CAC Tonawanda Coke Soil Study Questions and Answers:

Q1. Why was a pilot study performed? What was its purpose?

- *It was necessary to determine how far possible contamination spread. This is why we sampled all the way to the Kaufman Ave. area, which previous air studies indicated to be both the appropriate wind direction and distance away from TCC*
- *Samples were taken at 2 and 6 inches in the pilot study to determine which depth most accurately displayed the historic contamination caused by TCC*

Q2. How was it determined that 6 inches was the appropriate sampling depth?

- *Since TCC was fined and found to be breaking the Clean Air Act, new environmental pollution controls were installed in their smoke stacks; therefore, we would not get an accurate representation of what pollutants were being released prior to the new environmental safety measures from 0 to 2 inches*
- *2 inch sample results can be affected by everyday yard activities*
    - *e.g. the addition of topsoil*
- *The results of the pilot study showed that the 6 inch depth contained contaminants that could be attributed to TCC*

Q3. Can PAHs and heavy metal migration be seen/determined with 6 inch sampling?

- *PAHs are in a class called semi-volatile organic compounds (SVOCs)*
- *Both heavy metals and SVOCs have minimal migration*
- *These contaminants accumulate or are deposited over time*
- *2 inch sample results can be affected by everyday yard activities*
    - *e.g. the addition of topsoil*
- *The results of the pilot study showed that the 6 inch depth contained contaminants that could be attributed to TCC*

Q4. Why are we using 6 inch soil samples instead of the 3 inch maximum indicated by the USEPA?

- *For near surface soil contamination, the EPA and DEC suggest 2 or 6 inch sampling (this was approved by Ben McPherson, DEC representative, and Jon Gabry, USEPA Region 2)*
- *Again, we are looking for historic Tonawanda Coke deposition, which would be best represented by the 6 inch sample depths*

Q5. How do PAHs and heavy metals migrate through soil over time?

- *Soil accumulates or is deposited over time*
    - *e.g. topsoil is newer than deeper soil*
- *Contaminants (e.g. PAHs or heavy metals) are deposited through air as well as moved by human activities (e.g. gardening, lawn use)*

Q6. What is the half-life of the most dangerous PAHs?

- *Half-lives can be examined under laboratory circumstances and are well established in literature for specific contaminants, but PAHs as a class are constantly being emitted and deposited*

Q7. Why are we measuring some analytes that are not part of the coking process (e.g. pesticides)?

- *We are testing for a whole suite of chemicals that may have come from TCC. Pesticide chemicals can be used as a timestamp for the historic deposition, because when they are detected in soil, we know*

the years when they were phased out. We also can use them in GIS analysis as a negative control (knowing they are not from TCC). Further, we are looking for anything that will help to justify a cleanup.

- *Emergency cleanup funds provide the easiest, fastest cleanup (remediation) avenue possible if a problem is identified*
    - *Suing a company can take years and no guarantee of success*

Q8. How was the direction (movement) of the deposition (air) for particulate organic matter determined?

- *The DEC performed an air quality study starting in 2007, which was used as a reference*
- *In order to cover the entire area suspected to have the heaviest amount of contamination, the boundaries of our study were expanded beyond that in the DEC Tonawanda Community Air Quality Study*

Q9. How was the grid designed?

- *Distance and direction to sample from TCC*
- *The grid design was created to provide the most accurate predictions of contaminant concentration in the study area. This means we wanted to maximize the number of samples taken as well as minimizing the distance between sample points*
- *GIS allows us to interpolate (predict) contaminant concentrations only within the borders of our study area*
    - *Therefore, we must extend the boundaries of our study beyond the expected contamination*

Q10. How far did the pollution migrate off site?

- *The answer to this question is one of the expected outcomes of the study*
- *That is why we want to study an area that was larger than the DEC Air Study*
- *Ultrafine particles, which are the most dangerous to human health, can travel far from the pollution source*

Q11. a. Were soil types and weather (e.g. rainfall, temperature) considered for the fate and transport of chemicals in the soil?

- *This type of modeling is routinely done for sampling air and groundwater, soil sampling is different*
- *We will be using interpolation and other modeling techniques to get a predicted value of the contaminants in the study area*
- *To achieve this, we have to create a non-biased sampling plan in the beginning of the study. If we do not have an evenly spaced grid we would be introducing error into our study from the beginning*

b. Was any effort made to predict where the contaminants of concern might be distributed by distance and depth?

- *The interpolation methods we will be using incorporate the distance between samples and the distance to unknown sample points to create an estimate of contaminant concentration*
- *That is why it is important to have an evenly spaced grid sampling plan*

Q12. What is a false negative or a false positive? How do we control it?

- *A false negative means showing no contamination where contamination is present*
- *A false positive means showing contamination where no contamination is present*
- *Advanced GIS (e.g. interpolation methods) are being used to control these phenomena*
- *Using GIS and mathematical methods the predicted contaminant concentrations are based on the whole distribution of samples throughout the study area, not a single point*

    - *This means that the negative influences of false negative or false positive readings are minimized*

Q13. How was the type of sampling chosen (e.g. discrete vs composite)?

- *Composite samples combine multiple soil samples into a single sample. Therefore, if you have one sample with a high contamination value and you mix that with nine other samples with low contamination values, the predicted contaminant concentration value would be affected by the low contaminant values.*
    - *Composite sampling is more expensive causing fewer samples to be taken and potentially missing contamination*
- *Discrete samples are a single soil sample at one location*
    - *Theoretically it is possible to miss contamination if no modeling is done*
- *Using GIS it is possible to minimize the risk of missing contamination because it allows us to estimate or predict unknown concentrations from known concentrations*
    - *The GIS grid created has a maximum distance between points of 500 meters; therefore, given the size of the study area, it would be nearly mathematically impossible to miss contamination or a hot spot that needed further investigation*

Q14. What is the route of exposure at 6 inches? Why aren't we testing the top (0-2 inches) surface soil where human exposure is most likely?

- *The focus of the study will not be on health impacts or risk assessment (this will be the focus of the health study)*
    - *We will share our data with the health study*
- *We are looking at 6 inches because we are concerned about historic deposition*
- *Since TCC was fined and found to be breaking the Clean Air Act, new environmental pollution controls were installed in their smoke stacks; therefore, we would not get an accurate representation of what pollutants were being released prior to the new environmental safety measures from 0 to 2 inches*

Q15. How will the boundaries of contaminated areas be determined and distinguished from non-contaminated areas?

- *Soil Cleanup Objectives (SCOs) from NY, PA, and MA are being used in the study. These states have conservative and stringent guidelines for protecting residents' safety and exposure risk*
- *The boundaries will be determined using GIS modeling, which uses mathematical equations that utilize known concentration values from nearby samples to generate a color contour map of concentration values. Individual sample values will not be identifiable*