QUEST
CONSULTANTS INC.®

April 10, 2012

Mr. Kevin Bernstein
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One Lincoln Center
Syracuse, New York 13202

Dear Mr. Bernstein:

As a follow-up to our conference call April 3, 2012 with representatives from the New York Department of Environmental Conservation (DEC), I can offer the following insights concerning our quantitative risk analysis (QRA) report for the Finger Lakes LPG facility. This letter addresses the questions raised by DEC during our call.

1) Elaboration concerning topography effects

It was noted that in our report, we claim to take into account topography effects, and subsequently state that the dispersion modeling is based on flat, level terrain. The use of the term topography is used to cover the presence of liquid impounding (as applicable) and a characterization of the areas surrounding potential releases. It is correct that the dispersion models used in this type of analysis are based on the assumption of flat terrain. This is necessary because of the wide range of parameters accounted for in the QRA (wind speed, wind direction, atmospheric stability, hole size, release orientation, etc.).

One way in which any type of topography is accounted for in the QRA is the surface roughness parameter. This parameter provides for enhanced mixing due to obstacles in the path of a dispersing vapor cloud, such as grass, trees, buildings, etc. For the Finger Lakes LPG system, all release scenarios were run with the assumption of a forested terrain for the surrounding area. This selection is intended to be representative of the areas where a flammable vapor cloud may be dispersing, specifically areas outside the property lines of the Finger Lakes LPG facility, where the public may be impacted.

2) Elaboration on the choice and applicability of weather data

The three primary atmospheric variables in a QRA are atmospheric stability, wind speed, and wind direction. Stability is defined based on six classes, from A to F; wind speed is divided into six groups; wind direction is recorded as one of sixteen directions. In order to probabilistically account for these variables in the QRA, simultaneous measurement of all three, on an hourly basis, over a multi-year period, is required in a data set. Each data point is assigned the proper classification and over the set of thousands of data points, a probabilistic value for each potential set of conditions can be developed. (For example, the probability of 6.3 mph winds from the northwest with 'D' stability may be 0.06, or 0.6% of all measurements.)

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When Quest began this project, we contacted the National Climactic Data enter (Asheville, NC) and inquired about this type of data for the Watkins Glen area. We were informed that the closest available site with the full data set was Ithaca, NY. Ithaca is situated in a location similar to Watkins Glen, relative to one of New York's finger lakes. Because of the geographical similarities between the two cities, it was determined that the Ithaca data was sufficiently representative of the weather patterns in Watkins Glen.

It is worth noting that while the weather data applied to the QRA is "site-specific", it requires a significantly different weather data set to result in any appreciable variation in the resulting risk contours. The QRA accounted a wide range of wind speed, atmospheric stability, and wind direction combinations to provide a detailed representation of the potential weather conditions at the site. If the probabilities of actual site conditions vary somewhat from the applied data set, there will be small numeric variations in the QRA, but most often they are small enough in magnitude such that they cannot be perceived in the risk contour results.

3) Potential for escalation due to release events

The QRA study did not explicitly account for escalation of release events or simultaneous failure events. There are several reasons behind this.

a) Event Probabilities: One of the core concepts upon which the QRA is based is that all potential hazards become impacts to humans through an accidental release from the LPG system. The frequency of such events is accounted for by the use of equipment failure rate databases. This information accounts for mechanical failures of process equipment (piping, vessels, etc.), and subsequent release of hydrocarbons, resulting from many different initiating causes.. It is assumed that failures due to escalation events are included in the databases and therefore should not be added to the QRA.
b) Event Timing: The impacts of each event included in the QRA are potential acute fatality effects for humans. If an event were to escalate, it typically requires several minutes (or more) to develop into a new event. Because of this, the analysis assumes that the only fatalities are from the initial event. At the time of the escalation, it is assumed that persons not affected by the initial event are able to evacuate or take shelter such that the escalated event cannot affect them.
c) Maximum Consequences: The release scenarios modeled in this QRA include low frequency, high consequence events. Because of this, the maximum extents of any potential hazard following an escalation have already been accounted for, although not necessarily together with the initiating event.
d) Existing Hazards: For areas of the facility that are in proximity to other facilities (primarily the TEPPCO facility), the concern of an escalation has been raised. While escalations following a release from specific portions of the Finger Lakes LPG system are a possibility, the resulting hazard will be one which exists already at the adjacent facility. In other words, the Finger Lakes LPG facility does not pose a hazard to the TEPPCO facility that TEPPCO does not already pose to itself or the surrounding areas.
e) Non-Credibility: There are events associated with the Finger Lakes LPG facility that can be imagined, but are not credible events. For example, the potential of multiple, simultaneous BLEVEs (of either railcars or the stationary tanks) has been mentioned. Historically, this is not supported. While multiple BLEVEs from one location have happened, they have not been simultaneous.

Due to these reasons, escalation events and multiple simultaneous failures are not included in the QRA.

4) Seemingly inconsistent results in Tables 3-5 and 3-6

The QRA modeled four release hole sizes – pipe rupture, 3-inch hole, 1-inch hole, and ¼-inch hole. In Tables 3-5 and 3-6, for the low wind, very stable conditions (2.3 mph, F), the flammable vapor cloud following a 1-inch hole is predicted to travel further (550 feet) than the flammable vapor cloud following a 3-inch hole (475 feet). All other wind speed/stability combinations show that the 3-inch hole impacts are greater than the 1-inch hole impacts. The results at low wind and stable conditions are due to a) the relatively similar release rates from 1-inch and 3-inch holes; and b) a longer duration for the 1-inch hole. The combination of these factors results in the seemingly inconsistent results shown in the report.

5) Representative release scenario

The example case information presented in section 3 of the report shows the results for the multiple hazards for all four hole sizes, at one release orientation (of two), for one release scenario (out of approximately 60). This scenario was chosen because it is representative of the other scenarios in the QRA, with regard to the number of calculations and the extents of potential impacts. Obviously, if this level of information was to be presented in the report for all release scenarios, hole sizes, orientations, wind speeds and stabilities, and hazard types, it would require several hundred pages of tables.

The complete list of accident scenarios included in the QRA was presented in Table 2-1 and the maximum flammable vapor cloud and radiant hazard distances for each of the scenarios were shown in Table 3-15.

I believe this covers all the questions raised by the DEC.

Sincerely,

Jeffrey D. Marx
Senior Engineer