STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

April 13, 1992

Dr. John S. Fleming
Environmental Compliance
Textron Lycoming
550 Main Street
Stratford, CT 06497-2452

Dear Dr. Fleming:

I have reviewed Textron's submittal entitled "Supplementary Hydrogeologic Investigation Report, Textron/Lycoming, Stratford, CT" (December 1991). This report remedies in large part prior deficiencies regarding compliance with HM-358, which had been noted in a CME inspection performed by CT DEP in 1989. However, I have some technical comments regarding the report which Textron must address before CT DEP can consider issuing a letter stating that the facility has achieved full compliance with HM-358.

The report presents a large body of new site characterization data, which was used to develop a working hypothesis that site hydrostratigraphy comprises upper and lower sandy glacial aquifers separated by a peat aquitard. This scenario has obvious implications for ground water flow and contaminant transport at the site; contaminant flow from the regulated units is considered to be largely limited to the upper aquifer unit, with only minor downward leakage to the lower aquifer unit. This model of contaminant transport at the site may have future implications regarding strategy of ground water monitoring well placement and screened interval. However, I do not feel that the major premise--that the peat is a confining layer which limits downward contaminant transport--is strongly supported by the data. Specific comments are as follows:

1. The report makes distinction between an "upper glacial aquifer" and "lower glacial aquifer" underlying the facility; the distinction is based solely upon an intervening peat layer which is interpreted as an aquitard. However, the peat layer is demonstrably lenticular, and the two reportedly distinct aquifer units cannot be objectively differentiated in the absence of the intervening peat. It would appear more reasonable to interpret the hydrostratigraphy as comprising a single heterogeneous aquifer which contains a lenticular peat body. The difference in terminology is more than semantic, because formal recognition of upper and lower glacial aquifers implies a regional flow boundary between the units; such boundary apparently does not exist in the absence of the peat, and possibly does not exist in its presence (also see comments 2 and 3 below).

2. The peat layer has been interpreted as an aquitard which has produced recognizable ground water mounding in the overlying sediments. Contour maps of ground water elevation illustrate the mounding, but the interpretation of the underlying, lower

permeability peat as the cause of mounding is not strongly supported. In fact, values of porosity, hydraulic conductivity, and ground water flow rates within the peat (based on data from one well screened in the peat) are marginally higher than corresponding values for the underlying part of the aquifer. This suggests that the peat is not the aquitard causing the ground water mounding. Alternatively, the peat may have preferentially developed over an area of locally low permeability which promoted the development and retention of a hydric growing environment. Accordingly, the nearly coincident areal distributions of peat and ground water mounding may not represent cause-and-effect, but rather both may be effects caused by an underlying zone of locally low permeability.

3. Existing hydraulic conductivity values should be mapped across the site in several depth-discrete intervals below the peat/peat-equivalent depth, to help resolve two questions: (a) Does a local low-permeability aquitard underlie the peat and ground water mound? and (b) Is the change in hydraulic conductivity between the upper and lower parts of the aquifer actually as abrupt as reported? Although the ranges of hydraulic conductivities were reported and mean hydraulic conductivities were calculated for the sedimentary sequences above, below, and within the peat, it may have been instructive to have presented corresponding standard deviations/ variances. Intuitively, the scatter of hydraulic conductivity values seems to be quite large in the sequence beneath the peat. Subdividing the lower aquifer sequence into several depth-discrete units for analysis may reduce the apparent scatter and reveal a less abrupt vertical change in hydraulic conductivity than originally inferred (and then again, it may not!).

If the existence of a low permeability aquitard is believed to exert a major control on contaminant migration at this site, Textron might consider the use of seismic profiling to better define the location and geometry of the aquitard.

4. Although the peat is probably not an aquitard, it is likely to possess geochemical properties distinct from the overlying and underlying strata. The geochemical influence of the peat on fate and transport of site-specific contaminants should be discussed.

5. The report stated that aerial photos were used, in addition to well and boring data, in delineating the approximate boundaries of the peat unit. I would like to know in what context the aerial photos were useful--if the former marsh is actually visible in historic aerial photos, it implies that all or most of the presently overlying material is fill.

6. The vertical distribution of ground water salinities at the site has potential implications for the geochemical fate of contaminants. There do not appear to be any zones of truly fresh water or waters of normal marine salinity either beneath the site

or in the tidal ditch. Rather, the entire range of variation in salinity values presented in the report appears to fall within the "brackish" salinity class (Drever, 1982, The Geochemistry of Natural Waters). Consequently, reporting that "freshwater" in the "upper glacial aquifer" overlies "saltwater" in the "lower glacial aquifer" potentially exaggerates the reader's impression of the magnitude of difference in salinity between the units. As per item 3 above, existing salinity data should be mapped in depth-discrete intervals and the variances associated with the reported mean values should be calculated and reported. Increased analytical resolution may reveal that the observed higher salinity in the "lower glacial aquifer" represents a less abrupt change than originally inferred. A downward gradation from "less brackish" to "more brackish" water might be expected to occur in a mixing zone developed at the boundary between fresh and salt water lenses in proximity to the coastline.

7. The report documents that contaminant concentrations in site ground water are generally higher above the peat than below it. This distribution of contaminant concentration values was interpreted to support the inference that the intervening peat layer functions as an aquitard, limiting the downward transport of contaminants from the overlying sources. However, it is clear from the concentration data that one or more contaminant plumes do exist, and that contaminants are present to some degree in the aquifer unit stratigraphically below the peat.

The observed lesser concentrations of contaminants in the aquifer below the peat do not necessarily support an argument for limited connectedness between upper and lower aquifer units. The decrease in contaminant concentrations with increasing depth may simply reflect the expected attenuation of contaminant plumes with increasing distance away from near-surface source areas.

8. The contaminant plumes are inadequately characterized. Logarithmic dot plots of contaminant concentrations presented in the report are of limited usefulness in depicting plume geometry. Maps should be drafted to display contaminant concentration contours in depth-discrete intervals. Hydrostratigraphic cross-sections should be drafted to display geology, ground water elevation, and contaminant concentration contours in the vertical dimension. The combination of contour maps and hydrostratigraphic cross-sections should better depict the inferred contaminant plume geometry.

In summary, these technical comments largely pertain to my concern that the data as presented do not strongly support the site hydrogeologic model of discrete upper and lower sandy glacial aquifers separated by a peat aquitard. Without additional depth-discrete resolution of hydrogeologic data for the sequence below the peat/peat-equivalent depth, it is just as reasonable to infer

the presence of a single heterogenous aquifer, characterized by gradually decreasing hydraulic conductivity, gradually increasing salinity, and gradually deceasing contaminant concentrations, with increasing depth. Preparation and presentation of appropriate hydrogeologic cross sections and maps of depth-discrete intervals may better corroborate one of these models. Moreover, contention that the peat functions as an aquitard is rendered somewhat extraneous by the observation that contaminants <u>are</u> present in the aquifer stratigraphically below the peat. Consequently, the documented existence, present configuration, and migration history of the contaminant plumes may be more important determinants of future assessment monitoring strategy than a hypothetical ground water flow model.

In addition to the requisite discussion and evaluation of technical data, CT DEP requests that Textron incorporate into its assessment program summary report a written provision for future self-implementing ground water monitoring (GWM) program modification, including program upgrades when warranted, as necessary to adequately document the degree and extent of contamination, and rate of contaminant migration in accordance with 40CFR265.93.

Textron is directed to submit, within 90 days of the date of mailing of this technical review, a written response which fully addresses these technical comments, or incorporates recommendations for further investigations or evaluations necessary to address the comments, with an implementation schedule. The comments may be addressed by Textron in the context of an addendum to the original report submittal, in which this letter is referenced as an appendix. Please free to write or call me at (203) 566-1847 if you have any questions during preparation of your response.

I have evaluated Textron's request for GWM program modification as a separate issue from the technical review of the Assessment report, and have mailed that evaluation to you under separate cover.

Sincerely,

Michael A. Fracasso

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