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memorandum
Environment, Safety, and Health Division
ESH-17 Air Quality Group

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AIRNET ACTION LEVEL DETERMINATION

The current AIRNET "investigate" action levels were determined based on a subjective analysis of the 1996 air concentrations. ["Alert" action levels are determined based on dose, and are not discussed further.] For each AIRNET analysis, a level was selected at which ESH-17 AIRNET personnel would be automatically notified if elevated ambient air concentrations might be occurring. The problem with this approach is that it is not very technically defensible, and it also identified too many "investigates". That is, some air concentrations identified as "investigates", were produced by natural random fluctuations in the concentrations, or by routine weather conditions (windy days cause high uranium, hot weather causes high tritium) and were not Laboratory caused air concentration elevations. So, this project centered on methods for objectively identifying outliers to be eliminated from the ambient air concentrations data sets, prior to calculating the investigate action level. Two general methods were reviewed, a statistical formulation and a method identifying all values above the mean + 3 standard deviations. Investigate action levels would then be calculated using the mean + 3 standard deviations, after all outliers were eliminated from the data set.

Because of the naturally occurring fluctuations, some radionuclides require further analysis than the isotopes that can be represented using only a statistical approach; these will be addressed in a future memo. The remaining ones were represented with the statistical method by identifying potential outliers and removing the points from the calculations. The statistical method for identifying outliers was applied to tritium, americium-241, plutonium-238, and plutonium-239. With the exception of tritium, the results of the isotopes included data starting in 1990. It was necessary to start at that time to ensure enough data points to evaluate. Since the tritium data collection period changed in 1993 to every two weeks, this seemed the best time to start the analysis. These periods were chosen because they were the most representative of current Laboratory operations.

<u>Statistical Methods</u>

With the conclusion of the action level meeting on Monday May 3, it has been determined that a combination of Dixon and Rosner's statistical methods for identifying outliers should be used in the process of calculating the investigate action levels. Both methods are established statistical methods that are endorsed by the EPA in the "Guidance for Data Quality Assessment" (EPA QA/G-9). Since Rosner's method requires at least 25 samples to calculate for outliers, a method

that could evaluate sites with fewer samples was also needed. Dixon's method compliments the Rosner's method because the rules limit the sample size from three to 25.

In the course the study, Craig Eberhart and I saw the need to make a rule alteration of Rosner's method to better suit the study, which was to allow an unlimited number of outliers, instead of a maximum of ten as specified in the EPA document. We chose to do this because after some testing some of the data sets clearly have more than 10 outliers. Limiting Rosner's method to 10 outliers will produce an action level that is too high, and therefore not useful in identifying elevated air concentrations. We do not anticipate excessive investigations due to these lowered "investigate" levels that continuing beyond the method's threshold would create. Plus a review of the original research paper by Rosner did not suggest a maximum of ten outliers. The paper described different methods for obtaining the number of outliers with the maximum number of outliers left open to the person conducting the calculations.

After reviewing the data, it was decided that the results from statistical tests would not be directly applied to stations 27 and 38 in Area G for Tritium, Plutonium-239, and Americium-241measurements. This is because of a known source of contaminants has impacted the air concentration at these stations. The calculations would be run once the extreme points were taken out because the statistical methods would not recognize these elevated concentrations as outliers due to the sheer number of them. The action level calculated without removing the points would, in some instances, be near the 10 mrem standard. Dave Kraig and I determined the extreme points by plotting the station samples over time.

Graphical Method

Over the course of the study, the committee also reviewed a "graphical" method. In this case, outliers were identified as being greater than the mean + 3 standard deviations. The identified outliers were removed from the data set and the mean + 3 standard deviations were recalculated. The method was repeated until no additional outliers were identified. However, this method was shown to identify fewer outliers and would also be more difficult to implement in the AIRNET database. While a majority of the time the "graphical" investigate level was the same as the statistical methods calculation, the "graphical" investigate level was substantially higher in some stations, especially the Area G stations. It is the Area G stations where past activities elevated the amount of radionuclides present in the samples for a time, but levels have since fallen greatly. The statistical method did a substantially better job of detecting these outliers and eliminating them from the determination of action levels.

Study Results

Attached to this memo are the final results of the study in a table. The first two columns identify each station by its number and name. The third column shows the investigation levels calculated with the Rosner's method (R x+3s) for the tritium data. The rest of the columns are the investigation levels calculated with the Dixon's method (D x+3s) or with Rosner's method (R x+3s) for each of the remaining radionuclides.

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