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March 27, 2013

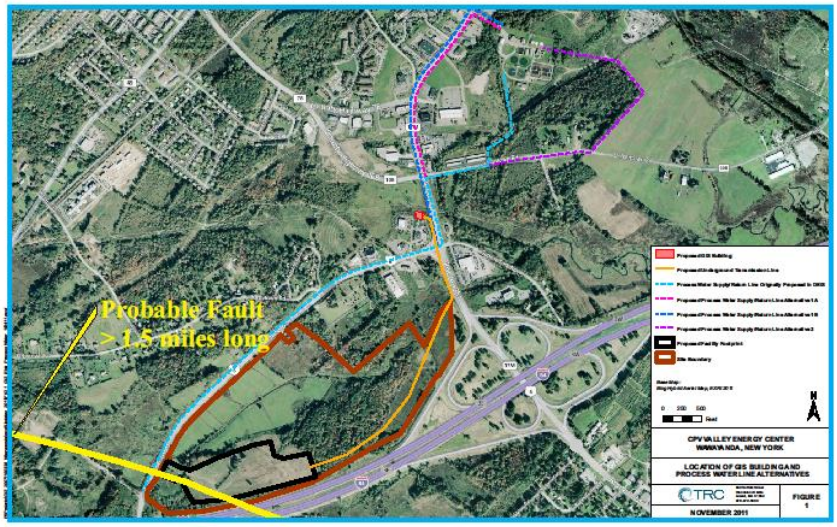
Barbara Parsons, Chair
Town of Wawayanda Planning Board
80 Ridgebury Hill Rd.
Slate Hill, NY 10973

RE: Risk of Structural Damage to the Proposed CPV Valley Energy Project Power Plant from Earthquakes

Ms. Parsons,

On behalf of Protect Orange County, I have been asked to comment on potential risk of structural damage to the proposed CPV Valley Energy Power Plant from earthquake activity. I am President of HydroQuest and have over 30 years of professional experience as a geologist.

Reference to Figure 1 below shows a small portion of what has been referred to as a bedrock fracture trace. The fracture information upon which this is based is data offered to the public from the Orange County GIS Department gisportal (see http://www.co.orange.ny.us/content/124/1344/1410/default.aspx). I have superimposed the bedrock fracture on a November 2011 TRC map. The fracture is illustrated as a yellow line that extends far beyond the area depicted for a distance in excess of 1.5 miles.



As a geologist familiar with the region, I have extensive experience mapping, measuring, and plotting fractures that occur in sedimentary bedrock. My field experience includes measuring fractures and faults in quarries, mines, caves, and in numerous bedrock outcrops. There are different kinds of fractures. The most common are referred to as joints. These are found everywhere in New York State and far beyond. They are mappable in the field where bedrock exposures are present. Faults are another type of fracture. Many are miles in length and can be identified and mapped using high resolution photoimagery, especially through the use of stereo areal photography. High resolution imagery was probably used to identify the fracture plotted on Figure 1 above that runs directly through the proposed power plant site.

Most joints in NYS are high angle and do not necessarily infer the presence of either active or inactive faults (i.e., seismic activity). The bedrock fracture illustrated on Figure 1 and beyond is greater than 1.5 miles in length. Based on familiarity with joints and joint sets in NYS, I am aware that few individual joints exceed a length of about 2,000 feet. Thus, the bedrock fracture illustrated in Figure 1 is almost certainly a major fault. Faults represent zones of preferential weakness that may become activated during earthquake events. Siting a power plant over or close to a fault or fault zone would not be prudent and should be avoided. Seismic events may cause disruption in plant functioning and release of fuels and other chemicals used and stored on site. An alternate site should be selected for the proposed CPV Valley Energy Project power plant.

Much of New York State is seismically active. Again, it would not be prudent to site a power plant on top of a fault line or fault zone. Even faults that have not been active for a long time pose a great risk to building stability because they are elongate zones of structural weakness that are more likely to become reactivated than surrounding areas during earthquakes. An excellent example of fault reactivation is present in the mine beneath Cobleskill Stone's quarry in Howes Caverns, New York. Here, massively slickensided (i.e., fault gouged surfaces) bedrock within a thin bedrock zone exhibits vastly different fault orientations over a distance of only one inch. Thus, if earthquake activity occurs in the area, structures constructed over faults are at far greater and unnecessary risk.

An analysis of earthquake probability at the Wawayanda site was conducted. The probability of earthquakes with magnitudes of greater than 5.0 was examined. *HydroQuest* assessed the probability of earthquakes in the greater New Hampton area using the proposed power plant site as a focal point. Modeling of earthquake probability was conducted using the USGS 2009 Earthquake Probability Mapping model and related data available from the USGS Geologic Hazards Science Center. A series of model runs were conducted to assess and graphically display earthquake probabilities that were computed from the source model of the 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update for New Hampton, NY (41.41º N, -74.43º W). Figures 2, 3, and 4 show the probability of earthquakes with magnitudes of > 5.0 within a radius of 50 km for 200, 500, and 5,000-year events. The USGS web-based model runs determined earthquake probability percent for these events to be 6 to 8 percent, 15 to 20 percent, and 80 to 90 percent, respectively. It is important to recognize that these probabilities are based only on the historic earthquake record to date. As time and more earthquakes occur it is likely that the probabilities with increase.

New Hampton, New York
> 5.0 Magnitude Earthquake
Probability within 200 years

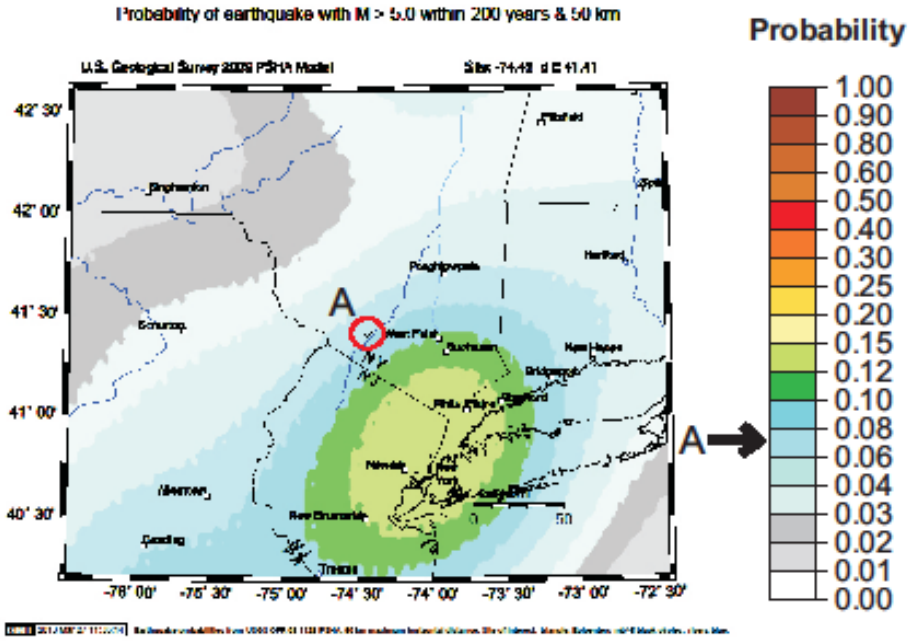


Figure 2. 2009 Earthquake Probability Mapping. USGS Geologic Hazards Science Center. This map displays earthquake probability that was computed from the source model of the 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update for New Hampton, New York [**A**] (41.41° N, -74.43° W). The generated map shows the probability of earthquakes with a magnitude of > 5.0 within a radius of 50 km for a 200-year event is 6 to 8%. Site area lies within the red circle. USGS web-based model run conducted by HydroQuest.

New Hampton, New York
> 5.0 Magnitude Earthquake
Probability within 500 years

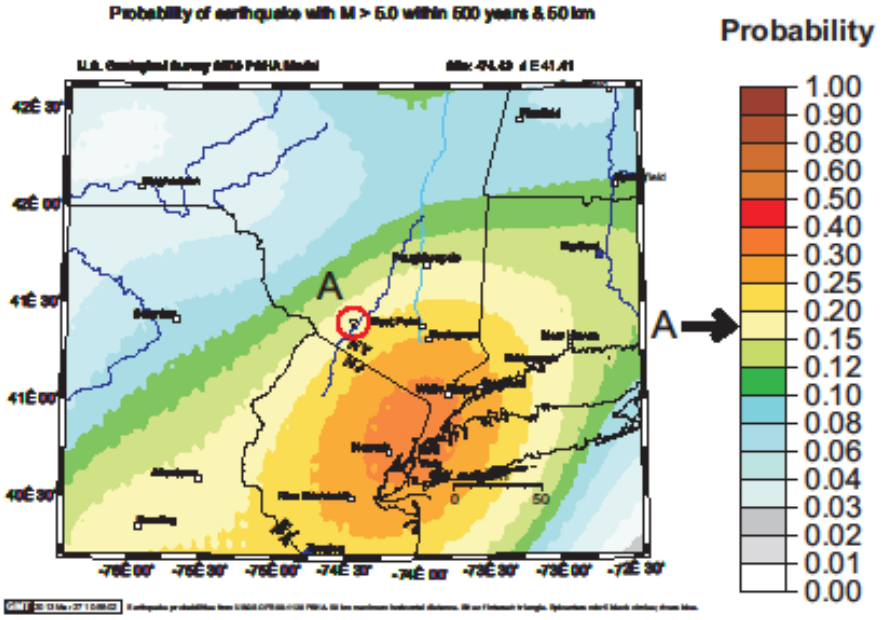


Figure 3. 2009 Earthquake Probability Mapping. USGS Geologic Hazards Science Center. This map displays earthquake probability that was computed from the source model of the 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update for New Hampton, New York [A] (41.41° N, -74.43° W). The generated map shows the probability of earthquakes with a magnitude of > 5.0 within a radius of 50 km for a 500-year event is 15 to 20%. Site area lies within the red circle. USGS web-based model run conducted by HydroQuest.

New Hampton, New York
> 5.0 Magnitude Earthquake
Probability within 5,000 years

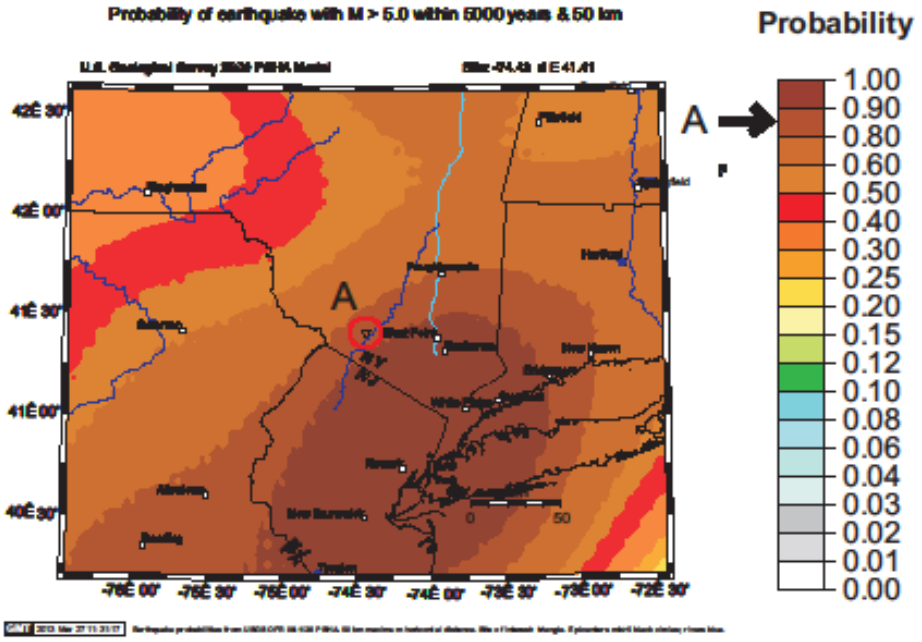


Figure 4. 2009 Earthquake Probability Mapping. USGS Geologic Hazards Science Center. This map displays earthquake probability that was computed from the source model of the 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update for New Hampton, New York [**A**] (41.41° N, -74.43° W). The generated map shows the probability of earthquakes with a magnitude of > 5.0 within a radius of 50 km for a 5,000-year event is 80 to 90%. Site area lies within the red circle. USGS web-based model run conducted by HydroQuest.

The FEIS (11.0 Soil, Geology and Seismology) provides limited discussion of Facility design considerations " … *to meet or exceed the seismic hazard, which includes regional seismicity and site-specific conditions related to the geologic formations present*." Reasoning of this nature has led to catastrophic environmental damage and loss of human life. Geologic wisdom does not call for " … *containment areas designed to prevent leakage or overflow to the site environment in case of a seismic event*.", it instead seeks to avoid unnecessary risk altogether. Geologists and seismologists who are familiar with earthquake related disasters do not recommend that structures whose failure pose such risk be built on fault lines.

The very real and high earthquake probabilities presented in Figures 2, 3, and 4 above stem from USGS web-based model runs conducted by *HydroQuest*. The probabilities for each of these events are based on known, recorded, earthquakes. Clearly, earthquake probability and the risk to the structural integrity of the proposed CPV Valley Energy Project power plant and any chemical containment structures are both real and high. Geologically, and from a risk standpoint, it would not be prudent to locate a power plant over a known fault or fault zone. *HydroQuest* recommends that an alternate site be selected. Approval for the proposed power plant should be denied.

Sincerely yours,

Paul A. Rubin
Geologist
HydroQuest