

Tonawanda Coke Corporation (TCC) Soil Study

January through October 2019

November 22, 2019

A. Introduction and Summary

This report covers the period from February 1 to November 21, 2019 of the TCC Soil Study, and includes efforts from the Department of Chemistry at the University at Buffalo, SUNY and SUNY Fredonia staff and students, led by the overall Study Principal Investigator, Professor Joseph A. Gardella, Jr and SUNY Fredonia coPI Professor Michael Milligan along with efforts from community volunteers organized by UB Department of Chemistry. Attached are summaries of activities. Budget reports from UB and SUNY Fredonia Department of Chemistry are being provided separately from the Research Foundation of SUNY and UB Sponsored Program services.

The present report will focus on activities *after what was reported in the Tonawanda Coke Soil Study Second Annual Report (July 18 2018 to January 19, 2019) report* (appendix 1). That report was the last report required by the Probation Office.

This report includes:

- The development of final maps from Geographic Information Analysis of Phase 2 data (appendices 2 and 3), and
- A description of efforts by SUNY Fredonia to collect and analyze results from testing for samples of residential air pollution (included in the narrative for this report), and
- a description of community consultation and outreach efforts from February through November 2010 and
- the status of source apportionment studies which determine the amount of pollution that originated from Tonawanda Coke and separated from other pollutions sources in the region.

B. Summary of recent efforts for soil sample collection, testing, data analysis and reports to participants and community.

Phase 2 soil sampling in Table 1 took place from July 2018 following through Summer and Fall 2018. Testing results were formatted, distributed and explained to participants through June 2019. Secondary permissions from participants were collected through July 2019. These secondary permissions allow the use of the testing data from each participant in the GIS mapping for public reporting. The TCC Soil Study Community Advisory Committee (CAC) met monthly from January through July 2019. In consultation with the CAC the SUNY Fredonia team led by Professor Michael Milligan proposed and began implementation of an expanded air sampling study in addition to the reference air sample that was taken at Tonawanda Coke. Community engagement (Tables 2 and 3), including regular Talks with Tammy, continued through August 2019. A public meeting was held on November 21, 2019 to present results from Phases 1 and 2 and current work on source apportionment. These results, when analyzed by the ongoing Phase 2 source apportionment effort, will yield a **comprehensive picture of the legacy of pollution due to Tonawanda Coke in the Town and City of Tonawanda, parts of Buffalo and portions of Grand Island.**

C. Development, Validation and Reporting of Phase 2 mapping results

- **TCC Soil Study Phase 2 Sampling Plan** was developed through outreach to potential participants. As noted in the outreach plan results, ca. 25,000 flyers distributed resulted in over 700 potential

participants for Phase 2 sampling. 129 samples were taken in Phase 2 and results have been evaluated and mapped after consultation by NYS DEC and EPA liaisons.

- **Expanded Air Sampling Study** proposed by Prof. Michael Milligan in response to discussions with the CAC was reviewed and implemented for six of nine residential samples
- **Tonawanda Coke leadership provided access for Court ordered soil sampling (October 12 2018) and air sampling (October 15 2018) just before the closure of the plant. These samples were tested for all pollutants involved in Phase 2 evaluation. The results have been under analysis as part of Phase 2 Source Apportionment work**
- **Several samples from elementary school sites in the Grand Island Central School District had elevated levels of Arsenic. One of these samples had high levels of polycyclic aromatic hydrocarbons (PAHs).** Because these samples were near other samples that had no elevated levels of contamination, we determined that highly localized contamination was not likely due to deposition from air emissions from TCC. We alerted NYS DEC liaisons and NYS DOH to the results. DEC indicated that these results would be the responsibility of the school district. We worked with the Grand Island Central School district leadership in reporting this to the Board of Education and then at a public meeting in December. The district is developing and implementing a remediation plan for the sites.
- **Soil sampling at the City of Tonawanda Schools** yielded no sites of contamination above SCOs and was reported to the Board of Education in December, 2018. This was an important result that affects the interpretation contamination distributions in the northwest Region of Interest in the City of Tonawanda (see ROI map below, Figure 1).
- **Detectable levels of Poly Chlorinated Biphenyls (PCBs)** were found at residential sampling sites near the previously remediated Spaulding Fibre Superfund Site in the City of Tonawanda. Because Spaulding Fibre had serious PCB contamination on site, the NYS DEC implemented follow-up residential sampling in the residential area closest to the cleaned up Spaulding Fibre site. No further concerns were identified and since values were below DEC Part 375 SCO's no action was anticipated.

D. Map Development from Phase 2 (Dr. Tammy Milillo)

Phase 1 maps were completed and reported for the January meeting and in the previous report (appendix 1). A map packet from the January 16 2019 meeting is available at the UB Chemistry website (see above). Over 4000 maps were created using multiple versions and strategies for the nearly 165 chemicals that were tested in Phase 1. The maps were optimized to minimize error in the estimates of spatial distribution of pollutants. 65 contaminants were identified with levels elevated above Soil Clean-up Objectives (SCOs). The Phase 1 mapping results led to the the decision to choose three specific regions of interest for Phase 2 sampling (see Figure 1 below). A summary of sampling, testing and secondary permissions data for Phase 2 is shown in Table 1. Phase 2 test results were evaluated and permissions gained from 129 samples from residences, schools and churches. The final design of the Phase 1 maps and the data within were used as the basis for Phase 2 maps, which combine both Phase 1 and Phase 2 data (see Figures 2-8 below, and Appendix 2).

Table 1: Summary of Phase 2 Sampling, Testing and Sites not approved for further study

Number of samples taken	Residences used in mapping	School/Church sites	Number of sites w/o permission for data use
131	87	42	15

Phase 2 also includes a detailed analysis of source apportionment¹, as described in the UB led proposal approved by Judge Skretny. This is described in sections E and F.

Figure 1: Map of Regions of Interest from Phase 1

A map showing the Tonawanda Coke Soil Study area. The Tonawanda Coke Plant is marked with a star. The solid pink line indicates the boundary of the study area, where soil samples have been taken in Phase I sampling. Dashed blue lines indicated regions of interest (ROIs) that soil study researchers investigated in Phase II sampling based on mapping results in Phase I. The boundaries of the ROIs were tested in Phase II sampling by taking samples on both sides of the boundaries. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study

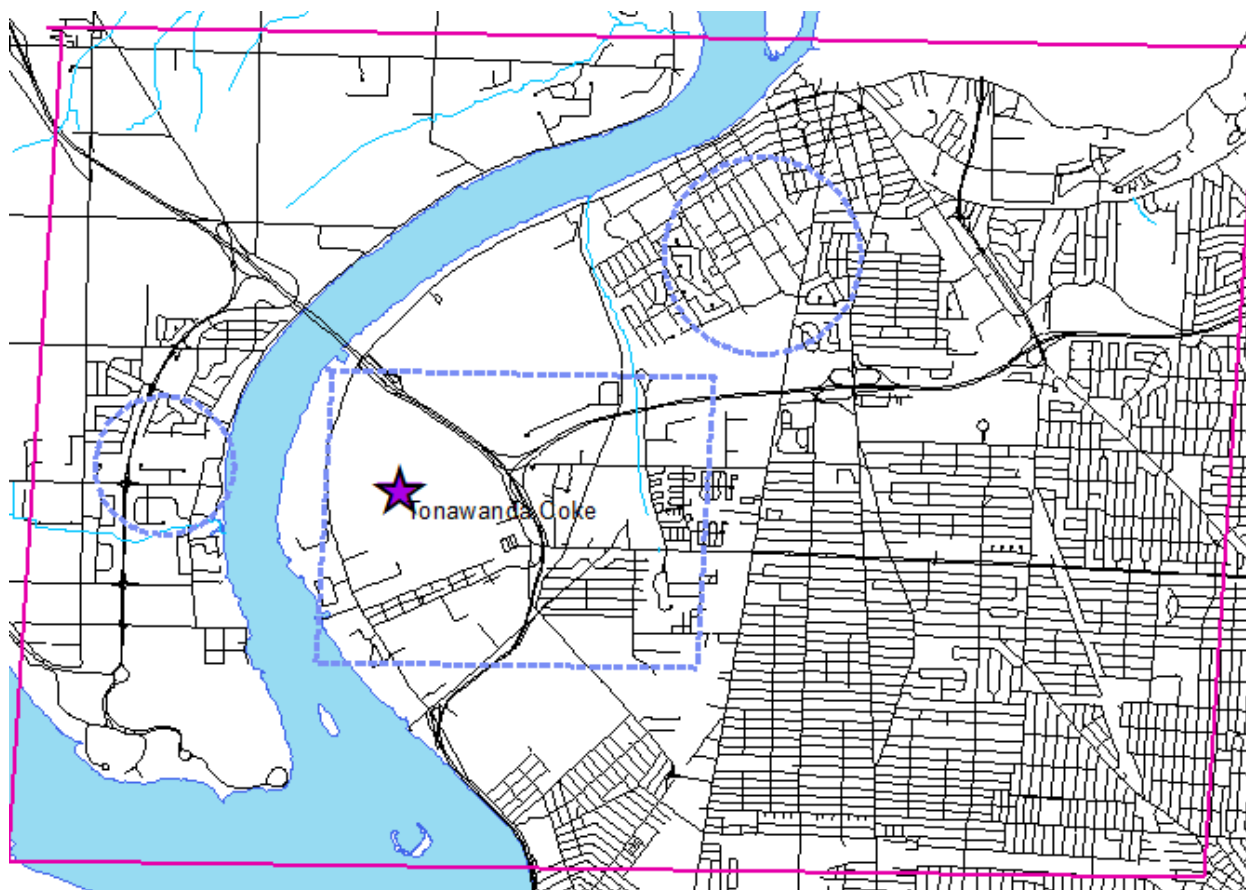


Figure 1 shows the three Regions of Interesting (ROIs) that were a major focus of Phase 2 sampling. The boundaries shown for the ROIs were first estimates. Phase 2 sampling tested the boundaries by taking samples and gathering data on both sides of the boundaries. In addition, as noted above, Phase 2 included sampling at all sites from Grand Island Central Schools and City of Tonawanda Schools. The results from the City of Tonawanda Schools were within the northwest ROI in the City of Tonawanda and

¹ Hopke P.K. (1995) The Mixture Resolution Problem Applied to Airborne Particle Source Apportionment. In: Einax J. (eds) Chemometrics in Environmental Chemistry - Applications. The Handbook of Environmental Chemistry, vol 2 / 2H. Springer, Berlin, Heidelberg

P. Hopke, (2015) Chemometrics applied to environmental systems, Chemometrics and Intelligent Laboratory Systems 149 205–214 <http://dx.doi.org/10.1016/j.chemolab.2015.07.015>

J. S. Wallace Modernizing Environmental Analysis: Mass Spectrometry as a Tool for Investigating and Answering Salient Environmental Questions, Ph.D. Dissertation, May, 2016.

no samples showed elevated levels of chemicals, giving the City of Tonawanda Schools a clean set of results, which contributes to resolving many concerns to that ROI. The results of concern from the Grand Island Schools (two small sites where Arsenic and PAHs (Kaegebein Elementary) and Arsenic (Sidway Elementary) validated the follow up in the ROI on the south of Grand Island. However, the elevated levels were localized to small areas of a parking lot for Kaegebein Elementary and area outside a playground at Sidway Elementary. TCC Soil Study staff along with Dr. Gardella assisted planning by the Grand Island Central Schools. This has allowed for remediation of these sites that is presently underway.

The maps in Figures 2-8 (appendix 2) show the estimated spatial distributions of PAHs (Figures 2 and 3), one type of Polychlorinated Biphenyls (PCBs) Arochlor 1016 (Figure 4), Lead (Figure 5), Arsenic (Figure 6), Cyanide (Figure 7) and Mercury (Figure 8).

Figures 2 and 3 show higher concentration levels of PAHs near neighborhoods in the northernmost part of the industrial area east of River Road, where Tonawanda Terminals and Infinity Plastics and across to Two Mile Creek Road and City of Tonawanda residential areas. The results from the City of Tonawanda Schools show that all of the school sites in that area have very few contaminants near or above SCOs. Inspection of the underlying data in that region show a few scattered areas where samples showed levels elevated above the SCO for Benzo(a)Pyrene (BAP) Equivalents (a metric that uses a summation of values from all PAHs tested by EPA methods). This is the preferred method used by EPA to evaluate PAH contamination. However, all maps of individual PAHs, such as figure 3 show the same darkened areas, but under DEC analysis (which examines a series of individual PAHs with high carcinogenicity) again, there were a few sites with levels above SCOs and no evidence of systematic area wide contamination.

There is also an area of high PAHs near the Rails to Trails Bicycle/walking path east of Colvin and Starin Avenues. This area was show in Phase 1 to have a few isolated high levels of PAHs at the 2 in and 6 in sampling depths, mainly in homes close to or even adjacent to the old railroad line.

Figure 4 shows results from one of a series of tests for Poly Chlorinated Biphenyls (PCBs). The results are due to a few isolated results of low levels of PCBs at residences near the remediated Spaulding Fibre Corp site in the City of Tonawanda. As noted in section C, the Soil Sampling team felt that these results were likely not from Tonawanda Coke's use of PCB laced materials but from Spaulding Fibre. We reported this to the DEC Region 9 staff serving as liaisons to the Soil Study. DEC staff chose to follow up at one residence that had the highest value PCB result, and take additional samples at 2 inches close to the exact position of the original test result. These results showed no PCB contamination at levels above SCOs and, when combined with the other low level PCB detection at other residences they determined that no further follow up was needed. The Soil Study team agrees with this conclusion.

Figure 5 shows results from analysis of lead with only one area with levels of lead that were higher than the rest of the sampling areas, mainly due to a few samples where lead was above SCO values. Again, in that area, focused sampling at the City of Tonawanda Schools saw no elevated lead results. We believe that Lead is not related to Tonawnda Coke emissions. These results show no concerns for lead contamination in the study area.

Figure 6 shows results from Arsenic, with very few samples showing levels above the SCO. The overall spatial pattern of the arsenic results is one expected from the emissions from air deposition focused on the area that includes Tonawanda Coke and the former Huntley Plant. We plan to use the geospatial data to help consider whether Arsenic is a component of Tonawanda Coke's emissions.

Figures 7 and 8 are maps of Cyanide and Mercury. Neither maps show evidence of pollutant concentrations above SCOs. These results are not of concern for residents, but the results from Cyanide could be associated with TCC and Mercury which likely is from the Huntley Plant are useful for source apportionment efforts.

Figure 2 Map

Map of Benzo[a]pyrene (BAP) equivalents in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of BAP equivalents increases. Samples taken on properties owned by the Town of Tonawanda and the City of Tonawanda are excluded, due to lack of permission from elected officials. BAP equivalents are a measure used by the EPA to evaluate polycyclic aromatic hydrocarbon (PAH) concentrations. The TCC soil study used an SCO of 1 mg/kg for BAP equivalents. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study

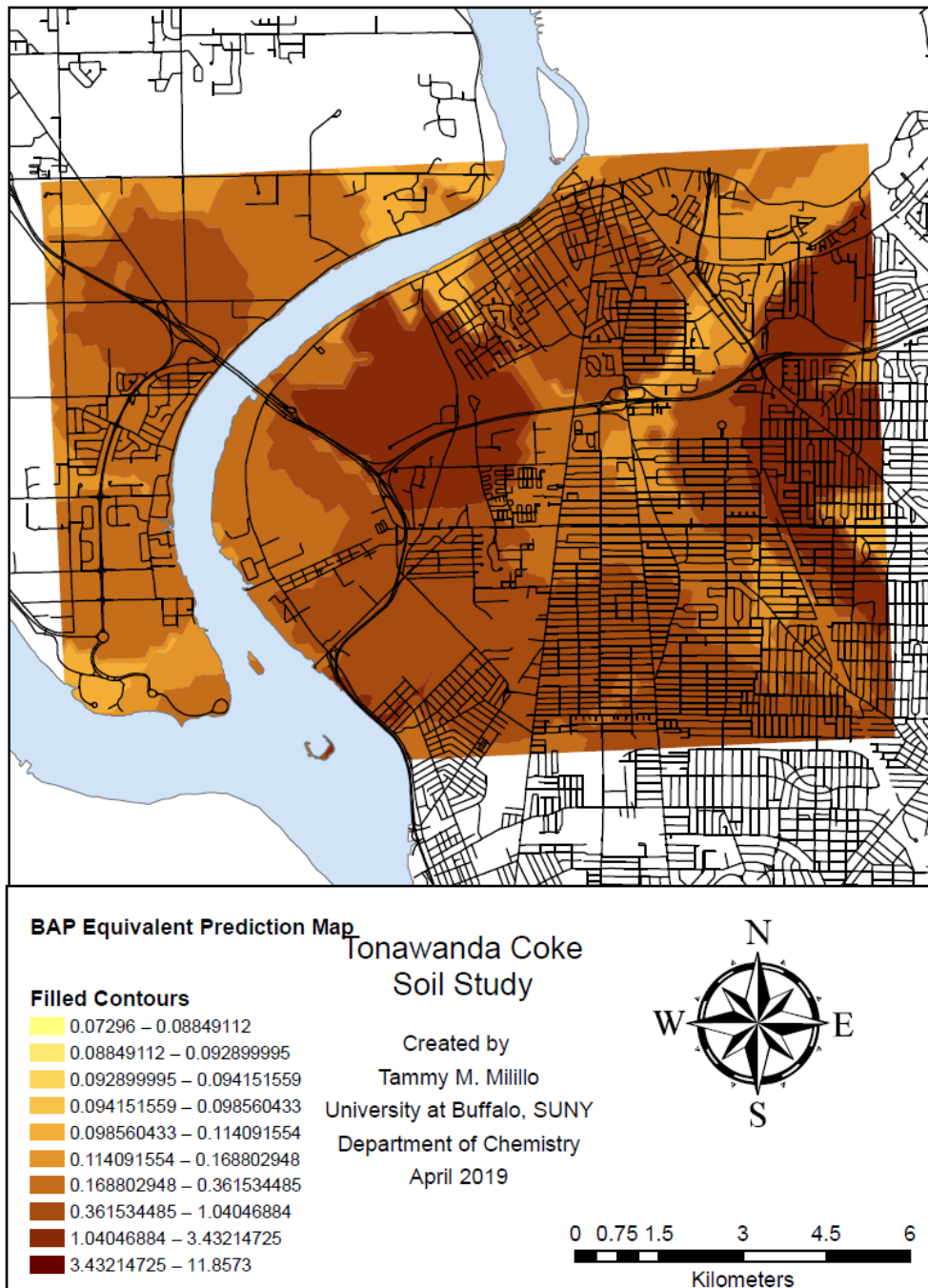


Figure 3 Map

Map of Benzo[a]pyrene (BAP) in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of BAP increases. Samples taken on properties owned by the Town of Tonawanda and the City of Tonawanda are excluded, due to lack of permission from elected officials. The TCC soil study used an SCO of 1 mg/kg for BAP, Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study

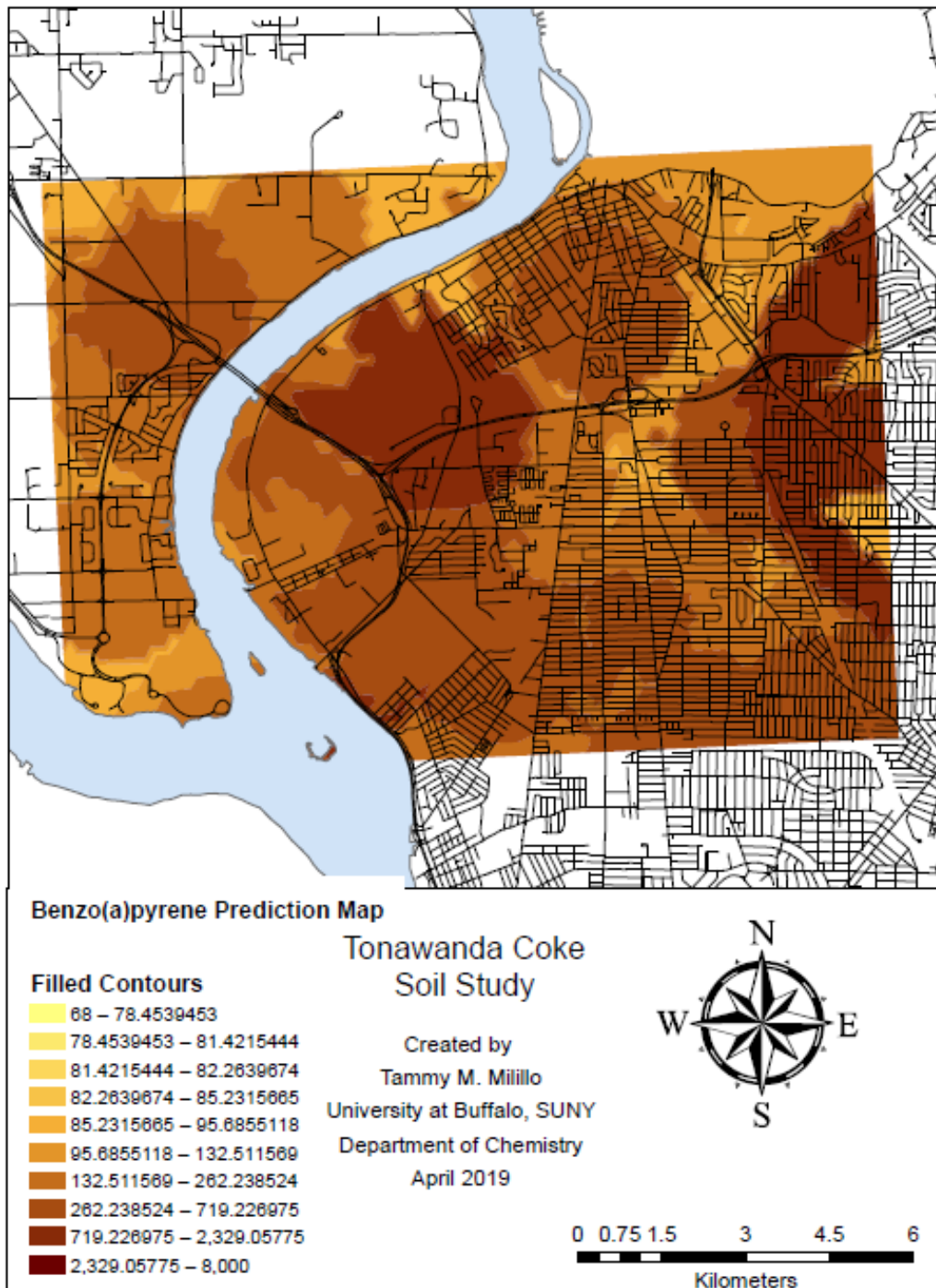
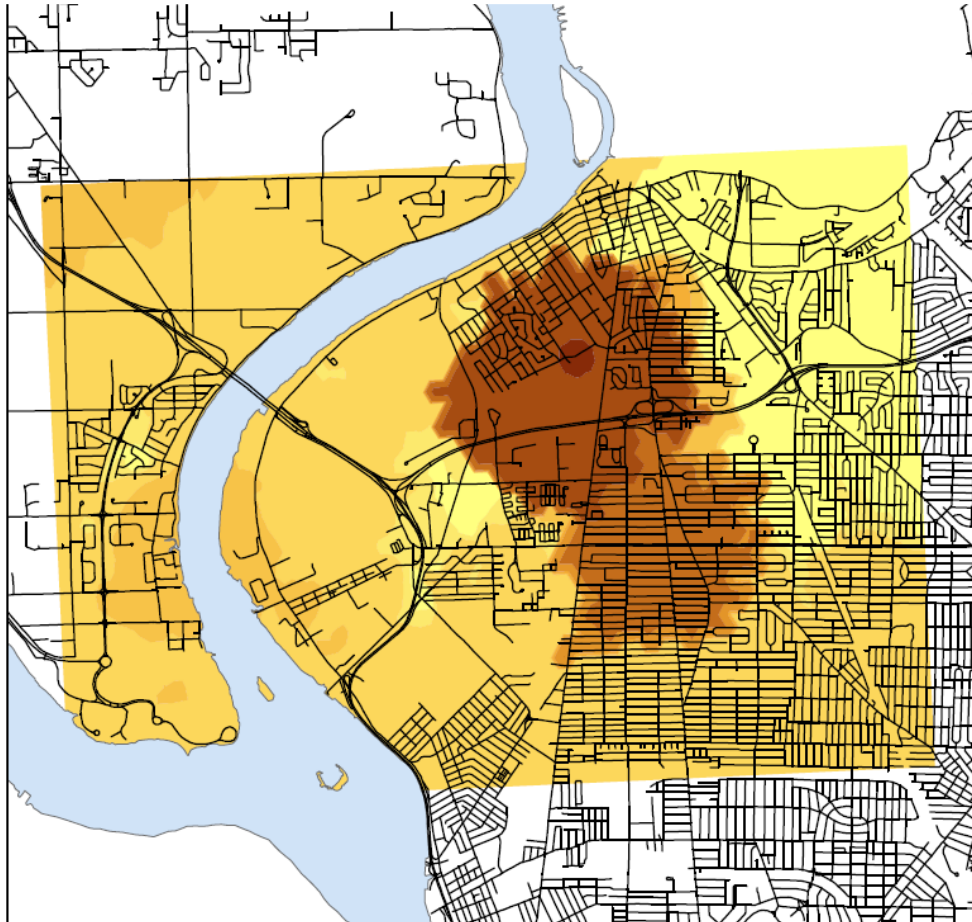


Figure 4 Map

Map of Arochlor 1016 in $\mu\text{g}/\text{kg}$. The map shows the modeled surface, as the color darkens, the predicted concentration of Arochlor 1016 increases. The TCC soil study used an SCO of $9000 \mu\text{g}/\text{kg}$ for Arochlor 1016. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study



Arochlor 1016 Prediction Map

**Tonawanda Coke
Soil Study**

Filled Contours

- 36 – 39.1519045
- 39.1519045 – 40.1019398
- 40.1019398 – 43.2538443
- 43.2538443 – 53.7108269
- 53.7108269 – 88.4036561
- 88.4036561 – 203.503054
- 203.503054 – 585.365004
- 585.365004 – 1,852.25737
- 1,852.25737 – 6,055.38959
- 6,055.38959 – 20,000

Created by
Tammy M. Milillo
University at Buffalo, SUNY
Department of Chemistry
April 2019

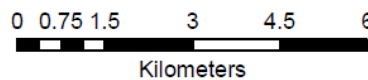
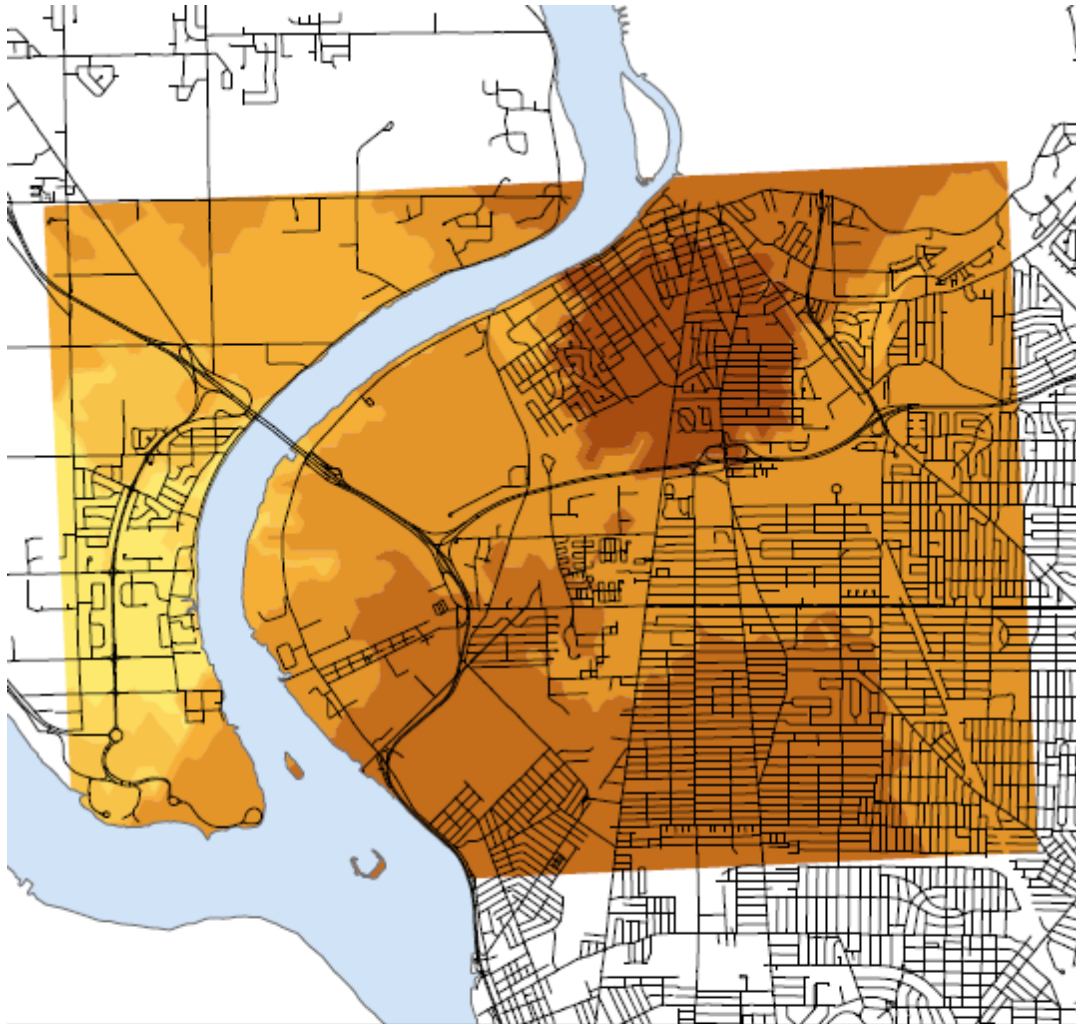


Figure 5 Map

Map of lead in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of lead increases. The TCC soil study used an SCO of 200 mg/kg for lead. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study



Lead Prediction Map

Filled Contours

11.3 – 24.5194597
24.5194597 – 29.2893169
29.2893169 – 31.0103809
31.0103809 – 35.7802381
35.7802381 – 48.9996978
48.9996978 – 85.6368779
85.6368779 – 187.175291
187.175291 – 468.58476
468.58476 – 1,248.49934
1,248.49934 – 3,410

**Tonawanda Coke
Soil Study**

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April 2019

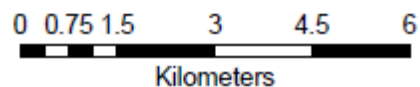


Figure 6 Map

Map of arsenic in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of arsenic increases. The TCC soil study used an SCO of 8 mg/kg for arsenic. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study

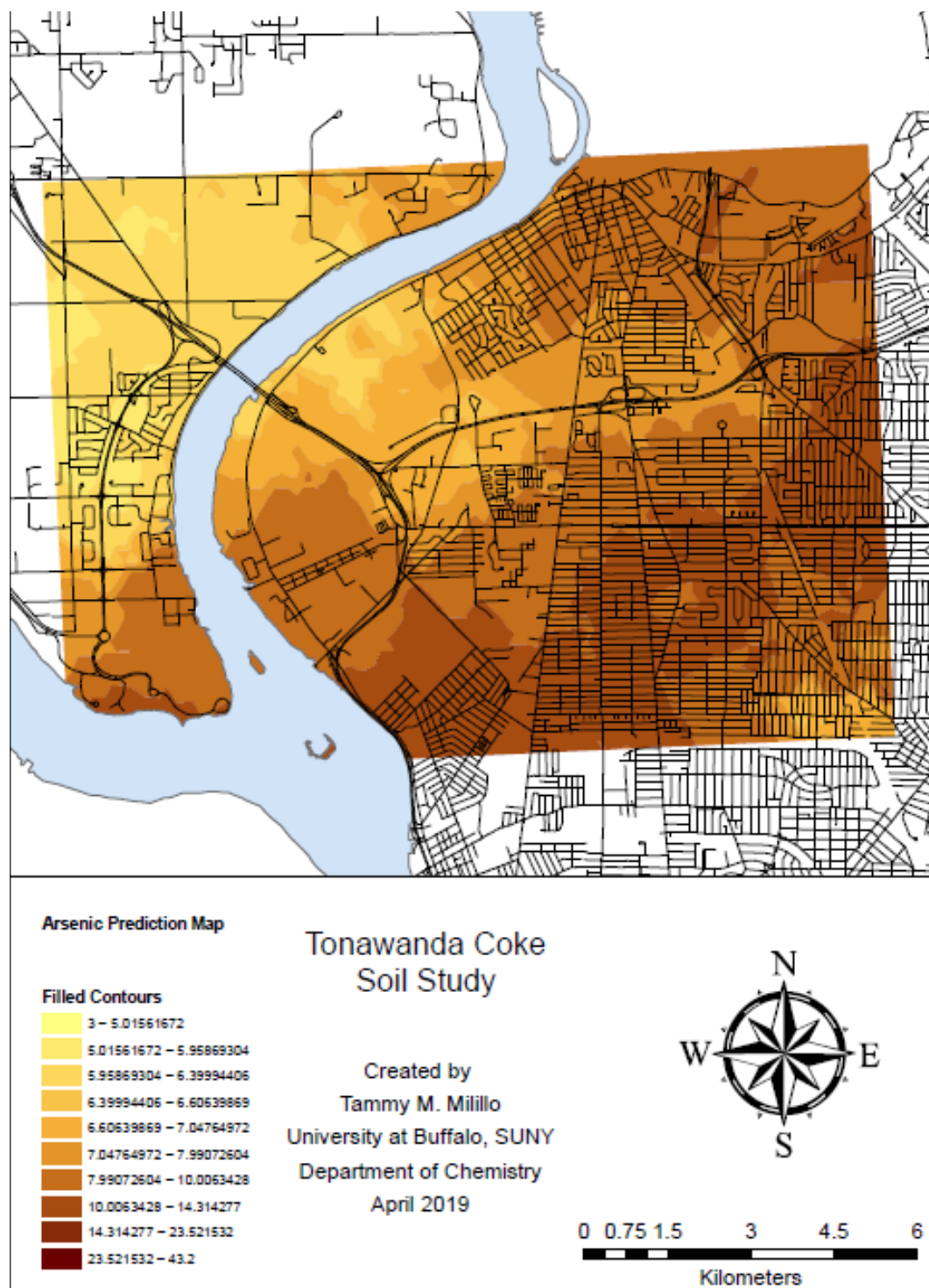
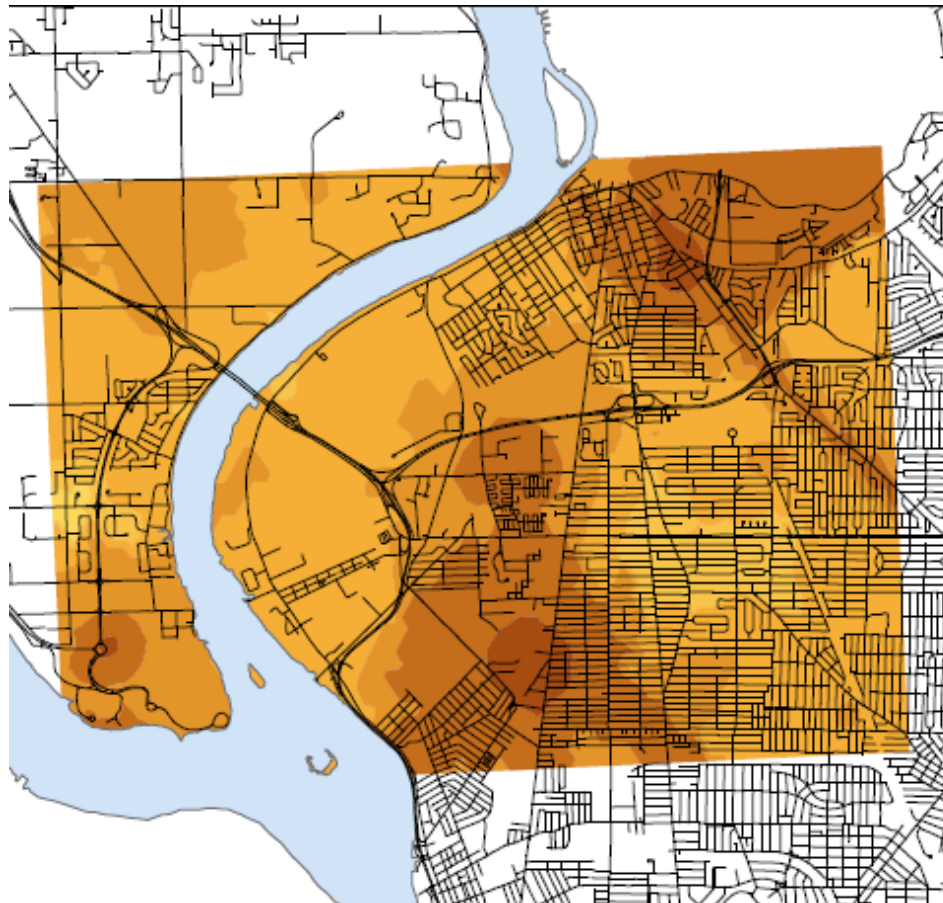


Figure 7 Map

Map of cyanide in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of cyanide increases. The TCC soil study used an SCO of 27 mg/kg for cyanide. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Cyanide is not a suspected contaminant from Tonawanda Coke, but it may provide necessary information for distinguishing Tonawanda Coke Corporation impact compared to other industries in the area. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study



Cyanide Prediction Map

Filled Contours

0.096 – 0.149988526
0.149988526 – 0.174749049
0.174749049 – 0.18610486
0.18610486 – 0.210865382
0.210865382 – 0.264853909
0.264853909 – 0.382571981
0.382571981 – 0.639247712
0.639247712 – 1.19891055
1.19891055 – 2.41921485
2.41921485 – 5.08

**Tonawanda Coke
Soil Study**

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April 2019

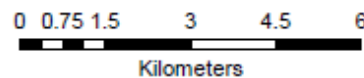
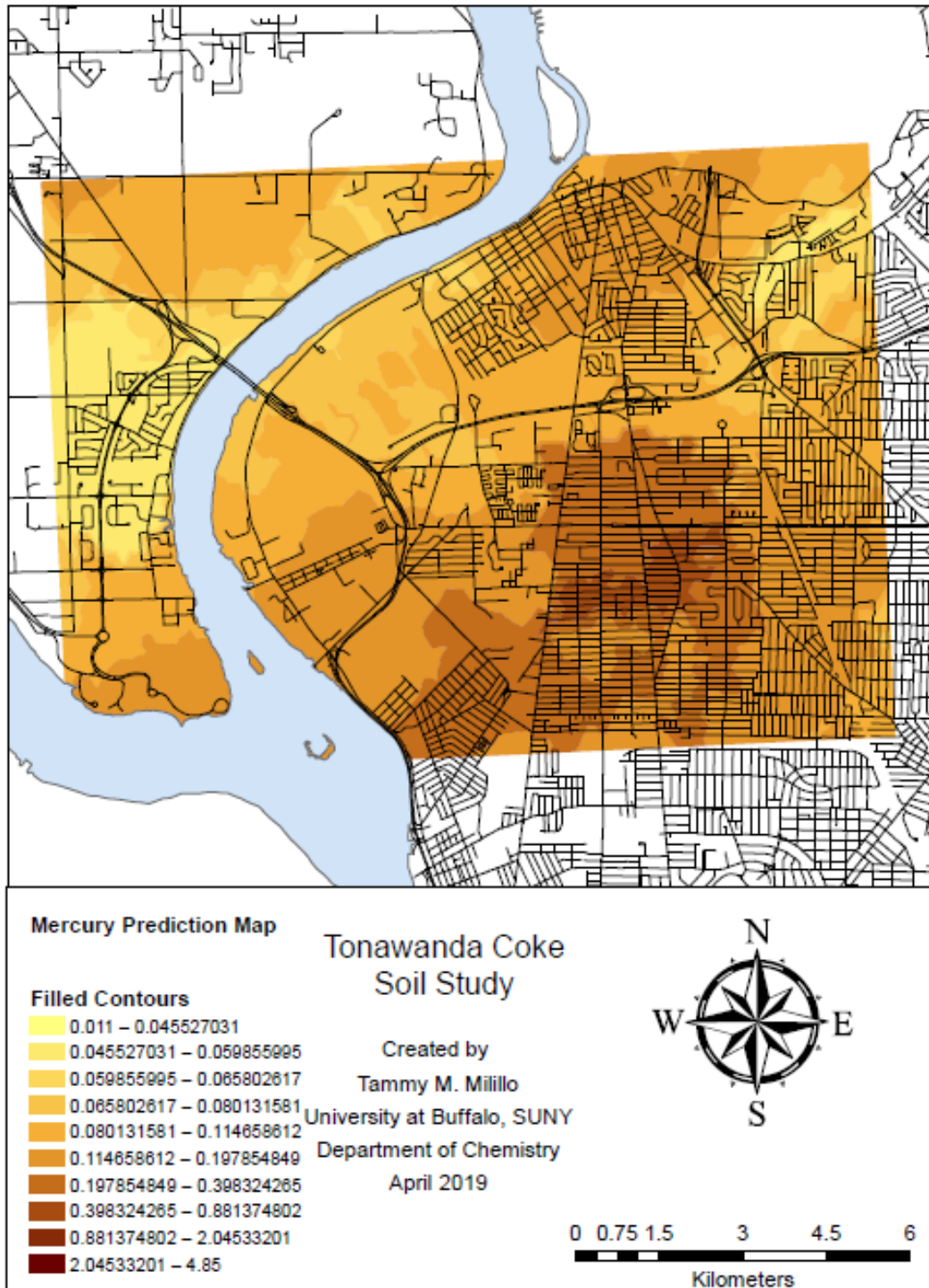


Figure 8 Map

Map of mercury in mg/kg. The map shows the modeled surface, as the color darkens, the predicted concentration of mercury increases. The TCC soil study used an SCO of 0.1 mg/kg for mercury. Intervals below the SCO are of no immediate concern to residents. Intervals which contain values above the SCO do not directly correlate to risk. Credit: Dr. Tammy Milillo/Tonawanda Coke Soil Study



**E. Expanded Air Study, SUNY Fredonia
Determining the Environmental Impact of Coke Oven Emissions Originating from Tonawanda Coke Corporation on Surrounding Residential Community**

Progress Report for Subcontract awarded to SUNY Fredonia, Co-PI Michael S. Milligan

02-01-19 to 11-01-19

Progress

- As reported in the previous progress report, we completed an air sampling run at the Tonawanda Coke facility in October 2018, and six air sampling runs at residences near the Tonawanda Coke facility in January of 2019.
- In July of 2019, we conducted four high-volume air sampling runs at the SUNY Fredonia Acid Rain Monitoring field site in Stockton, NY. This field site is located in a rural area up on the Chautauqua ridge, with few local sources of polycyclic aromatic hydrocarbons (PAHs), and will be used as a background site in which to compare with the Tonawanda air samples.
- The above samples, eleven in all, are currently being extracted and analyzed by ALS Global labs in Burlington, ON, for the standard list of polycyclic aromatic hydrocarbons and an extended suite of substituted polycyclic aromatic hydrocarbons. We expect to have the results delivered to us in a matter of days of this writing.
- Continued work on the development, improvement, and refinement of analytical methods using comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry (GCxGC-TOF) to be used for non-targeted analysis of soil sample extracts and air samples. Our hope is to identify unique chemical markers as part of the Source Apportionment efforts to the coking industrial process from soil samples collected during the Phase 1 and Phase 2 elements of this project.
- Assisted in the analysis and interpretation of the analytical results generated from the Phase 1 and Phase 2 soil sampling procedures.
- Attended monthly meetings with the Community Advisory Committee (CAC) to provide updates with the details of our progress.
- Supervised an undergraduate research assistant (Justin Dunlap) for the summer of 2019 and the 2019 fall semester. His responsibilities included assisting in optimizing analytical and instrumental techniques for soil and air analyses, and in the deployment and operation of the high-volume air sampler.

Plans

- After receiving the analytical results for the air sampling efforts described above, we will process all of the data and generate a report summarizing our results and conclusions. This report will be published on our Tonawanda Coke Soil Study webpage maintained by UB, and will be presented at any public meetings to be held in the future.
- We have received soil extracts from residential sites close to the Tonawanda Coke facility, and from background residences at the outer rim of our study plan. We will continue to analyze these samples using GCxGC-TOF techniques in the Fredonia lab to try to identify unique chemical markers from the coking process. These results will aid in our efforts to apportion pollutants generated from Tonawanda Coke separate from other possible sources.

F. Source Apportionment studies

Source Apportionment is the practice of deriving information about pollution sources and the amount they contribute to total pollution results (at a “receptor site”) from air and soil. Source apportionment requires complex data analysis strategies and identification of unique characteristics of each sources

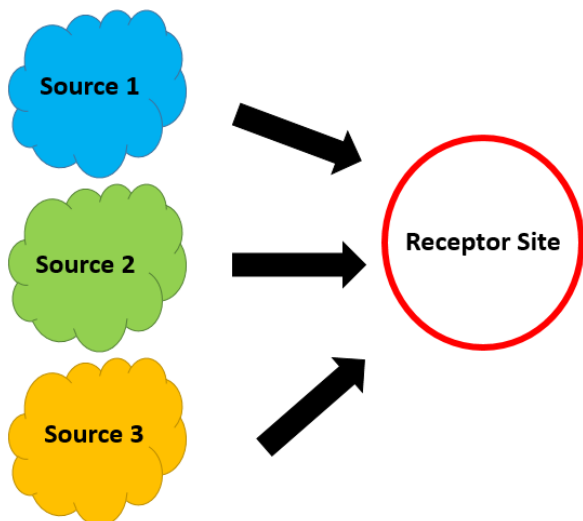


Figure 9: A schematic relevant to source apportionment, where three sources contribute to the receptor site (in our case soil pollution)

that allows the separation of contributions of chemical data. Figure 9 is a schematic of the relationship between emission sources and the total impact on soil at a particular receptor site, for example a residence or a park.

In addressing the effort we benefit from extensive efforts in the literature on PAH source apportionment. A key effort has been Dr. Joshua Wallace’s dissertation¹ which describes a path to source apportionment using added information from Time of Flight Secondary Ion Mass Spectrometry (TOF-SIMS). The work benefits from knowledge about the formation of PAHs due to combustion

processes that occur at different temperature levels. Figure 10 shows a schematic of the formation processes. Figure 11 (below, right) shows the schematic of the work flow for our laboratory based work that is underway.

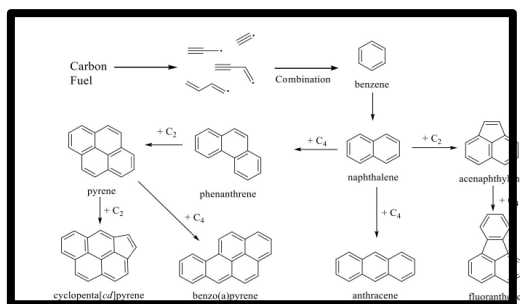
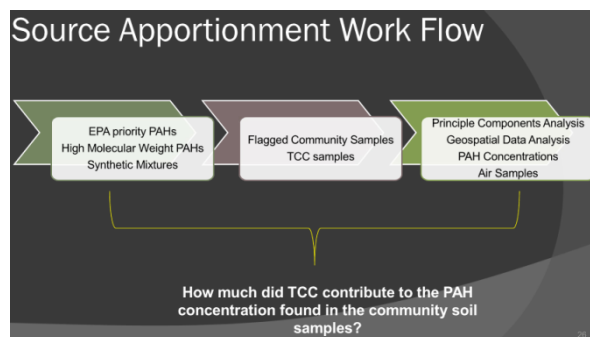


Figure 10 Schematic of PAH formation mechanisms.



The final three figures over leaf (12, 13, 14) include figure 12 a general depiction of and example of the deposition of airborne PAHs from multiple sources that requires source apportionment that is useful for explaining the process. Figure 13 is the list of the PAHs considered by EPA as priority pollutants, with those compounds labeled with a star to be considered as potential human carcinogens. Finally, Figure 14 shows some preliminary results from TOF SIMS of PAH reference samples that reveal high mass PAH compounds that can be used as new and additional information to identify the particular distribution of PAHs that is unique to TCC emissions. This information, SUNY Fredonia’s additional mass spectrometry work will be combined in a multivariate statistical and geospatial data analysis to identify TCC’s separate contribution to PAH concentrations in the residential areas near TCC identified as the region in Figure 1.

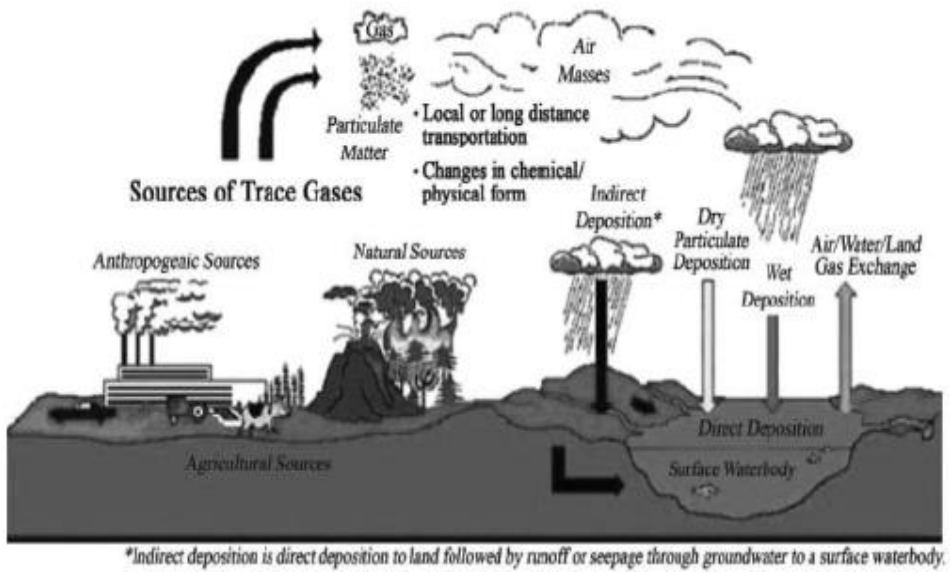
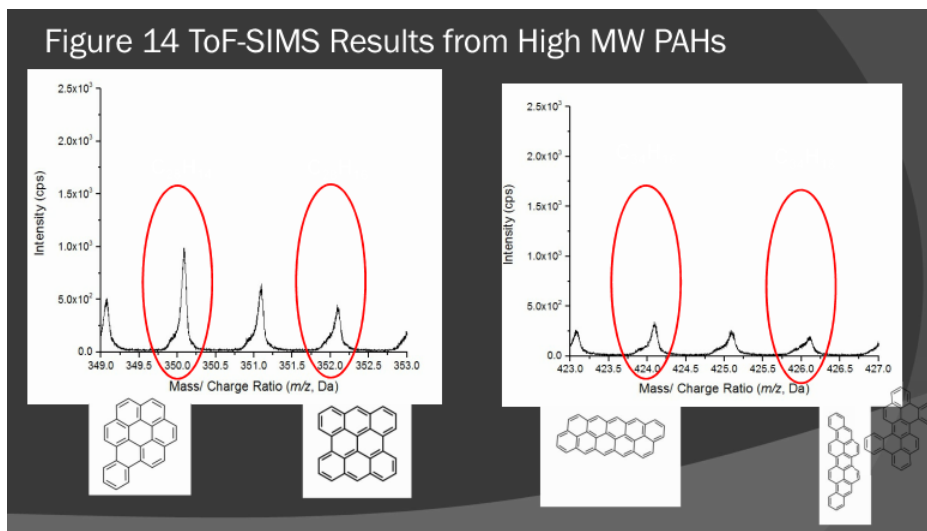
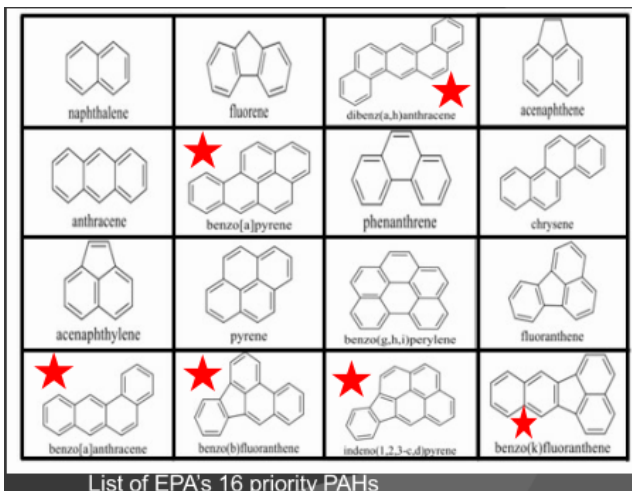


Figure 12 Schematic of Airborne Deposition of PAHs



G. Outreach and Community Education

First and foremost, monthly Community Advisory Committee (CAC) meetings for the TCC Soil Study continued from February through July at the Kenmore Public Library on Delaware Ave (with one meeting at UB for a tour of facilities) on Wednesday evenings at 6pm. These were announced on the Friends of the Tonawanda Coke Soil Study Facebook page.

Additional informal “Talks with Tammy” meetings were led by Dr. Tammy Milillo (Table 2). These regular public availability sessions were announced as events on our Friends of the Tonawanda Coke Soil Study Facebook page and continued through the end of August, 2019, when Dr. Milillo’s appointment on this project ended. “Talks with Tammy” events are informal sessions located at a local restaurant. As Phase 2 of the study progressed “Talks with Tammy” events are places where participants in the soil study can pick up their soil study report and have a private consultation about their results. Many residents have questions about their result packet; these events give participants an in-person option to discuss their results in addition to other options such as a phone call or a meeting in the participant’s home.

Table 1: Talks with Tammy event dates, locations, and number of attendees.

Event Location	Date	Number of Attendees
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Tuesday 1/8/19 6-8pm	2
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Wednesday 1/23/19 6-8pm	3
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Monday 2/4/19 6-8pm	2
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Friday 3/22/19 6-8pm	3
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Monday 4/1/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Monday 4/8/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Wednesday 4/17/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Friday 4/26/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Thursday 5/9/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Monday 5/20/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Thursday 6/13/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Tuesday 6/25/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Thursday 7/11/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Tuesday 7/23/2019 6-8pm	
Panera Bread – 1747 Sheridan Drive Tonawanda, NY 14223	Tuesday, 8/13/2019 6-8pm	

Also released were updated FAQ sheets, CAC meeting minutes and all previous reports from the TCC Soil Study to the Probation Office along with the Powerpoint presentation and map packet that was presented by Dr. Gardella at the public meeting on the TCC Soil Study on November 21 2019. These are all posted at UB's Department of Chemistry Website at

<http://arts-sciences.buffalo.edu/chemistry/tonawanda-coke-soil-study.html>

Social media communication through Facebook, Twitter and Instagram accounts were maintained for Friends of Tonawanda Coke Soil Study.

Social Media Outreach Statistics

Table 2: Number of followers for social media accounts.

Facebook	Instagram	Twitter
249	25	10

We keep our Facebook followers engaged with our page by regularly posting about relevant science articles, current events, and updates about the soil study.

The number of people who we have reached through our Facebook posts have been purely "organic" meaning that people who see the post are those who have either liked our page, or who have seen a post that has been shared from our page. We have not used the "Boost" feature, which posts content to others who are not friends of the page for a fee.

Table 4 shows events and meetings scheduled by Tess Morrissey and attended by Ms. Morrissey, Dr. Gardella and Dr. Milillo in an effort to promote transparency, knowledge about the research and to make information about the soil study more readily available to community members.

Table 3: Summary of soil study meetings.

Meeting Name	Location	Date	Purpose	Approximate # Attendees
Presentation to Grand Island School Board	Grand Island Schools	12/10/18	Explain interpretation of results from samples taken at Grand Island Schools.	25
Community Meeting	Grand Island HS Auditorium	12/17/18	Explain interpretation of results from samples taken at Grand Island Schools.	20
Meeting with Elected Official	Erie County Hall, Buffalo, NY	11/14/19	Explain interpretation of Phase 1 results, maps, and plan for Phase 2 to Legislator Kevin Hardwick. Provided opportunity to share questions and concerns.	2
Meeting with Elected Officials	Town of Tonawanda Town Hall	11/20/2019	Explain interpretation of Phase 2 to Supervisor Joe Emminger. Provided opportunity to share questions and concerns.	10 (including CSCR representatives)

Next Steps

1. We will complete the collaborative effort for source apportionment analysis of contributions from Tonawanda Coke and separating these results from other polluters in the area.

List of Appendices

Appendix 1: Tonawanda Coke Soil Study Second Annual Report (July 18 2018 to January 19, 2019)

Appendix 2: Map Packet released at November 21 public meeting with Phase 2 sampling and testing results

Appendix 3: Powerpoint presentation from November Public Meeting.

Appendix 1: Tonawanda Coke Soil Study Second Annual Report (July 18 2018 to January 19, 2019)

Appendix 2: Map Packet for Public Meeting on November 21, 2019

Appendix 3: Powerpoint for November 21st Public Meeting on Phase 2 maps