western sections, with its northern portion consisting of industrial buildings associated with the Project Development Area. All areas within ES-2 drain to Design Point #2, a 36-inch reinforced concrete pipe (RCP) culvert located in the western edge of the subcatchment, under the Metro-North rail line.

A pre-development watershed delineation map has been provided in Figure 4 of Appendix 5-A. The analysis of pre-development conditions considered existing drainage patterns, soil types, ground cover, and topography. The results of the computer modeling used to analyze the overall watershed under predevelopment conditions are presented in Appendix 5-A. A summary of the pre-development watershed runoff rates at each Design Point is presented in Table 5-6.

Table 5-6: Summary of Pre- and Post-Development Peak Discharge Rates

Pre- vs. Post-Development Discharge Rate (cfs)				
Design Point	10-year 24-hour storm event		100-year 24-hour storm event	
	Pre-	Post-	Pre-	Post-
1	38.81	26.64	195.42	159.10
2	67.13	51.88	136.44	111.11

5.6.2 Post Development Runoff

The post-development Project Development Area will be covered predominantly by pavement, gravel, buildings, woods, and wetlands. The facility will design and implement stormwater management BMPs to prevent contamination of surface runoff from industrial activities. These BMPs will consist of containment and reuse or sheltering practices as described in Section 5.6.4.2.

Based on the above, the proposed facility will not be subject to an Individual SPDES Permit or SPDES Multi-Sector General Permit since the project will not discharge stormwater to the waters of the United States from a point source that conducts industrial activities identified within 49 CFR Part 122.26(b)(14)(i) through (ix) and (x).

The analysis of post-development conditions considered existing drainage patterns, soil types, ground cover to remain, planned site development, site grading and, stormwater management facilities proposed as part of site improvements.

The post-development stormwater runoff would consist of runoff from graveled areas, the access drive, on-site roadways, miscellaneous structures, and parking lots. Non-stormwater discharge will consist of potential negligible discharge from annual testing and maintenance of fire-fighting systems, and potable water sources (i.e., periodic testing of the emergency eyewash/shower stations or minimal landscaping irrigation).

As depicted in Figures 5A and 5B of Appendix 5-A, the stormwater discharge from the Project Development Area will be controlled by three proposed bioretention facilities and one proposed stormwater management basin. The four proposed facilities are labeled:

- Bioretention area F-1: PS-1.3
- Bioretention area F-2: PS-1.4
- Bioretention area F-3: PS-2.3
- Stormwater Management Pond P-1: PS-2.2 and PS-2.4

It should be noted that not all areas in subcatchments PS-1.4 and PS-2.2 are tributary to a proposed stormwater management facility or design point. This is because runoff produced on the roofs and other containment areas found in these subcatchments is proposed to be captured, stored and ultimately utilized as process water in the operation of the facility. This "reuse" of stormwater is a benefit to the watershed, because it both decreases the peak rate of runoff as well as the total volume of runoff discharging from the site. Additionally, the reuse of this stormwater runoff will also reduce the amount of makeup water the facility would otherwise withdraw from the proposed wells on site. The roof and containment areas that are proposed to capture stormwater runoff are identified on the "Conceptual Subsurface Sewage Disposal System and Stormwater Management Plan" Sheet SP2, of Appendix 5-A.

In order to demonstrate that detention storage requirements are being met, the draft NYS Stormwater Management Design Manual requires that a hydrologic and hydraulic analysis of the pre- and post-development conditions be performed using the Natural Resources Conservation Service Technical Release 20 (TR-20) and Technical Release 55 (TR-55) methodologies. HydroCAD is a Computer-Aided-Design (CAD) program for analyzing the hydrologic and hydraulic characteristics of a given watershed and associated stormwater management facilities. The results of the HydroCAD modeling used to analyze the overall watershed under post-development conditions are presented in Appendix 5-A.

A comparison of the pre- and post-development watershed conditions was performed for all design points (Design Point #1 and #2) and storm events. A summary of the post-development watershed runoff rates at each design point is presented in Table 5-6. This comparison demonstrates that the peak rate of runoff for both design points will decrease with the implementation of the project's recommended post-development SWPPP. Therefore, the project will not have a significant adverse impact on the adjacent or downstream properties or receiving water courses.

Stormwater runoff from impervious surfaces is recognized as a significant contributor of pollution that can adversely affect the quality of receiving water bodies. Therefore, treatment of stormwater runoff is important since most runoff related water quality contaminants are transported from land, particularly impervious surfaces, during the initial stages of storm events. The NYS Stormwater Management Design Manual requires that water quality treatment be provided for the initial flush of runoff from every storm. The NYSDEC refers to the amount of runoff to be treated as the "Water Quality Volume" (WQv). The WQv equation has been applied to the drainage area tributary to each of the stormwater quality practices proposed for this project. The practices have been sized to accommodate the WQv, as per the performance criteria presented in Chapter 6 of the Draft NYS Stormwater Management Design Manual. Design computations for the proposed stormwater quality practices are presented in Appendix 5-A.

For the proposed water quality control practices, the design computations indicate that the NYS water quality requirements have been met. Therefore, the project should not have a significant adverse impact on the quality of the receiving waters.

Inspection and maintenance of post-construction stormwater management practices shall be performed in accordance with the procedures set forth in Appendix 5-A. These inspection and maintenance practices will commence when all disturbed areas are stabilized and all stormwater management systems are in place and operable.

5.6.3 Best Management Practices

The April 2008 NYS Stormwater Management Design Manual describes provisions to manage both water quality and quantity. In November 2009, the NYSDEC issued a draft addendum to its Stormwater Design Manual, which describes methods to reduce the total water quality volume to the maximum extent practicable through the incorporation of green infrastructure techniques. This addendum was finalized and published in August 2010 as part of the 2010 NYS Stormwater Management Design Manual. CVE will meet these objectives by applying BMPs which will limit peak runoff rates and improve the quality of runoff leaving the developed site as described below.

5.6.3.1 Wet Extended Detention Pond (Design Variant P-3)

Wet extended detention ponds are very similar to wet ponds with the exception that their design is more focused on attenuating peak runoff flows. As a result, more storage volume is committed to managing peak flows as opposed to maximizing the wet pool depth. CVE's Wet Extended Detention Pond was designed according to the criteria set forth in Section 6.1 "Stormwater Ponds" of the Draft NYS Stormwater Management Design Manual.

Wet extended detention ponds can be used to attenuate the peak flow and provide quality treatment by sedimentation, flocculation, and biological removal. Wet extended detention ponds are designed for a contributing drainage area of 25 acres or more. Sediment forebays will capture sediment and floatable debris prior to entering the pond. The pond is landscaped with a variety of plantings including emergents and woody shrubs, with each type of planting corresponding to the water depth. An extended aquatic bench will maximize the biological uptake of pollutants. For more information see Appendix 5-A.

5.6.3.2 Bioretention Areas

Bioretention systems are shallow landscaped depressions adapted to treat stormwater runoff. These depressions are design to incorporate many of the pollutant removal mechanisms that operate in forested ecosystems. Stormwater flows into the bioretention area, ponds above the mulch and soil, and gradually infiltrates into the soil bed. Pollutants are removed by a number of processes, such as adsorption, filtration, volatilization, ion exchange, and decomposition. Filtered runoff will infiltrate into the surrounding soil, functioning as an infiltration basin or rainwater garden.

CVE's bioretention areas were preliminary designed according to the criteria set forth in Section 6.4 "Stormwater Filtering Systems" of the November 2009 Draft NYS Stormwater Management Design Manual. For more information see Appendix 5-A.

5.6.3.3 Pre-Treatment Areas

The NYS Design Manual requires that stormwater enter a pre-treatment device/area to provide filtering/sedimentation of coarse materials before entering the Stormwater Management Practices (SMP). Plunge pools have been provided to assist in the trapping of incoming sediment and taking up of nutrients prior to reaching the bioretention areas. The plunge pools have been preliminary sized to capture 40 percent of the water quality volume[4]. Each plunge pool will consist of a separate cell of a minimum of four feet in depth, formed by an earth barrier, and will be equipped with a trapezoidal weir to convey stormwater to the stormwater basin. The trapezoidal weirs will be stabilized with rip rap to prevent erosion to the earthen berm.

Similarly to the plunge pool, forebays are provided at inlets of stormwater ponds to pre-treat stormwater. Forebays are hydraulically connected to stormwater basins, but utilize earthen berms to trap sediment to facilitate maintenance and cleaning activities. Forebays have been preliminary sized to capture 10 percent of the water quality volume, and also may be used for quantity calculations.

5.6.3.4 Soil Restoration

The structure of healthy soil is permeable, with spaces between solid particles where water, air, and soil organisms can move. Soil compaction occurs when weight on the soil surface collapses these spaces, creating a hard solid mass. Water, air, and roots may be completely unable to penetrate compacted soil, reducing or destroying its capacity to sustain life. Soil restoration promotes greater stormwater infiltration in areas with pervious cover, and therefore helps to reduce runoff volume.

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[4] WQv is defined as the storage needed to capture and treat 90 percent of the average annual stormwater runoff volume.

Soil restoration is achieved by aeration through mechanical loosening, and addition of organic matter and soil amendments. In areas where soil disturbance has occurred outside of buildings and pavement areas, the disturbed sub-soils shall be returned to rough grade and the following soils restoration steps applied:

- Apply 3 inches of compost over soil. Compost shall be aged, from plant derived materials, free of viable weed seeds, have no visible free water or dust produced when handling, pass through a 0.5-inch screen and have a pH suitable to grow desired plants.
- Till compost into the subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, mixing and circulating air and compost into sub-soils.
- Rock-pick until uplifted stone/rock materials of 4 inches and larger size are cleaned off the site.
- Apply topsoil to a depth of 6 inches.

5.6.4 Anticipated Stormwater Impacts

Land use change and development in a watershed increases the volume of runoff. Reduction in the amount of runoff from new development, accomplished through the implementation of a stormwater management plan, plays an important role in the success or failure of watershed-wide stormwater management. CVE will implement measures to prevent contamination of surface runoff, and where prevention is not possible, will adequately collect, treat, and convey the stormwater as described in this section.

5.6.4.1 Construction Impacts

Project construction activities will consist primarily of site demolition, site grading, paving, and the installation of storm drainage, water supply and sewage collection infrastructure to support the power plant facilities. Construction phase pollutant sources anticipated at the site are disturbed (exposed) soil, vehicle fuels and lubricants, chemicals associated with building construction, and building materials. Without adequate control there is the potential for each type of pollutant to be transported by stormwater.

The project's construction phase will be approximately 36 months in duration. The construction phases will include overlapping activities for initial site clearing/preparation, major foundations, steel and building erection, equipment delivery and sitting, piping and electrical installation, and commissioning and startup. In order for construction to progress in a practical and efficient manner, soil disturbance in excess of 5 acres at any given time will be required. The General Permit allows for soil disturbance of greater than 5 acres upon written authorization from the NYSDEC. As the development plan is refined during the site plan review and permitting process, permission to disturb greater than 5 acres of soil will be requested from the NYSDEC. This request will include a phasing plan that defines the maximum disturbed area per phase and shows the required cuts and fills.

The temporary erosion and sediment control measures recommended and described below are to be installed and/or implemented prior to the initiation of construction and during construction:

- *Stabilized Construction Entrance* - Prior to construction, stabilized construction entrances will be installed at points of entry and egress from the site to reduce the tracking of sediment onto public roadways. This will trap dust and mud that would otherwise be carried off-site by construction traffic.
- *Dust Control* - Water trucks will be used as needed during construction to reduce dust generated on the site. Dust control must be provided by the general contractor in compliance with applicable requirements.
- *Temporary Soil Stockpile* - Materials, such as topsoil, will be temporarily stockpiled (if necessary) on the site during the construction process. Stockpiles will be properly protected from erosion by a surrounding silt fence barrier and located in an area away from storm drainage, water bodies and/or water courses.
- *Silt Fencing* – Prior to the initiation of and during construction activities, a geotextile filter fabric (or silt fence) will be established along the down slope perimeter of areas to be disturbed as a result of the construction which lie up-gradient of watercourses or adjacent properties.
- *Temporary Seeding* – Areas undergoing clearing or grading and any areas disturbed by construction activities where work has temporarily or permanently ceased will be stabilized with temporary vegetative cover within seven days from the date the soil disturbance activity ceased.
- *Stone Inlet Protection Barrier* – Concrete blocks surrounded by wire mesh and crushed stone will be placed around both existing catch basins.
- *Stone Check Dams* – Stone check dams will be installed within temporary diversion swales to reduce the velocity of stormwater runoff, to promote settling of sediment, and to reduce sediment transport offsite.
- *Temporary Sediment Traps* - Rip-rap outlet traps are included as part of the conceptual erosion and sediment control plan to intercept sediment-laden runoff and allow it to settle out of the surface runoff prior to being discharged from the site.

- *Temporary Diversion Swales* – Temporary diversion swales will be used to divert off-site runoff around the construction site, divert runoff from stabilized areas around disturbed areas, and direct runoff from disturbed areas into sediment traps.

5.6.4.2 Operational Impacts

Since the project's combustion turbines and majority of other ancillary equipment will consume only natural gas, only small quantities of fuel and lubricating oil will be stored and used on-site. Permanent diesel fuel storage on-site will be limited to: the fire pump's integrated 650-gallon diesel fuel tank and the four emergency black-start generators with integrated 1,000-gallon diesel fuel storage containers. Other lubricating and cooling oils will be associated with the combustion turbine generator and steam turbine generator equipment lubricating system and the transformers. All tanks, equipment, and vessels containing fuel (diesel) and lubricating oils will be inside an environmental concrete containment, sump or curb dike area as required for spill control and management.

CVE will implement measures to prevent contamination of surface runoff through containment and reuse or sheltering practices from the following industrial activities:

- The black-start diesel electrical generators will have integrated fuel tanks with steel bases located within a building. A concrete containment curb will be placed around the outer foundation of the generator and fuel tank to hold the maximum amount of fuel and any oil/contaminant leaks.
- The diesel fire pump engine and associated fuel tank will be located within a building. A concrete containment curb will be placed around the outer foundation of the fire pump and fuel tank to hold the maximum amount of fuel and any oil/contaminant leaks.
- Natural gas will be filtered prior to being directed to combined turbine generators, duct burners, and auxiliary burners. Filtered hydrocarbons will be directed to a sump tank that will be enclosed by a concrete containment curb.
- The air cooled condensers will be a sealed/closed loop steam and water system and no exterior chemicals will be used during operations. The exterior radiator fins will be cleaned once a year with raw well water to remove dust collected from the air movement. The water used to clean the radiator fins will be contained and tested prior to release to the stormwater system, or removed by a licensed company.
- The switchyard consists of a gravel surface, but the equipment will be located within a building placed in the center of the gravel area. The building will be

equipped with floor drain that will be piped to an oil/water separator. The oil/water separator will be housed and curbed. The process water from the separator will be recycled to the plants raw water system and will not be sent to the stormwater system. Captured oil from the separator will be removed from the site by a licensed company and hauled to a suitable disposal facility.

- The step-up transformers, located within the power blocks, will be contained in concrete curbs to hold the maximum volume of oil leak and rainfall. Collected liquid will be piped to an oil/water separator. The oil/water separator will be housed and curbed. The process water from the separator will be recycled to the plant's raw water system and will not be sent to the stormwater system. Captured oil from the separator will be removed from the site by a licensed company and hauled to a suitable disposal facility.
- The 19 percent aqueous ammonia storage tanks, forwarding pumps, and associated loading area will be contained in concrete curbs. Collected liquid from the loading area will be piped to the oil water separator. The process water will be recycled to the plant's raw water system and will not be sent to the stormwater system. If an ammonia leak occurs, this liquid would be pumped to a specialized environmental tanker for off-site remediation and disposal by a licensed company.

The proposed stormwater collection system, consisting of pipes, open drainage ways and on-site stormwater management facilities, will adequately collect, treat, and convey the stormwater. A wet extended detention basin and bio-retention areas will be used to treat the stormwater quality volume produced from the proposed development. Runoff from containment areas; and from the roofs of the administration/control room building, maintenance shop/warehouse building, gas insulated substation switchyard building, water treatment building, and Units 1 – 3 (i.e., step up transformer) for all storms will be captured, routed to the on-site storage tank via a pump, for reuse within the plant.

The post-construction stormwater management practices will be implemented by CVE. Policies and procedures will be put in place to ensure operation and maintenance of the practices in accordance with the operation and maintenance plan.

5.6.4.3 Laydown Site

The Laydown Site is largely composed of agricultural fields with scattered woods and grass areas to the south, east, and western sections. The west and east sides of the site are bordered by Route 22 and Old Route 22 respectively. The watershed associated with the site flows overland via sheet and shallow concentrated flow to an unnamed tributary that traverses the southern portion of the parcel, which eventually drains to the Ten Mile River.

Prior to construction, portions of the agricultural field will be temporarily replaced with gravel for construction parking and laydown areas. Topsoil removed from the field will be stockpiled during construction and the site will be restored to agricultural use upon project completion. As this temporary change will result in an increase in impervious surfaces, a stormwater management plan, designed using the latest NYS Stormwater Management Design Manual, will be implemented to regulate and control the quantity and quality of stormwater runoff. For detailed information on this stormwater plan, see Appendix 5-B.

In order to mitigate the potential discharge rate and qualitative treatment impacts associated with the proposed development, a number of BMPs will be included to achieve compliance with the Town of Dover and NYSDEC standards. The following practices, as detailed in Appendix 5-B, will be considered in the proposed SWPPP: micropool extended detention pond; pocket pond; infiltration basin; biorention areas; dry swales; and pre-treatment areas.

5.7 Conclusions

The project has incorporated proven water conservation measures to minimize water demand and associated resource impacts during operations and construction and to make it one of the most water-efficient electrical generating facilities in the region. These measures include a highly efficient combined cycle technology, air cooled condensers, ZLD system; rain capture system and storm water management systems.

The project proposes to use on-site, bedrock water wells to meet water needs. A pumping test program was developed to demonstrate that the extraction of up to 120 gpm from the bedrock aquifer would not have an adverse impact on: private well water supplies in the areas surrounding the site; wetlands within and adjacent to the Property; and the Swamp River. The testing program was intended to demonstrate that the primary and backup wells have sufficient production to supply a continuous 60 gpm, the anticipated summer water demand, and a short-term supply of 120 gpm, the maximum amount required during operational transients and unanticipated upset. The pumping test confirmed there would be no significant impacts on offsite wells, on-site and off-site wetland areas, or the Swamp River due to the project's water withdrawal from the primary well.

Water budget calculations on the aquifer indicate that the site is fully capable of supporting its proposed average water consumption under both average and drought conditions, and that the site's overall water budget needs are therefore self-sufficient and would generate no permanent off-site drawdown impacts of any type.

All construction and operation activities at the site will be conducted in accordance with the SWPPP using BMPs, and with the Erosion and Sedimentation Control requirements of the Dover Town Code. This will ensure minimal impact to surface waters, on-site wetlands and subsurface conditions at the site and the surrounding areas.

Stormwater discharge from the Project Development Area will be controlled by three bioretention facilities and one stormwater management basin. They have been designed to provide quantity controls by attenuating stormwater runoff and releasing runoff to off-site locations at a rate equal to or less than that which existed prior to development of the site. For all design points and design storms the peak rate of runoff will not be increased. Therefore, the project will not have a significant impact on the adjacent or downstream properties or receiving water courses.

5.8 References

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