This document summarizes the objectives as well as the findings for the Tonawanda Coke Soil Study.

The Tonawanda Coke Soil Study was initiated by the Federal court system as a result of the conviction of the Tonawanda Coke Corporation (TCC) for violating the Clean Air Act.[1] The company was ordered to fund two community-based studies: a two-year soil study (Tonawanda Coke Soil Study) and a ten-year longitudinal health study (Environmental Health Study for Western New York.)

The soil study team was specifically charged by the Judge and the Department of Justice to examine the historic impact of TCC and to identify the portion of the pollution that could be attributed solely to TCC.

Residents in the community were asked to provide permission to take samples from their properties for analysis. Residents were also encouraged to become part of the soil sampling teams. The community was educated about the soil sample collection process and chain of custody. Residents were also encouraged to be part of the Community Advisory Committee, (CAC) to provide feedback on how to communicate results and findings in a transparent manner. The researchers hoped that this would give the residents a sense of ownership in this project and its oversight.

The soil study was designed as a two-phase study.

In the first phase, the goals were to define the boundaries of the study area and provide a general survey of the pollution found in this community. 182 samples were taken at 6" depth, and 73 at 2" depth from properties in Grand Island, the Town of Tonawanda, the City of Tonawanda, Kenmore, and a small section of Buffalo. (Total samples for Phase 1: 255.) All soil samples were sent to an EPA certified laboratory for analysis.[2] Each sample was tested for 168 chemicals in four classes: heavy metals, semivolatile organic chemicals (SVOC), including polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) and volatile organic chemicals (VOC) and pesticide residues. The study of pesticides was a marker for the age of the soil samples, since many of the pesticide compounds were taken off the market some 40 to 50 years ago.

As a result of the analysis of these samples, 6" (depth) samples were determined to be most representative of the pollution caused by TCC. Therefore, all subsequent samples were taken at 6 inches, and further analysis used the concentrations reported at this depth.

The results of their soil sample analysis were included in an environmental model of the contamination in the study area using geographic information analysis (GIA). Over 4000 chemical-specific contaminant maps were created, identifying areas with samples above concentration guidelines set by the US Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYS-DEC.) (These maps are available upon request to the research team and a selected group are on the TCC Soil Study Website at UB:
http://arts-sciences.buffalo.edu/chemistry/tonawanda-coke-soil-study.html.)

Figure 1 summarizes this analysis. The pink star indicates the location of the Tonawanda Coke Corporation. The green outline indicates the boundaries of the study area, and the blue outlines indicate regions of interest where some samples exhibited contaminant concentrations above EPA and NYS-DEC guidelines.

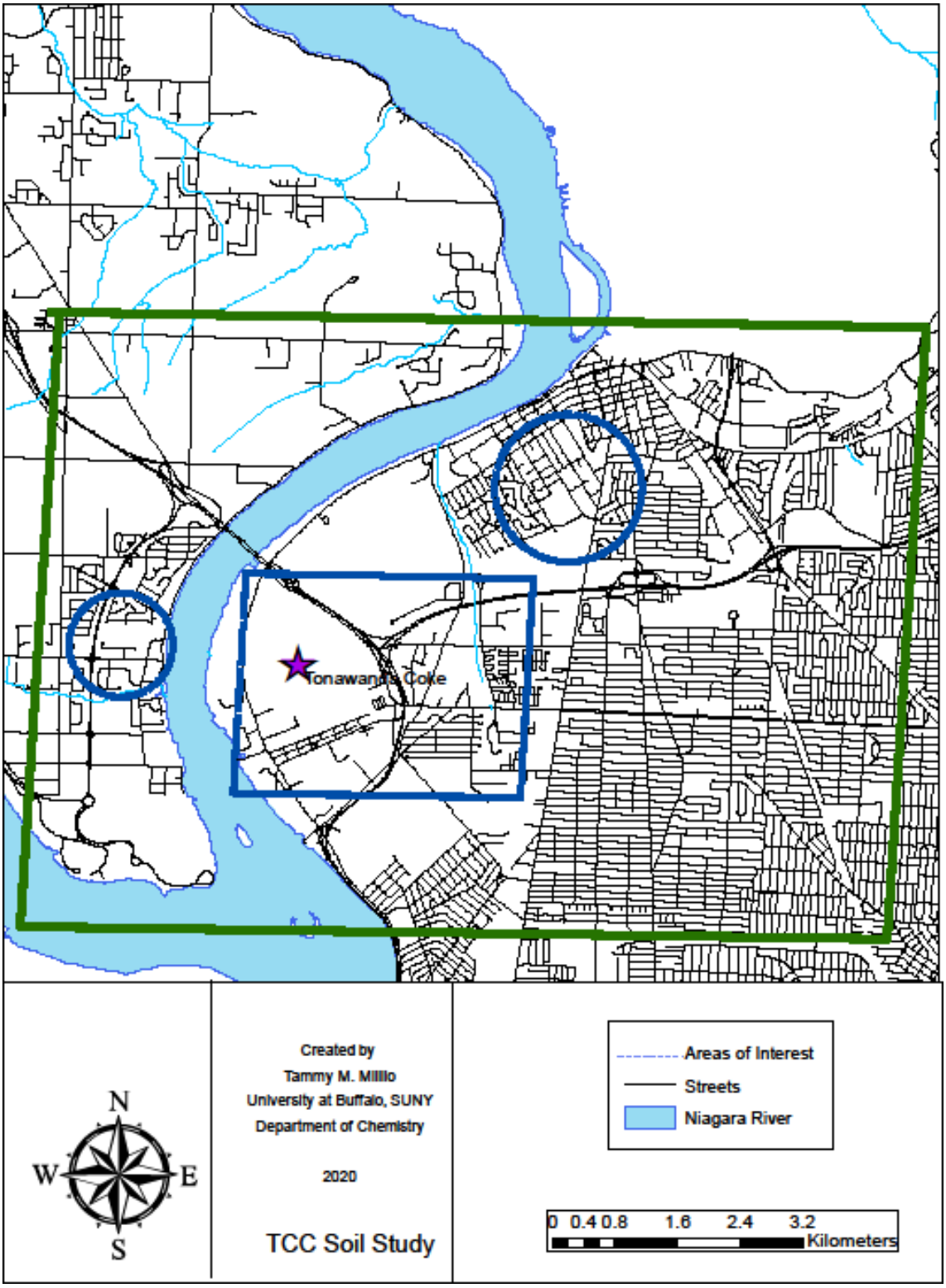

Figure1: Regions of Interest and Phase 1 of TCC soil study. Green outline: Study Area boundary, Pink Star: Tonawanda Coke Corporation, Blue outlines: areas of interest

Using the results found in Phase 1, an additional 95 samples were taken in and around the regions of interest identified in Figure 1. This helped discern where the boundaries of the three regions should be and to identify if there was a consistent distribution of elevated contamination in these areas.

The phase 2 sample results were added to the chemical concentration maps created in Phase 1. This improved the accuracy of the model's predicted concentrations.

An additional finding from phase 2 was that, in the region of interest on Grand Island, high arsenic concentrations were identified on school-district owned properties. This contamination was found as a result of our analyses; however, it was unrelated to TCC. The research team reached out to appropriate school district officials, who worked with the research team and the New York State Department of Health (NYS-DOH) to immediately remediate the affected parking lot and playground areas.

Statistical methods collectively known as Source Apportionment were used to fulfill the second part of the court's order, identifying the portion of the contamination in the community which could be attributed to TCC.

The results of the additional 95 phase 2 samples showed that there were a limited number of samples in the remaining two areas of interest with elevated PAH concentrations. This is a class of contamination known to have carcinogenic properties, and also known to be produced by Tonawanda Coke. However, there are large number of industries in the study area that have permits to release specific amounts of air pollution, as well as the effects of everyday activities such as gasoline combustion. This created challenges for the source apportionment process. It was necessary to combine multiple scientific techniques (GIA, multivariate analysis, chemical analysis) to achieve the objective of source apportionment.

In addition to the community soil samples, reference samples from the soils of TCC, the coke produced by TCC, coal tar (waste from the coking process that could have been produced by TCC, Huntley or other nearby industries), and diesel fuel emissions (produced by industrial truck traffic) were used in the source apportionment analysis.

Similarities existed between the TCC samples and the community samples with elevated PAH concentrations. There is 85% confidence that the elevated PAH at these community locations can be attributed to TCC.

Researchers would typically look for a higher level of confidence in a purely analytical chemistry study (which requires 95-99% certainty.) However, many contributing sources present in the community could not be fully accounted for in this analysis. Other potential sources of contamination include gasoline and diesel combustion emissions from Interstate 190, and emissions from

the Huntley plant. If we had data from those sources the certainty level of the findings would increase had such reference samples been available. The findings are significant enough to say that source apportionment was achieved, and TCC was responsible for a significant proportion of the contamination found.

The researchers wish to emphasize that in the cases where elevated levels of PAHs were found, it was at the 6" soil depth. This means that the residents of these properties should understand that

digging in the soil on their residence may create contact with the affected soil. The residents of these properties will be contacted by researchers after the final meeting to remind them of the responsibility to disclose the testing results to potential buyers of their properties should the current owners wish to sell.

There were delays in the source apportionment portion of this study and contacting residents about the final results, as a result of COVID. A final (virtual) community meeting was scheduled on Feb 24, 2022 to relay these results and findings to the community. This will allow any interested residents to know the results of this project, even if their properties were not sampled as part of the study. The PowerPoint of this meeting and this report will serve as the final communication and work products of the Tonawanda Coke Soil Study.

Citations:

[1] 33 U.S.C §§ 1251 *et seq.*
[2] ALS Environmental, Rochester, NY., https://www.alsglobal.com/
[3] https://cfpub.epa.gov/, accessed 2/10/2022.