



Lessons Learned From Tropical Storms Irene and Lee

Blenheim-Gilboa
Pumped Storage
Power Project and
Vischer Ferry Plant



**New York Power
Authority**

Generating more than electricity

Collaborative Review and Comment Provided by:
New York State Canal Corporation
New York State Office of Emergency Management
Schoharie County Emergency Management Office

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Tropical Storm Irene struck Central New York on Sunday, August 28, 2011.

Forecasts of limited effects in the region proved extremely inaccurate as the state experienced a historic storm that caused epic flooding and devastating damage. Some of the most dramatic impacts occurred along the Schoharie Creek in Schoharie County, where towns from Gilboa through Middleburgh, Schoharie and Esperance were inundated by water levels exceeding the previous flood of record.

The New York Power Authority's Blenheim-Gilboa Pumped Storage Power Project, located on Schoharie Creek, and its Vischer Ferry small hydroelectric plant, about 80 miles downstream on the Mohawk River, were both affected by the storm, described by the United States Geological Service as a 500-year event. However, thanks to proactive emergency actions by NYPA's Blenheim-Gilboa staff, both facilities continued to function as designed, and sustained minimal damage. Following recovery from the storm, NYPA developed and is implementing recommendations from its "lessons learned" to improve operations and response during future storm events.

When the storm hit, the Blenheim-Gilboa lower reservoir was close to its lowest level, which is typical of weekend operation. Within hours, as the storm progressed, the reservoir almost reached capacity and its earthen dam was at risk of being overtopped. The Blenheim-Gilboa staff's emergency actions not only prevented damage to the dam, but also limited peak outflows from the reservoir into Schoharie Creek. Once the situation at Blenheim-Gilboa had concluded, the storm threatened the stability of the Vischer Ferry Plant. Again, the NYPA staff's response mitigated the potential effects.

Never before had the Power Authority declared a Type B emergency — notification that a potentially hazardous situation is developing — under its Emergency Action Plans (EAPs). As a result of Tropical Storm Irene, it declared two such emergencies within 24 hours.

The exemplary response to this unprecedented challenge occurred despite the fact that communications systems, at Blenheim-Gilboa and in the region, experienced difficulties. Verizon land-line telephone service to the project failed early during the storm and cellular phone service was virtually non-existent.

The Authority has since upgraded the communications system at Blenheim-Gilboa and engaged area governmental entities to



Blenheim-Gilboa spillway with all three Tainter gates in the open position.

develop opportunities to improve communications infrastructure in the vicinity of the power project.

Based on lessons learned during Tropical Storm Irene and the subsequent Tropical Storm Lee, the Authority has developed 26 specific recommendations for strengthening emergency communications outlined in this report. These primarily include physical upgrades, enhancement of the EAPs and expanded contacts with various public agencies. Many measures have already been implemented, including upgrading Blenheim-Gilboa's cellular phone service through a signal repeater at NYPA's facility, and activating 10 phone lines into the power project. The full list of recommendations and the current status of implementation is listed on page 16 of this report.

For improvements that could extend benefits beyond the power project, to both NYPA and the community, the Authority plans to issue a competitive solicitation for the construction of a new cellular antenna tower on its property that would be beneficial to local area residents as well as NYPA staff.

The completed and pending communications improvements, to be carried out by NYPA and others, will prevent a recurrence of the problems encountered during the previous storms.

Background and Overview of Affected Projects

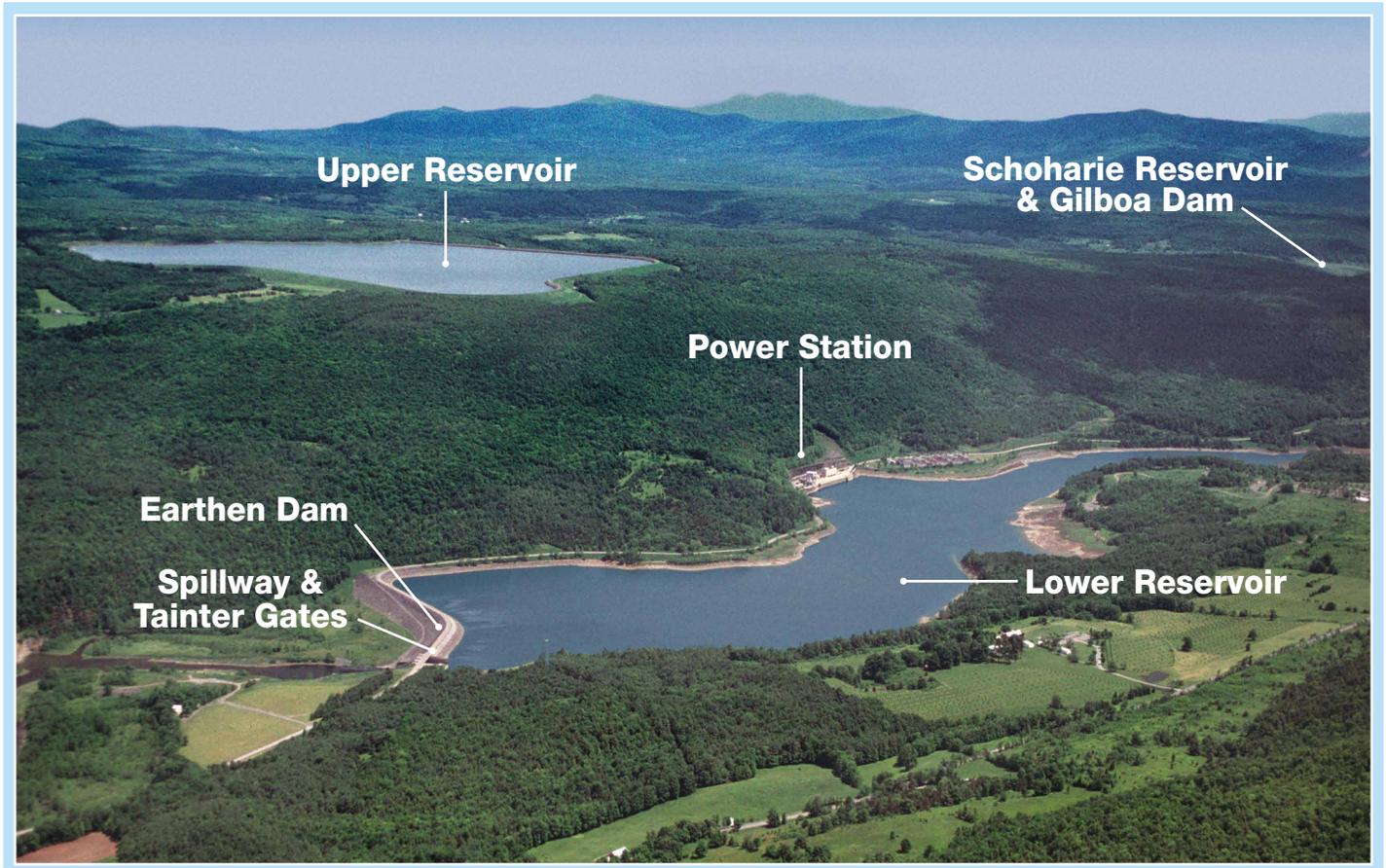


Figure 1. Blenheim-Gilboa Project

Blenheim-Gilboa Pumped Storage Power Project

The origin of the Blenheim-Gilboa project can be traced to legislation signed into law on May 21, 1968, by then-Governor Nelson A. Rockefeller authorizing the Authority to construct such a facility. Within three months of the enactment of this law, the Authority filed an application with the Federal Power Commission—predecessor of the Federal Energy Regulatory Commission (FERC)—for a license to construct Blenheim-Gilboa. The project first produced its original full-rated capacity of 1,000 megawatts (MW) on December 17, 1973. An illustration of the project with the major components identified is shown in Figure 1.

Blenheim-Gilboa has the capability to reduce energy prices through the re-timing of energy by using its four reversible hydraulic pump-turbines to pump water to an upper reservoir during off-peak periods, when energy prices are lower, and releasing water from the upper reservoir to produce electrical energy during peak periods, when prices are generally higher. In addition, Blenheim-Gilboa (along with the Authority's Niagara and St. Lawrence-Franklin D. Roosevelt hydroelec-

tric projects) is a primary component of the New York Independent System Operator's (NYISO) System Restoration Plan (SRP). These black start resources are extremely valuable from a statewide perspective in that they have the capability to provide a prompt restoration of service following a complete or partial outage of the New York State power system.

The unique values attributable to Blenheim-Gilboa, in addition to its SRP participation, are its capability to re-time energy to periods of the day when it is most needed and most valuable, and its capability to instantaneously respond to statewide generation requirements, particularly when the NYISO is experiencing emergency conditions. A diagram showing the pumping and generation functions is set forth in Figure 2.

Upon commercial operation, Blenheim-Gilboa's full capacity was sold to upstate investor-owned utilities (then, Niagara Mohawk Power Corporation, New York State Electric & Gas Corporation,

Rochester Gas and Electric Corporation and Central Hudson Gas & Electric Corporation) under long-term contracts, with Niagara Mohawk receiving the largest share (550 MW). In 1989, certain upstate utilities voluntarily relinquished portions of their Blenheim-Gilboa capacity allocations, which were subsequently re-allocated by the Authority to the three downstate investor-owned utilities (then, Consolidated Edison Company of New York, Long Island Lighting Company and Orange and Rockland Utilities). While the contracts with the utilities required them to provide the pumping energy associated with their allocations, the Authority would often provide the pumping energy from excess low-cost hydro energy that was available, essentially re-timing that low-cost energy to be available during peak periods, which resulted in savings to ratepayers on a statewide basis.

During the period 2002 through 2004, contracts with all utilities, except the Long Island Power Authority¹ (50 MW), expired or were terminated. Following the relinquishment of most of the Blenheim-Gilboa capacity by the utilities, the Authority allocated 250 MW of such capacity to support the requirements of its New York City governmental customers. The remaining available Blenheim-Gilboa capacity, i.e., the capacity not sold under contracts to LIPA and the New York City governmental customers, is bid by the Authority into the markets administered by the NYISO.

The total capacity of the Blenheim-Gilboa project was recently increased to 1,160 MW through the replacement or overhaul of major components. While the majority of the project's capacity is no longer sold pursuant to long-term contracts, Blenheim-Gilboa continues to provide major value to the NYISO from the perspective of supporting statewide system reliability. In addition to the crucial SRP role previously discussed, Blenheim-Gilboa provides operating reserves that

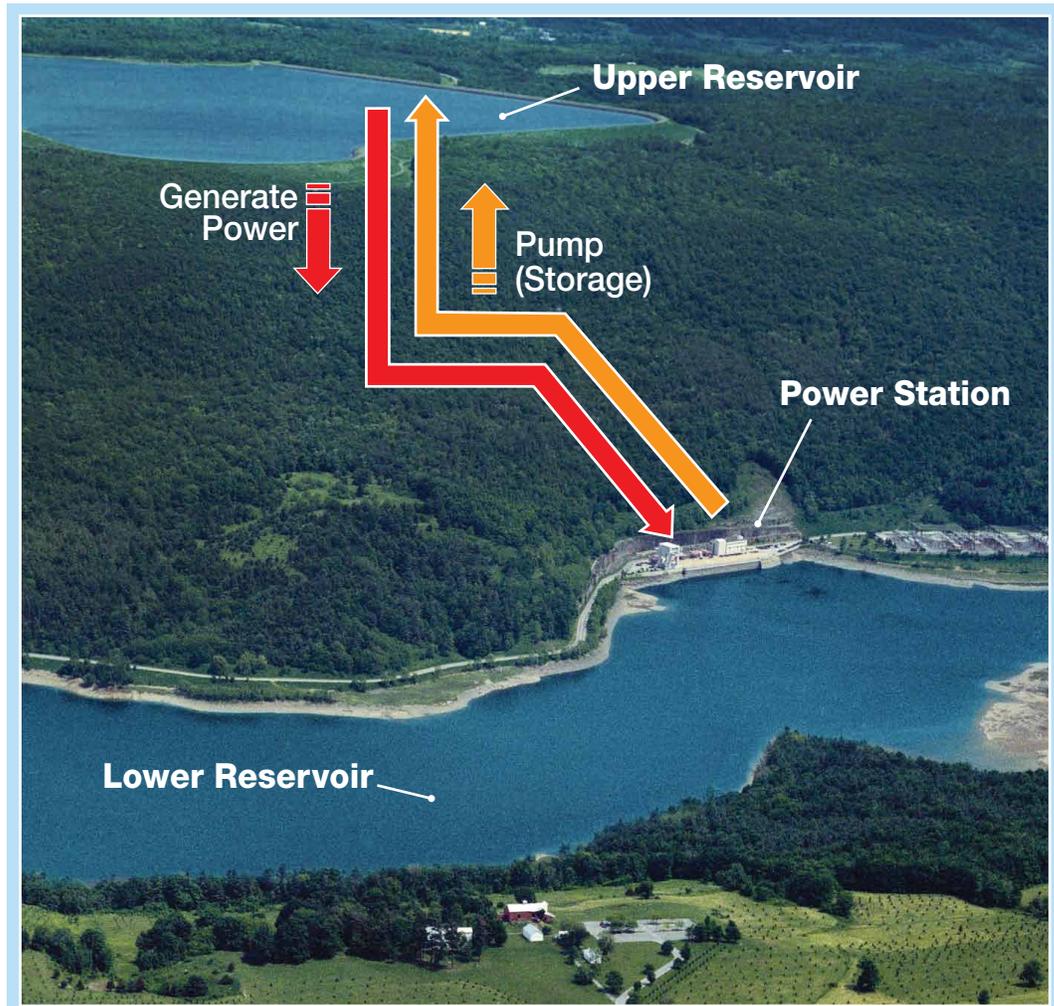


Figure 2. Project Diagram

can be called upon by the NYISO in the event of a forced outage of a major generating unit, and also provides load-following capability that supports the NYISO in matching generation and load requirements on an instantaneous basis.

It must be emphasized that Blenheim-Gilboa is a power generating project and **NOT** a flood control facility, and as such, does not have the capability to materially mitigate flows. Pursuant to its FERC license, any water that flows into the Blenheim-Gilboa project must ultimately be released downstream.

¹The Long Island Power Authority (LIPA) replaced the Long Island Lighting Company in 1998.

Vischer Ferry Plant

The Vischer Ferry hydroelectric plant is located on the Mohawk River (State Barge Canal) and is one of the Authority's five small hydropower facilities. The original project was installed in 1913. The Authority subsequently acquired and upgraded the project and expanded its capacity from 4,000 kilowatts (kW) to 9,948 kW, with first commercial power from the expanded facility beginning in July 1991. The plant is operated remotely from the Blenheim-Gilboa Control Room. Its generation supports the Authority's Southeast New York (SENY) governmental customers. Figure 3 shows an overhead view of the Vischer Ferry Plant and Figure 4 shows the adjacent Lock No. 7 of the Barge Canal System.



Figure 3. Vischer Ferry Plant



Figure 4. Lock No. 7

Emergency Action Plans – Blenheim-Gilboa and Crescent/Vischer Ferry

Purpose and Authority Responsibilities

As both the Blenheim-Gilboa project and the Vischer Ferry plant are hydroelectric facilities licensed by FERC, the Authority is required to file and maintain Emergency Action Plans (EAP) in the Event of a Dam Failure for each project.² The purpose of the EAPs is to provide an early warning system to downstream inhabitants, property owners, operators of water-related facilities, recreational users and others who might be directly affected in the event of an impending or actual sudden release of water caused by failure of the dike or dam structures or a non-failure emergency. The foregoing reflects the definition of an “emergency” as set forth in the EAPs. Among other things, EAPs include notification procedures and pre-planned actions to provide for a timely response to a dike or dam failure for the purpose of minimizing impacts on life and property.

While the Blenheim-Gilboa and Vischer Ferry EAPs primarily address the responsibilities and activities of the Authority with respect to a potential emergency situation, they also establish the Authority’s required interactions (directly or indirectly) with county and other agencies in connection with timely notifications of emergency conditions. EAPs also include (i) physical characteristics of the project facilities and watershed, (ii) a summary of the dam failure analysis, (iii) inundation maps for evacuation planning, (iv) plans for training, testing and annual reviews and (v) documentation of consultation with federal, state and local agencies.

Alert Levels

The EAPs list two³ categories or types of emergencies, specifically:

- A – Failure is imminent or has occurred
- B – A potentially hazardous situation is developing

A “Type B” emergency entails a situation in which a failure may develop, but pre-planned actions taken during specific events (e.g., floods, earthquakes) may prevent or mitigate the failure. Notwithstanding that failure may ultimately be inevitable; more time to issue warnings and take preventive actions is typically available under a Type B emergency than under a Type A. The level of notification during a non-failure emergency condition is determined by site-specific conditions. Examples of Type A and Type B emergencies are set forth in Appendix A.

Notification Flow Charts

The EAPs include Notification Flow Charts that would be employed in the event of an emergency. The flow chart, which is essentially a phone tree, lists the parties (i.e., the agency or office) to be contacted. The listing sets forth the designated order in which the identified parties are responsible for notifying the specific corporate representatives and public officials having jurisdiction for public safety. The Authority

is required to directly notify specific entities and certain of those entities are charged with notifying other identified entities. Listings of the entities that the Authority is required to contact directly for Blenheim-Gilboa and Vischer Ferry are set forth in Appendix B. The flow charts for these EAPs include at least two phone numbers for each party listed; contact numbers are expected to be manned 24 hours a day, seven days a week. Appendices C-1 and C-2 show abbreviated versions of the Blenheim-Gilboa and Vischer Ferry Notification Flow Charts (with the phone numbers deleted).

Training, Testing and Annual Review

The EAPs require that operating and supervisory personnel receive annual training to assure adequate and timely assessments of developing emergency situations and performance of duties during such events. The training concentrates on identifying different types of failures and determining the appropriate alert levels that would apply.

The EAPs require the designation of an EAP Coordinator who will be charged with, among other things, conducting a comprehensive review of the adequacy of the EAP at least annually. In the course of the review, a determination of any new developments or other changes downstream or elsewhere will be made to ascertain if any revisions to the existing EAP are necessary.

The EAP Coordinator is responsible for ensuring the state of readiness for their particular project. This entails a mandatory annual test of the state of training and readiness of key Authority personnel responsible for actions during an emergency to assure a knowledge and understanding of the procedures to be followed and the actions required in the event of an emergency. The annual test is predicated on the hypothetical failure of one of the project works. Operators and other key personnel are consulted on the procedures that should be followed. The EAP Coordinator determines if the test was successful, and the FERC Regional Engineer is subsequently notified that the project has been tested. Such notification includes a critique of the test, including concerns regarding telephone contacts, and will address the testing of emergency power sources and remote surveillance systems. In addition, the critique evaluates the time to complete the test and identifies areas of improvement to reduce the time required to implement the EAP. The Authority has completed all required testing in accordance with FERC rules.

²The EAP for Vischer Ferry also applies to the Authority’s Crescent hydroelectric plant, which is downstream of Vischer Ferry.

³As discussed later in this report, the Authority is in the process of adding a third emergency notification category for major flood stages.

Tropical Storms Irene and Lee

The Weather Forecasts

Tropical Storm Irene

Precipitation and flow forecasting is performed under the lead of the National Weather Service (NWS), using river-specific models. Such models take into account: (i) the precipitation forecast, (ii) actual precipitation amounts from radar, observers and collection equipment and (iii) actual flows from U.S. Geological Service (USGS) stream-gaging stations. With respect to Tropical Storm Irene (originally Hurricane Irene), the NWS forecast on August 26 (i.e., two days before the storm was expected to hit New York) projected a track that would bring the bulk of the rain east of the B-G area by August 28 and a flow rate of 17,000 cubic feet per second (cfs) for the Gilboa Dam,⁴ which is immediately upstream of the Blenheim-Gilboa lower reservoir. While the forecast issued the following day increased the flow rate at the Gilboa Dam to 20,000 cfs, with the potential for minor flooding, there were no projections by the NWS for heavy rain or major flooding conditions in Central New York. Appendix D shows the projected storm trajectory as of August 24.

Tropical Storm Lee

The remnants of this storm, which began in the Gulf of Mexico off Louisiana on September 3, were projected by the NWS to produce very high levels in the Mohawk River and to bring heavy rain and moderate flooding to Central New York by September 8.

The Actual Storm Results (by Project)

Blenheim – Gilboa

Notwithstanding that it was originally projected to skirt Central New York, Tropical Storm Irene was a direct hit on the region and produced record rainfall for Schoharie County. The bulk of the rainfall first affected Greene County, which is upstream of the Schoharie watershed. The NWS predictions concerning this storm and its impacts on Central New York were extremely inaccurate. The torrential rainfall caused epic flooding, resulting in devastation, road closures and evacuations throughout the region. After an unusually wet August, the saturated ground was unable to absorb the record rainfall. Preliminary personnel communications with USGS indicates that the Blenheim-Gilboa drainage basin (see Figure 5) experienced a 500-year storm, but the analysis is not complete at this time. The heavy rain continued all day on August 28, with NWS flash flood warnings continuing several days thereafter. Many streams and creeks continued to overflow their

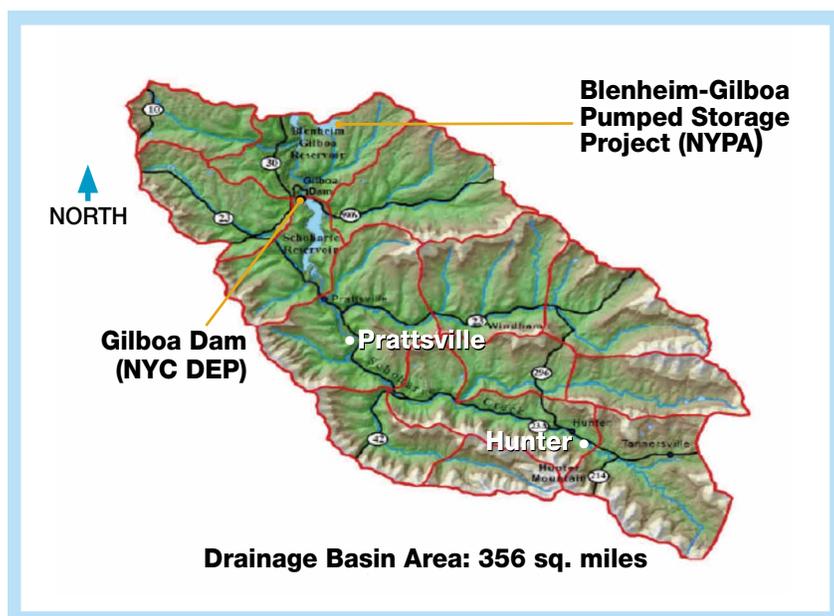


Figure 5. Blenheim-Gilboa Drainage Basin

banks in Schoharie County. During a 12-hour period, Tropical Storm Irene dropped 12- to 18 inches of rain on the region. Appendix E shows rainfall totals for the region.

Vischer Ferry - Tropical Storm Irene

As the Vischer Ferry facility is about 80 miles downstream of the Blenheim-Gilboa project, it also was impacted by the flooding since the Schoharie Creek flows into the Mohawk River. The effects of Tropical Storm Irene, along with the torrential rains associated with Tropical Storm Lee, caused severe flooding in the vicinity of the Vischer Ferry plant. As described later in this report, these conditions and the resultant high flows caused substantial seepage at the downstream side of the Vischer Ferry embankment, owned by the New York State Canal Corporation (NYSCC), and also came extremely close to overtopping the Town of Niskayuna-owned boat launch area at the west end of the embankment.

Vischer Ferry - Tropical Storm Lee

Tropical Storm Lee hit the Vischer Ferry area on September 8. In light of the back-to-back tropical storms, higher runoff was experienced at Vischer Ferry due to the saturated ground conditions. Recognizing the prospect for significant flooding in connection with the high flows attributable to Tropical Storm Lee, the Authority re-established the boat launch berm at Vischer Ferry⁵ and raised the level of the Lock No. 7 wall to that of the embankment to prevent spillage. While this was a serious condition, it was not as severe as the forecasts had indicated, i.e., the forecast was again inaccurate, but this time in the region's favor.

⁴The Gilboa Dam is owned and maintained by the New York City Department of Environmental Protection (NYCDEP).

⁵The berm at the boat launch that had been provided by the Town of Niskayuna in connection with Tropical Storm Irene had been subsequently removed by the Town.

Power Authority Storm Preparations

In preparation for what was originally Hurricane Irene, the Authority activated its White Plains Emergency Operations Center⁶ (EOC) on August 27. The EOC's initial focus was on Authority facilities in New York City and on Long Island as those areas were projected to be most severely impacted by the storm. At the time, the NWS forecast for the Schoharie basin was for minor- to -moderate flooding, and no issues were anticipated with respect to Blenheim-Gilboa or Vischer Ferry (or any of the Authority's other small hydro plants).

While the New York City/Long Island area was hit hard by Tropical Storm Irene (which had been downgraded from a hurricane), with substantial property damage and major power outages, none of the Authority's facilities located in the region were impacted. However, while initially not expected to be a serious issue, the weather situation at the Blenheim-Gilboa project deteriorated rapidly, causing the EOC to shift its focus to Central New York. Specifically, the EOC was advised that water levels at Blenheim-Gilboa were expected to reach points 3.5 times higher than had been originally predicted since the volume of precipitation being experienced was substantially higher than official predictions. During this period, the EOC maintained constant communications via a tie-line with Blenheim-Gilboa, notwithstanding that the project lost its land-line telephone service to the outside world and cell phone service was ineffective, as discussed later in this report. Among other things, the EOC and Blenheim-Gilboa representatives discussed adjusting the project's mode of operation at the Authority's sole cost to moderate flood conditions, to the limited extent that the project had that capability. This entailed turning on pumps to mitigate the flows through the Blenheim-Gilboa spillway.

In addition to managing the issues at Blenheim-Gilboa, which occurred primarily on August 28, the EOC expanded its focus on August 29 to oversee the seepage and potential boat launch area

overtopping issues at Vischer Ferry. These concerns and their ultimate resolution required postponing the deactivation of the EOC. Accordingly, the EOC continued to monitor the situations at both Blenheim-Gilboa and Vischer Ferry, and was finally deactivated at 2:00 p.m. on August 30, when it was determined that emergency conditions were no longer applicable.

Blenheim-Gilboa Operations and Actions During Tropical Storm Irene

As previously indicated, Tropical Storm Irene was originally not expected to be an extraordinary event in Central New York, based on the weather forecast. Key among the numerous metrics monitored by Blenheim-Gilboa staff, particularly during heavy rain storms, are the level of the lower reservoir and the rate of flow (in cfs) into that reservoir. At 866 feet (above mean sea level), the lower reservoir is at its lowest level. The reservoir is considered full at 900 feet (i.e., a differential of 40 feet), and is not designed for the water to overtop the dam level of 910 feet (see Figure 6 below). In addition, the B-G staff monitors flows at seven locations in the Schoharie Creek through the receipt of real-time data from USGS stream-gaging stations.

At 11:00 a.m., on August 28, the lower reservoir was at 866 feet and the inflow was about 16,000 cfs. By 11:20 a.m., the reservoir level was 868 feet and the inflow had doubled to about 32,000 cfs. At 12:02 p.m., the reservoir level was 879 feet. As a result of this very substantial flow increase, the Blenheim-Gilboa staff commenced raising the Tainter gates to the maximum discharge position at the B-G lower reservoir spillway, which releases water from the lower reservoir.⁷ Notwithstanding that the Tainter gates were opening, the lower reservoir

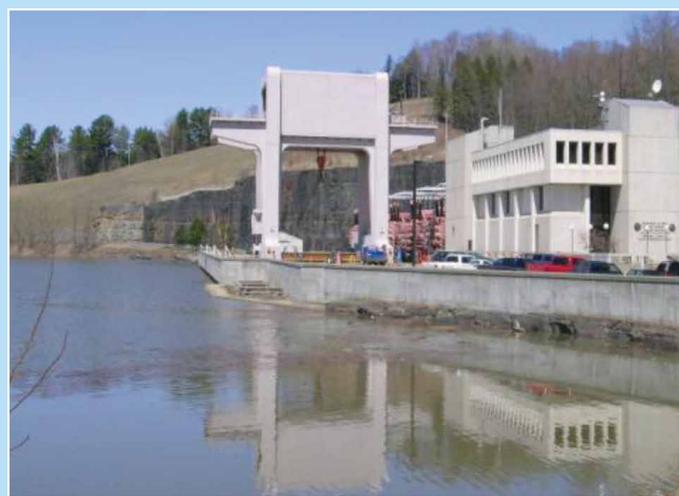


Figure 6. Lower Reservoir at High Level



Lower Reservoir at Low Level

⁶The EOC is located on the 15th floor of the Power Authority's White Plains Office and is activated by the Authority's President and Chief Executive Officer during heightened emergency situations.

⁷The gates had been partially opened earlier in the day to address expected moderate-to-high flow conditions. Typically, the Blenheim-Gilboa staff commences opening the Tainter gates when outflows reach about 500 cfs.

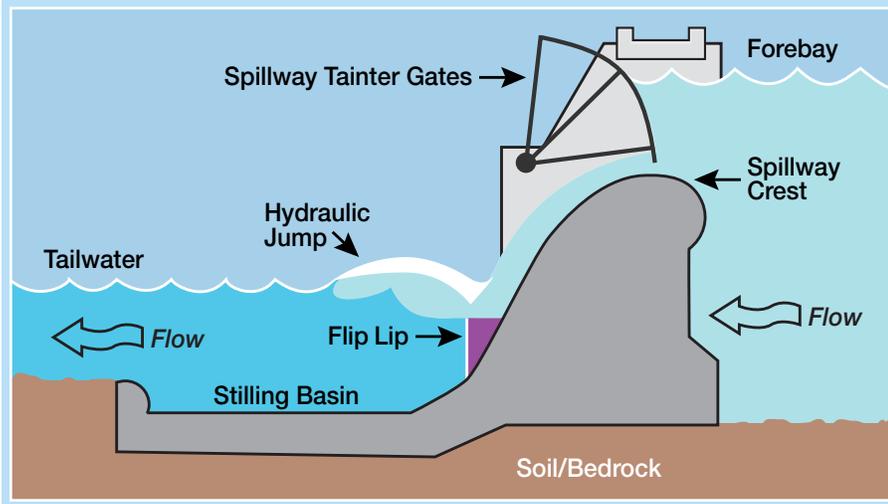


Figure 7. Tainter Gate Operations

level continued to rapidly increase, and by noon the inflow rate was approximately 73,000 cfs. (Figures 7 and 8 illustrate Tainter gate operations.)

To mitigate the impacts of downstream flooding by reducing outflows, at 12:30 p.m. the Blenheim-Gilboa staff started to operate project units in the pump mode to pump water from the lower reservoir to the upper reservoir, which had a very limited amount of room available (it was almost full, which is typical for most Sundays). To operate the pumps, the Authority needed to secure the approval of the NYISO and to purchase pumping energy at its sole cost. At 1:20 p.m., with three pumps online and all three Tainter gates wide open, the lower reservoir was at 894.44 feet (almost full) and the inflow rate was more than 129,000 cfs⁸ (see Appendix F). It was at this time that an EAP Type B emergency was declared from the Blenheim-Gilboa Control Room because of the exceptionally high flows and because the NYCDEP had declared a Type B event for its Gilboa Dam, which is located upstream from the Blenheim-Gilboa project.⁹

Ultimately, the actions employed by the Blenheim-Gilboa staff (opening the Tainter gates to maximum discharge levels and starting pumps) were effective. By 3:20 p.m., the lower reservoir reached 898.25 feet, its maximum level during this event and about 10 feet from being overtopped. Appendix G shows how the Blenheim-Gilboa staff's actions mitigated the peak outflows from the project

⁸This was the peak inflow.

⁹In follow-up discussions between the Authority and the NYCDEP, the following information was provided by the NYCDEP as clarification to the enactment of the Type B EAP at the DEP's Gilboa Dam: "At 12:04 p.m. the four extensometers at the Gilboa Dam went into alarm condition, however they were within a safe range based on engineering guidance incorporated into the control center standard operating procedure. At 12:08 p.m., all communication was lost to

Vischer Ferry Operations During Tropical Storm Irene

Recognizing the projected high levels for the Mohawk River and the loss of all telemetry as a result of Tropical Storm Irene, on August 28, the Authority dispatched an operator and mechanic to monitor and record water levels at the earth embankment at Lock E7 of the barge canal. The lock is adjacent to the Vischer Ferry hydroelectric plant and, notwithstanding that the embankment is owned by the NYSCC, the Authority, as the owner and operator of the Vischer Ferry plant, is responsible under its FERC license for the maintenance of the embankment.

The Blenheim-Gilboa staff monitoring the flows and water levels at Vischer Ferry observed that the water level was approaching the top of the

core wall and that the embankment was seeping. A New York State-Licensed Professional Civil Engineer from Blenheim-Gilboa, who was flown to the plant by helicopter, promptly evaluated the situation and recommended declaring a Type B emergency (11:08 a.m., August 29) because of the seepage and because the Vischer Ferry headwater was rising rapidly. The rapidly increasing water levels approached a low spot near the boat launch area and, to avoid an overtopping situation, the Authority requested the Town of Niskayuna to provide fill material, which was subsequently provided by the Town (and by NYSCC) and which prevented overtopping.



Figure 8. Tainter Gate Operations

- Gates open at 1 foot per minute; each gate requires 42 minutes to fully open
- Redundant gate motor operators and gear boxes
- Redundant power supplies to operate gates

the instrumentation and at approximately 12:10 p.m. the video feed of the dam was lost. The decision to activate the Gilboa Dam EAP was made based on reports that the reservoir level at the dam was predicted to exceed prior record levels, there was a possible spike in extensometer readings transmitted from the dam, and because all video and data communication from the dam was lost not long after that spike. The spike in instrumentation readings was a possible indication of unacceptable movement of the spillway control section."

With respect to the seepage, an Authority contractor, with support from the Town and NYSCC, mobilized the site. The contractor delivered 111 truck-loads of fill, which were spread by Town and contractor bulldozers to depths as much as 10 feet. The fill was placed at the toe of the Vischer Ferry embankment (see Figure 9).

In total, 140 truckloads of material were delivered by the Town, NYSCC and the Authority contractor to mitigate the seepage condition and prevent overtopping at the low spot near the boat launch. These actions, as directed by the Authority, successfully resolved the emergency conditions and, after a New York State-Licensed Professional Civil Engineer from the Authority staff monitored the situation throughout the night, the Type B emergency was declared terminated at 11:30 a.m. on August 30.

Vischer Ferry Operations During Tropical Storm Lee

Because of the still saturated ground from Tropical Storm Irene, the Mohawk River upstream of Vischer Ferry was projected by the NWS to rise five feet due to the remnants of Tropical Storm Lee. In light of this situation, the Authority posted a New York State-Licensed Professional

Civil Engineer at Vischer Ferry to monitor the embankment through the night of September 8. In addition, in recognition of the water-level forecast, the Authority directed its contractor to increase the level of the Lock 7 wall by one foot to elevation 220 and to blend it into the embankment. The sandbags and berm on top of the lock wall were intended to direct any overflow away from the Vischer Ferry embankment. Moreover, the Authority directed the contractor to deliver an additional 43 truckloads of fill to extend the berm to the lock wall.

The maximum level reached on September 8 was 217.1 feet, just above the top of the core wall, which was lower than what was expected based on the weather forecast. The Authority's New York State-Licensed Professional Civil Engineer remained at Vischer Ferry until 3:00 a.m. on September 9, when the water level dropped to 216.5 feet. Since the dam was not at risk of failure, it was not necessary to declare an EAP emergency.



Figure 9. Seepage Mitigation at Vischer Ferry Embankment

Communications During and After the Storms

Blenheim-Gilboa

As previously indicated, Appendix C lists the entities from the EAP Notification Flow Chart that are required to be contacted, both directly and indirectly, in the event a Type A or Type B emergency is declared at Blenheim-Gilboa. The list includes many Authority personnel who are assigned primarily to the Blenheim-Gilboa project and those who would report to the EOC when it is activated. The primary external parties to be directly notified include the Schoharie County Sheriff, the State Police, the NYCDEP, the New York State Office of Emergency Management (NYSOEM) and FERC. Pursuant to the requirements of the EAP, upon the declaration of the Type B emergency (1:20 p.m. on August 28), the required notifications were made from the Blenheim-Gilboa Control Room advising downstream entities and NYCDEP of the condition at the lower reservoir. The FERC Regional Engineer was directly notified by Authority staff.

In addition to the mandatory notifications indicated above, on August 28, prior to declaring the Type B emergency, the Blenheim-Gilboa staff notified the Schoharie County Emergency Management Office (EMO) and the Schoharie County Sheriff that the upstream Prattsville flows were beginning to exceed 10,000 cfs. The Schoharie County EMO and Sheriff were also advised by Blenheim-Gilboa several times prior to the Type B declaration of the outflows from the lower reservoir, specifically at 10:25 a.m., 10:44 a.m., 10:55 a.m., 11:28 a.m., 11:43 a.m., 12:12 p.m. and 12:30 p.m. The Schoharie County EMO had previously initiated emergency evacuation sirens when the EAP Type B emergency was declared at the Gilboa Dam by NYCDEP.

Although the Blenheim-Gilboa project has external Verizon land-line telephone service in two different area codes (607 and 518) to two different switching locations, 607 – Grand Gorge (south of the project) and 518 – Middleburgh (north of the project), during the storm, Blenheim-Gilboa lost all external land-line service. This situation, combined with extremely limited cell phone service, prevented the project from making any follow-up notifications, although none are mandatory under the EAP. Fortunately, the Authority tie-lines to White Plains and Marcy, north of Utica, were not affected by the storm and essentially provided Blenheim-Gilboa with indirect access to the outside world. It should be noted that throughout the storm the White Plains EOC was in regular communications with both the Governor's Office and NYSOEM with respect to conditions at Blenheim-Gilboa.

As indicated above, the Authority met its notification obligations as required by the EAP, notwithstanding the failure of the telephone sys-

tems. However, the susceptibility to losing external land-line telephone service, coupled with unreliable cell phone service, is an unacceptable condition for a critical facility like Blenheim-Gilboa. As discussed later in this report, the Authority has implemented communications improvements to ensure that such a situation will not recur.

Vischer Ferry (Tropical Storm Irene)

On August 29, the Blenheim-Gilboa Control Room experienced the unprecedented situation of declaring a second EAP Type B emergency in a 24-hour period — this one for Vischer Ferry. As with Blenheim-Gilboa, the Notification Flow Chart for Vischer Ferry (Appendix C) lists all the entities to be notified (directly and indirectly) by the Blenheim-Gilboa Control Room in the event of a Vischer Ferry emergency. As described above, all external land-line telephone service at Blenheim-Gilboa was lost during the storm. However, the Blenheim-Gilboa Control Room was able to make all required EAP notifications using cell phones, notwithstanding that such service was compromised. Cell phone service was also used to call contacts (the Town of Niskayuna, NYSCC and the Authority's contractor) for equipment and supplies. While the cell phone service could not be considered reliable, the Authority was ultimately able to use such service to meet its EAP obligations and to secure equipment and materials.

As with the Blenheim-Gilboa storm situation, during the Vischer Ferry event, the Blenheim-Gilboa staff never lost contact with the White Plains EOC through the use of the Authority's dedicated tie-lines. Similarly, the EOC kept the Governor's Office and the NYSOEM fully informed as to the status of the Vischer Ferry plant.

Since communications involving Vischer Ferry are based at Blenheim-Gilboa, the comments in the preceding section apply equally to Vischer Ferry.

Vischer Ferry (Tropical Storm Lee)

External land-line telephone service had not been restored at Blenheim-Gilboa when Tropical Storm Lee hit the region barely a week after Tropical Storm Irene. However, a temporary work-around telephone system was installed at Blenheim-Gilboa after Tropical Storm Irene, but before Tropical Storm Lee. This temporary system would have obviated the need to use cell phones if it had ultimately become necessary to declare an EAP emergency.

While an EAP emergency was not declared, on September 7, Blenheim-Gilboa contacted the NYSCE, the Schenectady Emergency Management Office, the Town of Niskayuna and the NYSOEM to advise them of the situation at Vischer Ferry. Follow-up calls were made to these parties on September 8. Through its ongoing contact with NYSCE, the Authority was able to quickly quell a rumor that Lock and Dam No. 9 upstream of Vischer Ferry had failed.¹⁰ Had the lock and dam failed, the contractors working at the Vischer Ferry site would

have had to promptly evacuate, but good communication with NYSCE avoided that unnecessary action.

As noted above, an EAP event was not declared at Vischer Ferry because an imminent or potential failure of the dam was not expected. However, if the projected flows had been experienced, major flooding would have occurred. Recognizing that the expectation of such flooding should warrant notification under the EAP, the Authority is currently revising the Crescent & Vischer Ferry EAP¹¹ to provide for emergency notifications to be issued when significant flooding is expected. For each affected project, the Authority will determine the flow trigger points that will require the flood notifications to be issued.

¹⁰ NYSCE and the Authority agree that through excellent collaboration, communication and coordination, the rumor was dispelled within 10 minutes.

¹¹ Similar revisions are also under way with respect to the EAPs for Blenheim-Gilboa and for the Authority's Gregory B. Jarvis Hydroelectric Plant at Hinckley Reservoir, north of Utica.

Coordination with Affected Parties

New York City Department of Environmental Protection

The NYCDEP oversees the Gilboa Dam, which is part of New York City's reservoir system that supplies water to the City. The capacity of the reservoir associated with the Gilboa Dam is about 21 billion gallons. While the Gilboa Dam is not subject to FERC jurisdiction since it is not associated with a generating facility, it is regulated by the NYSDEC, which promulgates its own dam safety regulations and protocols.

As the Gilboa Dam is upstream of the Blenheim-Gilboa project, it is imperative that the Authority be promptly advised of any issues affecting the dam since Blenheim-Gilboa could be seriously impacted. During Tropical Storm Irene, Blenheim-Gilboa was notified of the Type B emergency under the NYCDEP EAP. As the Gilboa Dam is not regularly manned by the NYCDEP,¹² and since Blenheim-Gilboa was not able to readily secure any additional information as to the status of the Gilboa Dam, project staff dispatched a security guard to travel to a location where the dam was viewable and report back. The security guard reported that the dam appeared to be in place and holding. Clearly, there is a need for improved communications between the NYCDEP and Blenheim-Gilboa with respect to any issues affecting the Gilboa Dam. As discussed below, improvements are being implemented.

Schoharie County EMO and Sheriff's Department

In order for the public to be effectively warned of an actual or potential dam failure, it is critical that the Authority and Schoharie County communicate with each other as efficiently and effectively as possible. As it is essentially Schoharie County's obligation to promptly notify the towns and villages of any potential emergency affecting the project, the Blenheim-Gilboa staff maintains a close working relationship with County emergency management personnel. In addition to notifying Schoharie County of potential dam emergencies in accordance with the Blenheim-Gilboa EAP, the Blenheim-Gilboa staff contacts the County whenever flows reach 5,000 cfs, 6,000 cfs, 7,000 cfs and 8,000 cfs. When flows are expected to exceed 10,000 cfs, the Blenheim-Gilboa staff provides 30-minute updates until flows subside. When flows reach 10,000 cfs, Schoharie County issues a dispatch via radio to Town Supervisors, Highway Superintendents and Fire Chiefs.

New York State Canal Corporation

With respect to the Vischer Ferry project, it is clear that the Authority and NYSCC are inextricably intertwined as Lock No. 7 and the Vischer Ferry generation facilities are essentially part of the same infrastruc-

ture. As a result, regular communication between the Authority and NYSCC with respect to operating and maintenance matters is essential. Accordingly, NYSCC is directly notified by the Blenheim-Gilboa Control Room in the event of an emergency involving the Vischer Ferry project.

While Blenheim-Gilboa is about 80 miles upstream from Lock No. 7, NYSCC is also impacted by flow conditions at the project. In the event of high outflows at Blenheim-Gilboa, it is imperative that NYSCC receive timely information so that it can notify the boating public and marina operators of potential flood conditions. Pursuant to the Blenheim-Gilboa EAP Notification Flow Chart that was in effect during the two tropical storms, NYSCC was indirectly notified (Schoharie County Sheriff to Montgomery County Sheriff to NYSCC) of the emergency condition at Blenheim-Gilboa that resulted from Tropical Storm Irene.

Governor's Office and NYSOEM

As discussed above, both the Governor's Office and NYSOEM were kept fully informed on an ongoing basis as to the status of the situations at both Blenheim-Gilboa and Vischer Ferry. The Authority coordinated emergency management responses with the Governor's Office to ensure consistency of actions. The Authority briefed the NYSOEM through hourly conference calls on the status of issues in the Blenheim-Gilboa region, focusing on communications, flooding and road closings.

FERC

As required by its Blenheim-Gilboa and Vischer Ferry licenses, the Authority has provided detailed reports to FERC describing the storm events, any unusual occurrences or operating conditions, the measures taken to mitigate conditions and a detailed description of any damage. The reports included very detailed time lines showing key events and Authority actions during the course of the storm. The Authority also kept the FERC Regional Engineer informed throughout the storm as to the ongoing situations at Blenheim-Gilboa and Vischer Ferry.

In addition to the foregoing, on January 12, 2012, the Authority filed a Section 12.10(a) Incident Report with FERC concerning a New York State Department of Transportation (NYSDOT) Emergency Request for the Authority to Curtail Flows at the Blenheim-Gilboa Lower Reservoir. NYSDOT requested that outflows from the lower reservoir be curtailed for nine working days to accommodate emergency repairs to the abutment of the New York State Route 30 bridge immediately downstream from the project. The NYSDOT emergency repair work was related to damage from Tropical Storm Irene on August 28, 2011.

¹² The Gilboa Dam is monitored via cameras by the NYCDEP from its Grahamsville office. The NYCDEP has also noted that trained DEP staff were on site at the dam with operable communications to their EOC & Water Supply Control Center before, during and after the storm event.



New York State Department of Transportation - Bridge Repair

As described above in the FERC section, the Authority assisted the NYSDOT by curtailing flows from the Blenheim-Gilboa lower reservoir for nine days to permit the NYSDOT to effect repairs to the NYS Route 30 bridge abutment. The Authority worked closely in coordinating this emergency request from the NYSDOT with FERC, the NYSDEC and the Schoharie County Emergency Management Office.

Project Roadways Opened to First Responders and Others

Due to the severe flooding experienced in Schoharie County, numerous roads in the area were impassable. To accommodate first responders, people with medical issues, Schoharie County and Town of Gilboa vehicles and the general public, the Authority made the roadways through the Blenheim-Gilboa project available on a priority basis. Because of security issues, the Authority could not permit parties to drive through the project at will. However, parties were allowed to use the project roadways using a caravan arrangement with an Authority security guard in the lead vehicle.

New York State Department of Environmental Conservation

One of the lessons learned associated with post-storm collaborative actions led to the incorporation of the NYSDEC Dam Safety Group on the EAP Notification Flow Charts for Blenheim-Gilboa and Crescent/Vischer Ferry (as well as Jarvis). This action resulted from recent correspondence from the FERC and had been requested by NYSDEC.

Communications Issues and Proposed Resolutions

Loss of Land-line Phone Service at Blenheim-Gilboa with no Reliable Backup Arrangement

The Blenheim-Gilboa staff should be commended for its innovativeness in meeting the notification requirements of the Blenheim-Gilboa and Vischer Ferry EAPs, notwithstanding the loss of multiple external land-line telephone services and the presence of very limited cell service. However, it is imperative that a critically important facility such as Blenheim-Gilboa, have more reliable communication facilities to ensure that such a failure does not recur.

To address the foregoing issues, the Authority has been implementing arrangements to “storm harden” the existing Time Warner cables used to provide data service to the project. These cables access the project at the South Gate. In addition, the Authority is currently arranging with Time Warner for the installation of a Primary Rate Interface¹³ (PRI) into its existing telecommunications system. A new fiber optics system, which was installed in early March 2012, includes 100 new Direct Inward Dialing (DID) numbers. The project will maintain its existing 1,000 DID numbers from the Middleburgh Telephone Service, which is provided through the North Gate. Additional back-up service has been achieved by reactivating 10 Verizon business lines that provide service through the South Gate.

While the land-line upgrades described above should substantially improve the reliability of Blenheim-Gilboa telephone service, it is essential that further backup communications arrangements be implemented. To this end, the Authority should continue to encourage Verizon to make system upgrades that would improve cell phone service, which is sporadic even on clear days.

It is noteworthy that the Authority has been urging Verizon to improve cellular service in the region for some time. In fact, the Authority had previously offered Verizon the use of its tower on Brown Mountain at no charge for the installation of a cellular antenna, contingent upon engineering approval. In connection with this offer, the Authority has agreed to provide Verizon with free power and backup service, along with unlimited access to the facility. Notwithstanding the Authority's offer, to date Verizon has not expressed interest.

In addition to the foregoing, the Authority has had discussions with independent tower erectors, asking them to evaluate economic aspects of installing a permanent and dedicated cell tower (and related equipment, including that required for power supply) at a location on the Blenheim-Gilboa property.

The Authority has taken action to improve cell service in the Blenheim-Gilboa buildings by installing, as of late March 2012, a system with a repeated Verizon signal to the upper complex, warehouse, real estate building and security building, along with the seventh, eighth and ninth floors of the administration building. This system has dramatically improved the cellular reception within the administrative building, which includes the Central Region Control Room, conference room/EOC and executive offices, essentially resolving the cellular reception issue for operational needs, at manageable emerging costs.

In addition, investigation of the potential applicability and availability of mobile communication tower(s), i.e., cells-on-wheels (COW) or cells-on-light-trucks (COLT),¹⁴ should be conducted. COWs and COLTs, which are typically quite maneuverable and can be set up in minutes, can support critical emergency communications during storms and other disasters.

While the Authority has diligently made the communications upgrades required to ensure that the failures experienced during the storm do not recur, this will only resolve a part of the underlying issue. As the Blenheim-Gilboa project was not the only entity in Schoharie County losing land-line service, it is imperative that the parties listed on the EAP Notification Flow Charts also have reliable telephone service that includes solid backup arrangements. To that end, it is understood that Schoharie County is currently investigating the installation of a new county-wide 911 Emergency Call Center that would include a broadband ring network with complete redundancy. The Authority has advised Schoharie County that it is interested in learning more about the County's proposed regional communications solution.

Issue – Communications with Schoharie County

While the Authority communicated with Schoharie County during the storm and met its obligations under the Blenheim-Gilboa EAP,¹⁵ it is indisputable that the communications services in the region are generally unreliable. The Authority was advised at a recent meeting with County emergency management officials that the County has established a Committee on Communications to address this situation. The Authority reiterated its interest in improvements the County may make to communications within the county, especially to emergency communications systems.

Going forward, the Authority is fostering improved communications with the Schoharie County EMO prior to taking Blenheim-Gilboa operational actions that could impact downstream communities.

¹³ PRI is an international telecommunications standard that is used for digital communications. It reduces the number of physical communications needed to connect to the telecommunications service provider.

¹⁴ All the major mobile phone carriers have COWs and COLTs available to restore mobile phone service in emergency situations. For example, the vehicles were deployed to strategic locations in Florida in advance of Hurricane Charley's landfall in 2004.

¹⁵ In follow-up discussions, the Schoharie County EMO expressed concerns regarding the communications challenges experienced during the event with the Authority. The Authority will coordinate with Schoharie County EMO to come to mutual resolution of its concerns.

As an aside, the County reports that Verizon recently initiated contact with the County to discuss the prospects for improving cell service in the region. The Authority advised the County that the Authority is agreeable to discussing the feasibility of permitting or accommodating a tower or tower space on Brown Mountain along with power service to Verizon, contingent upon an engineering assessment.

Issue – Communications With New York City Department of Environmental Protection

As previously discussed, the NYCDEP declared an EAP Type B emergency during Tropical Storm Irene due to a spike in instrumentation readings at Gilboa Dam, which was a possible indication of unacceptable movement of the spillway control section. This clearly was a major concern to the Blenheim-Gilboa staff and, when unable to contact NYCDEP to confirm the situation, the staff dispatched its own representative to check the status of the dam.

Based on activities during the storm, both the Authority and the NYCDEP recognized that communications between the agencies warrant improvement. To that end, the NYCDEP hosted Blenheim-Gilboa staff members at a meeting and tour of the Gilboa Dam on January 10, 2012. In addition to the tour, NYCDEP gave a presentation on the Gilboa Dam reconstruction program. To reciprocate, on February 7, 2012, the Blenheim-Gilboa staff gave a presentation to NYCDEP on project operations, including the facility's features and functions, and the storm response. Both meetings were considered productive and regularly scheduled meetings are anticipated for the future. In addition, it has been proposed that a clear communications strategy be developed between the Authority and NYCDEP. In particular, a small base station that would accommodate communications among the Blenheim-Gilboa staff, NYCDEP and the Schoharie County Sheriff has been suggested for installation at the Gilboa Dam. In addition, NYCDEP was requested to add the Blenheim-Gilboa Control Room to the primary notifications in NYCDEP's EAP, which has been accomplished.

With the addition of the fiber optics phone lines to the Time Warner system described above and the anticipated improvements to cell phone service, the communications issues with NYCDEP will be essentially resolved. Since the NYCDEP monitors the Gilboa Dam via camera, it is recommended that the Blenheim-Gilboa staff request access to the feeds from the camera(s). This would be useful for corroborating information about the status of the dam in the future.

The Gilboa Dam is currently undergoing a \$300 million reconstruction program, including spillway and training wall modifications and

embankment improvements. When the reconstruction program has been completed, the dam will have several additional enhancements to its former condition. Since these enhancements will result in the Gilboa Dam becoming more of an operating project, the Authority and NYCDEP will likely need to develop joint operating protocols since activities at the upstream Gilboa Dam could potentially impact inflows at the Blenheim-Gilboa project.

Issue – Interactions with New York State Office of Emergency Management

During the course of the storm, the White Plains EOC regularly updated NYSOEM (and the Governor's office) on the status of Blenheim-Gilboa and Vischer Ferry. These updates were well received and kept state officials fully apprised of all key developments during the storm pertaining to Blenheim-Gilboa and Vischer Ferry. To augment this capability, the Authority is currently establishing EOCs at all of its major facilities.

Issue – Interactions with New York State Canal Corporation

As previously indicated, it is imperative that NYSCC receive timely notification of any significant outflow conditions at Blenheim-Gilboa so that the affected boating public and marina operators can be informed. While it was the understanding of the Blenheim-Gilboa staff that NYSCC received direct notification from the Blenheim-Gilboa Control Room (notwithstanding that direct notification was not required by the Blenheim-Gilboa EAP Notification Flow Chart as it existed at the time), NYSCC advises that it did not receive the notification, nor did it receive any follow-up calls. To address this issue, the Authority has revised the Blenheim-Gilboa EAP Notification Flow Chart to include the NYSCC Canal Hydrologist as a direct contact. It should be noted that with respect to the Vischer Ferry Type B emergency and the subsequent high water event, there were no communications issues between the Authority and NYSCC.

Conclusions and Recommendations

Preliminary staff communications with the USGS indicates

that Tropical Storm Irene was a 500-year storm that pummeled the Authority's Blenheim-Gilboa and Vischer Ferry facilities. Record flood stages were achieved on the entire length of the Schoharie Creek. Notwithstanding the ferocity of the storm, the Authority's facilities functioned as designed with minimal damage. In addition, the performance of the Blenheim-Gilboa staff was exemplary. The staff ensured that Schoharie County and others on the Notification Flow Charts promptly received the required notifications, and it operated the project in a manner that mitigated the peak outflow.

As outlined above, during Tropical Storm Irene, the Blenheim-Gilboa facility and the surrounding communities experienced significant outages in their available communications systems. The Authority has since upgraded and expanded the communications equipment that is under its control. In addition, the Authority staff has met with the affected governmental entities and, while there were no major issues with respect to the Authority's performance during and after Tropical Storm Irene (or Tropical Storm Lee), the parties agreed that opportunities to improve communications infrastructure should be pursued. Following is a breakdown of communications-related improvements associated with the lessons learned from the two storms that have been completed, are under way, or are under consideration:

- Expand Time Warner cable system to include fiber optics telecommunications with 100 new Direct Inward Dialing (DID) phone numbers (completed).
- Maintain existing 1,000 DID phone numbers provided by Middleburgh Telephone Service (North Gate); meet with Middleburgh to encourage storm hardening of existing lines (to be scheduled).
- Re-activate 10 Verizon business lines provided via South Gate (completed).
- Upgrade Blenheim-Gilboa cell phone service through a repeater Verizon signal to the upper complex, warehouse, real estate building and security building along with the seventh, eighth and ninth floors of the administration building (completed).
- Make Authority tower on Brown Mountain available for Verizon's evaluation for cellular antenna installation; provide unlimited access and electric service, contingent upon NYPAs engineering assessments (under consideration).
- Prepare internal cost estimate for Authority funding (full or partial) of the installation of a dedicated "dark" cellular tower on Blenheim-Gilboa property, and making it available to potential carriers (in progress).
- Contact Verizon to pursue the potential availability of a COW or COLT in advance of forecasted storms (under consideration).
- Meet with Schoharie County EMO representatives to review communications issues during the storm (completed).
- Revise the Blenheim-Gilboa and Vischer Ferry EAPs to provide for a major flood notification to downstream parties, and conduct public meetings with emergency management agencies to advise of changes (completed).
- Include NYSDEC Dam Safety Group on the Blenheim-Gilboa and Crescent & Vischer Ferry EAP Notification Flow Charts (completed).
- Meet with NYCDEP to review storm related activities and lessons learned, particularly with respect to communications; participate in tours of Blenheim-Gilboa and Gilboa Dam facilities (completed).
- Request NYCDEP to include Blenheim-Gilboa Control Room in EAP primary notifications (completed).
- Schedule periodic meetings with NYCDEP; develop joint operating procedures after completion of Gilboa Dam reconstruction (to be prepared upon completion of reconstruction project).
- Request Blenheim-Gilboa Control Room access to NYCDEP camera(s) at Gilboa Dam (under way).
- As a party directly contacted in the Blenheim-Gilboa Notification Flow Chart, encourage NYCDEP to participate in EAP training exercises (ongoing).
- Meet with NYSCC to review any communications issues and activities during the storms (completed).
- Include NYSCC Canal Hydrologist as a primary notification on Blenheim-Gilboa and Crescent & Vischer Ferry EAP Notification Flow Charts (completed).
- Upon becoming aware of potential major storm, call all direct contacts on EAP Notification Flow Chart to ensure that they are aware of situation and that contacts are up to date. Contacts are currently checked on an annual basis. (under review).
- Make efforts to foster improved and more direct communications with Schoharie County EMO (in progress).
- Investigate the benefits of installing common voice/data communication system encompassing Blenheim-Gilboa, White Plains Corporate EOC and direct contacts on EAP Notification Flow Charts (ongoing).
- Meet with NYSOEM to review communications and other issues during the storms (meeting requested).
- Acquire four additional satellite phones, which will provide greater reliability in the region (completed).
- Install integrated On-Star Response System in Blenheim-Gilboa security vehicles (completed).
- Explore all aspects of installing Verizon cell phone boosters in Blenheim-Gilboa security vehicles (under consideration).
- Develop EOCs for all Authority Regions that will have interoperability with the White Plains Corporate EOC and all requisite emergency response redundancies (under way).
- Coordinate periodic operational coordination meetings with Schoharie County OEM (under way).

Appendix A • Examples of EAP Emergencies

Type A

- Unscheduled rapid draw-down of impounded water.
- Failure of any facility that controls the release or storage of impounded water, such as a gate or valve.
- Failure or unusual movement, subsidence or settlement of any part of a Project work.
- Piping or slides of materials in any dam, abutment, dike or embankment.
- Significant slides or settlements of materials in areas adjacent to reservoirs.
- Significant damage of either upstream or downstream slope protection.
- Unusual instrumentation readings.
- Sinkholes.

- Failure of a Project structure caused by a natural disaster such as an earthquake or flood.
- Failure of a Project structure caused by sabotage or acts of terrorism.

Type B

- Significant settlement of material in any abutment, dike or embankment.
- Unusual concrete deterioration or cracking, including development of new cracks or the lengthening or widening of existing cracks.
- New seepage or leakage or significant gradual increase in a pre-existing seepage or leakage.
- Declaration of a Type B (or similar) Event by an upstream facility.
- Unprecedented and rising inflows to a Project.

Appendix B • EAP Contacts in the Event of a Dam Failure

Blenheim-Gilboa Pumped Storage Power Project

Federal, State and Local Agencies to be Directly Contacted by the Authority in the Event of an Emergency Condition:

- Federal Energy Regulatory Commission Regional Office
- National Weather Service (Albany)
- New York State Office of Emergency Management
- New York State Police Communications Section
- New York City Department of Environmental Protection, Bureau of Water Supply Control Center (Grahamsville)
- Schoharie County Sheriff

Crescent and Vischer Ferry Hydroelectric Plants

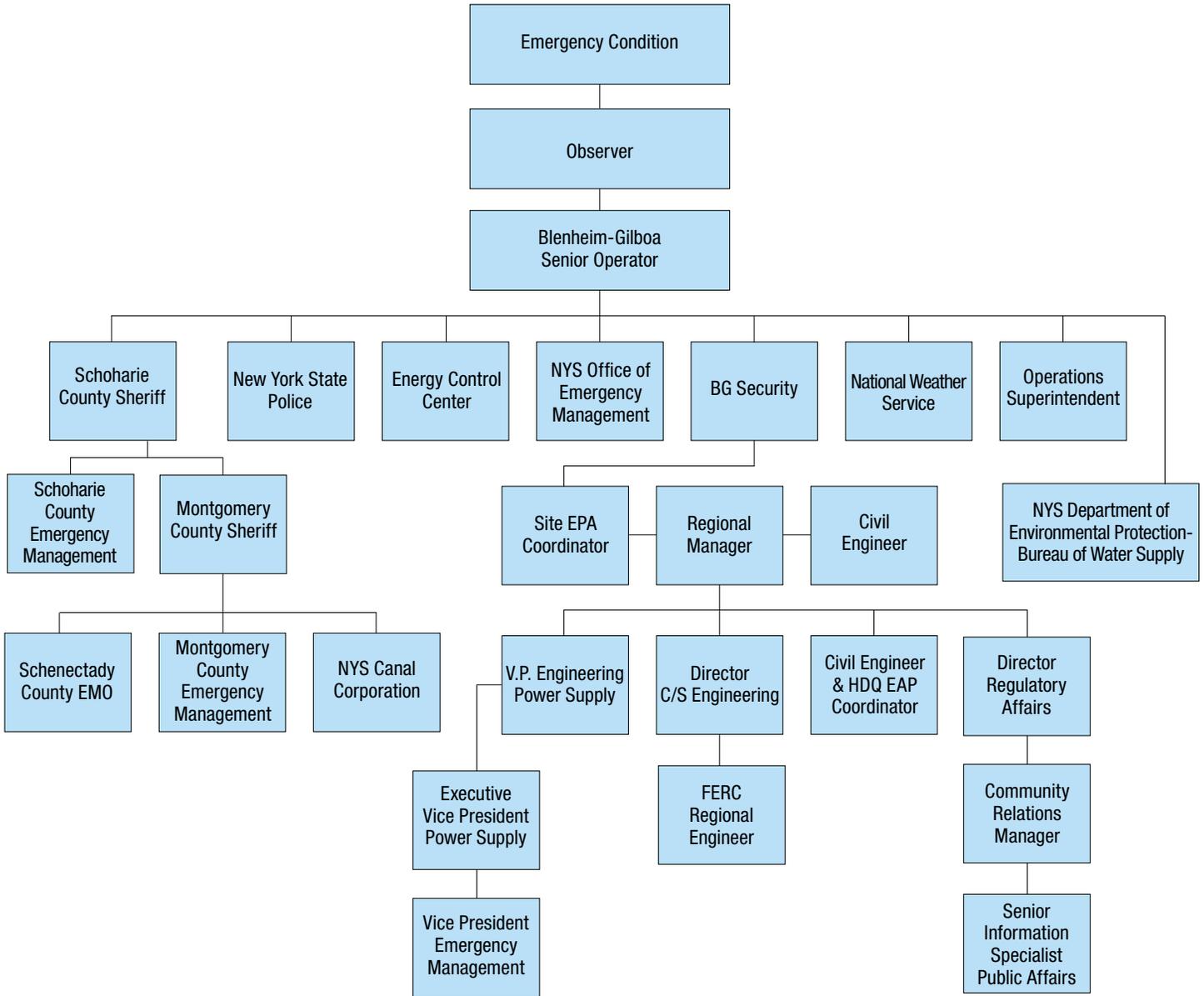
Federal, State and Local Agencies to be Directly Contacted by the Authority in the Event of an Emergency Condition:

- FERC Regional Office
- National Weather Service (Albany)
- New York State Office of Emergency Management

- New York State Police – Loudonville
- New York State Office of Parks, Recreation and Historic Preservation
- Albany County Sheriff's Department
- Saratoga County Communications Center
- City of Schenectady Public Safety Communications Center
- Rensselaer County 911 Office
- New York State Canal Corp., NYS Thruway Dispatcher
- New York State Department of Transportation Region 1 Office
- Peebles Island State Park
- Brookfield Power Corporation
- Boralex Operations, Inc.
- Waterford Mill Notification
- Cohoes Mill

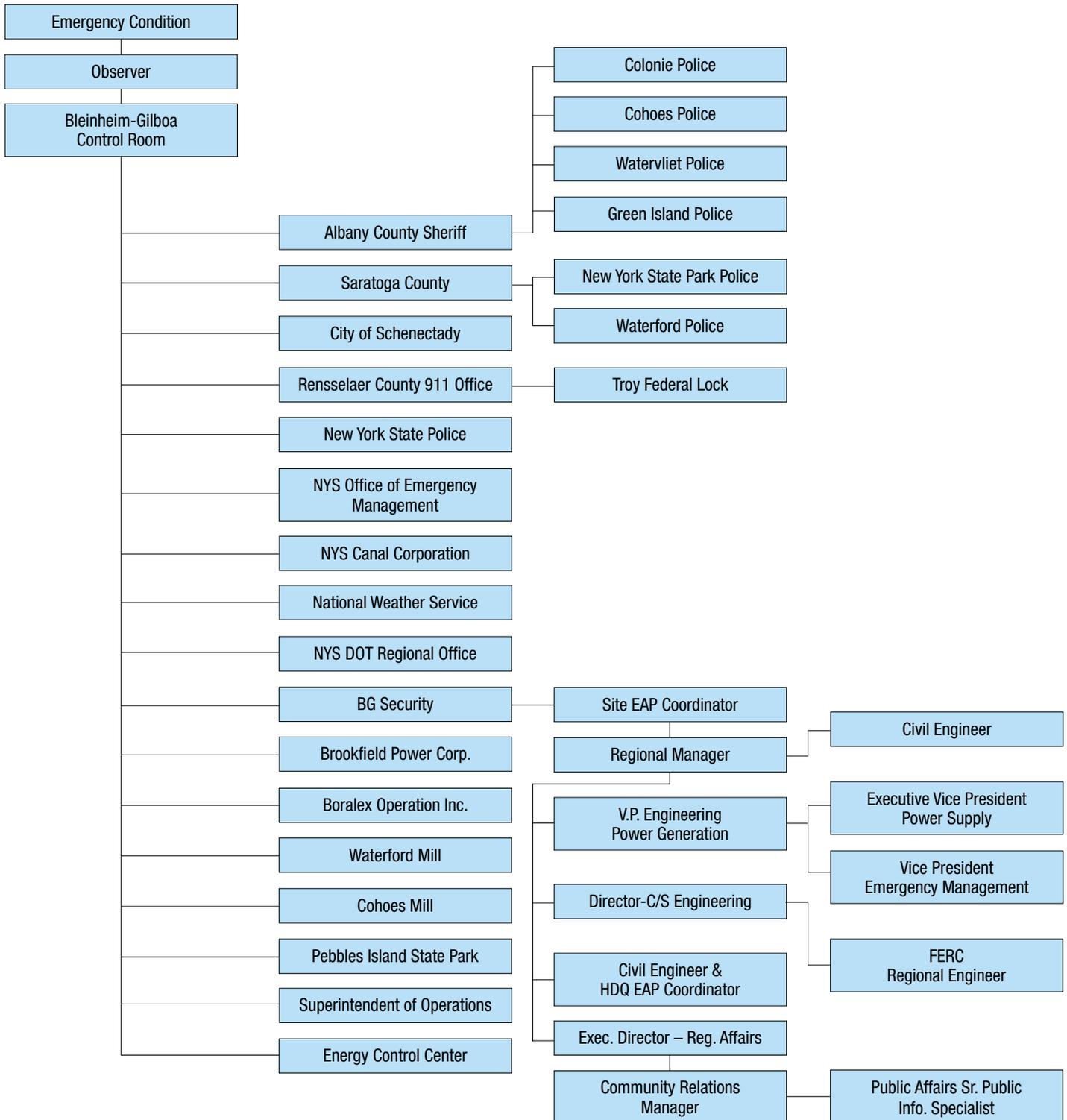
Appendix C-1 • Notification Flow Chart – Blenheim-Gilboa

Emergency Action Plan Notification Flow Chart in the Event of Dam Failure (Abbreviated) Appendix C-1 Blenheim-Gilboa



Appendix C-2 • Notification Flow Chart – Crescent & Vischer Ferry

Emergency Action Plan Notification Flow Chart in the Event of Dam Failure (Abbreviated) Appendix C-2 Crescent & Vischer Ferry

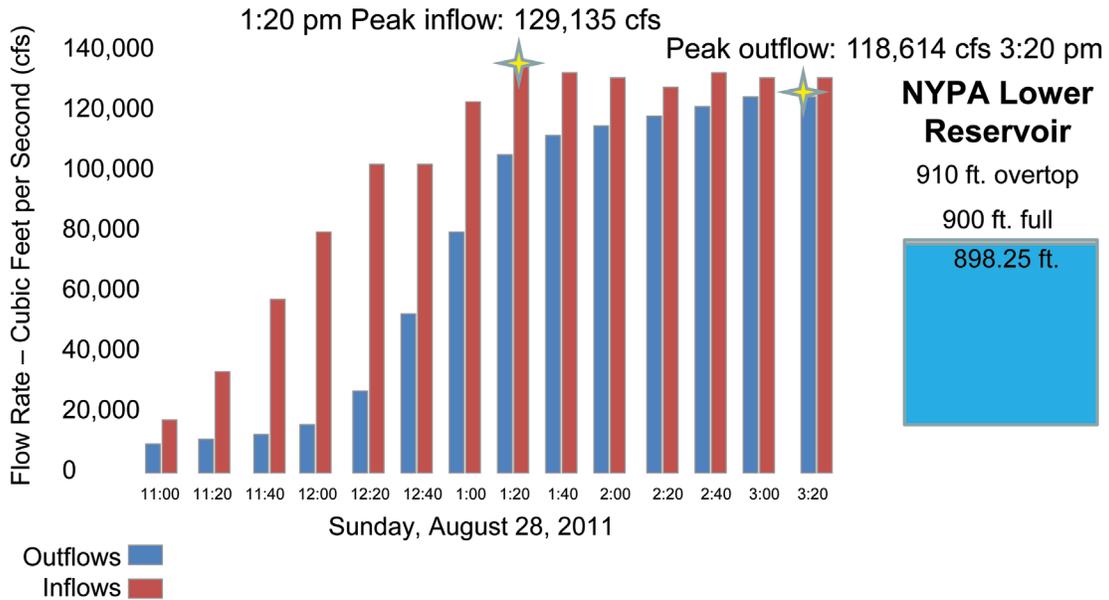


Appendix D • Hurricane Irene Storm Track – August 24

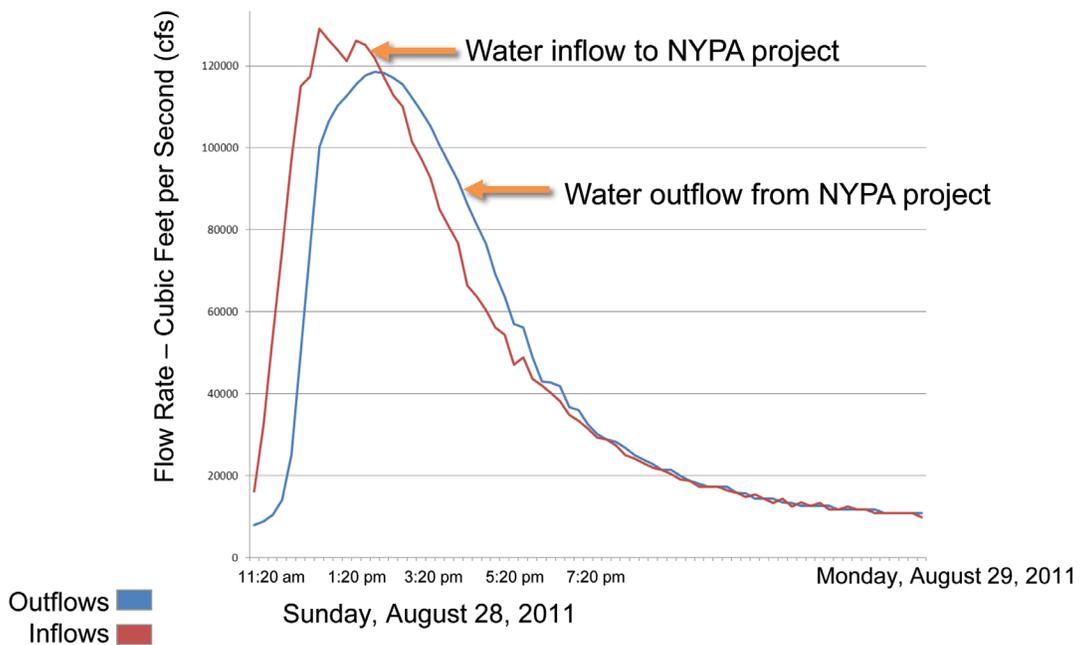


Figure D 1. Hurricane / Tropical Storm Irene Projection as of August 24, 2011

Appendix F • Lower Reservoir – Inflows/Outflows



Appendix G • Lower Reservoir – Water Flow Peak Shaved



Black start resource – a generating facility that has the capability to go from a shutdown condition to an operating condition delivering electric power without assistance from the electric system.

Direct Inward Dialing (DID) – a service under which a telephone company provides one or more trunk lines to the customer for connection to the customer's PBX and allocates a range of telephone numbers to this line and forwards all calls to such numbers via the trunk.

Five hundred (500) year flood – a flood that has a 0.2 percent probability of occurring each year.

Headwater – the point at which a river or creek begins.

On-Star Response System – subscription-based system offered by the On-Star Corporation providing wireless communications, in-vehicle security, hands-free calling, turn-by-turn navigation and remote diagnostics.

Repeater signal – a cellular repeater, cell phone repeater or wireless cellular signal booster is a device used for boosting the cell phone reception to a local area by the use of a reception antenna, a signal amplifier and an internal rebroadcast antenna.

Spillway – a structure used to provide the controlled release of flows from a dam into a downstream area.

Storm harden – any action taken to make the utility system more resilient during a major storm event.

Stream-gaging station – location in a terrestrial body of water for measuring flow and depth.

Tainter gate – a type of spillway radial gate, which is used to retain water in a reservoir, release water from a reservoir or to regulate downstream water flow.



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