Ambient Air Toxics Monitoring Project Summary
Glasgow Borough, Beaver County, Pennsylvania

April 29, 2016

In the summer of 2014, residents of Glasgow Borough, Beaver County (population 60 in 2010 U.S. Census) contacted the U.S. Environmental Protection Agency (EPA) Region III Air Protection Division in Philadelphia about the potential adverse impacts of toxic metals emitted from S. H. Bell Company's East Liverpool Terminal and nearby metals processing facilities in East Liverpool, Ohio and Midland, Pennsylvania. The S.H. Bell East Liverpool Terminal is bisected by the PA/OH border lying partially in Glasgow Borough, PA and partially in the City of East Liverpool, OH. The S.H. Bell facility receives bulk shipments of steelmaking amendments, repackages and bulk distributes these amendments to commercial customers.

In response to the community's concerns, EPA Region III contacted DEP. Based on those concerns, DEP's Air Quality Monitoring Division (AQM) in the DEP's Bureau of Air Quality (BAQ) and Southwest Regional Office (SWRO) in Pittsburgh initiated an ambient air monitoring project to screen for potential impacts due to ambient concentrations of eight toxic metals.

In the fall of 2014, BAQ installed two particulate samplers in the Borough to help characterize ambient air toxic metal concentrations over time. The samplers included a total suspended particulate (TSP) sampler and a PM_{10}[1] particulate sampler. Both samplers collected 24-hr time weighted average samples every six days using quartz filters suited for measuring metals in ambient air. The samples were analyzed by the Department's Bureau of Laboratories using laboratory analysis code 3IC consistent with the BAQ's procedures for investigative sampling of toxic metals in air. The analysis included particulate weight and concentrations of metals including arsenic, beryllium, cadmium, chromium, lead, manganese, nickel and zinc for both TSP and the PM_{10} fraction reported as micrograms per cubic meter ($\mu g/m^3$).

Sampling commenced on October 26, 2014 and continued systematically every 6th day with the final sample taken on July 5, 2015. During this approximately 8-month period, 40 TSP and 41 PM_{10} filters were collected and quality assured as valid samples[2]. Sampling ended after the July 5th 2015 sample, because the property owner where the samplers were located requested that sampling be completed and the samplers removed from the property.

At the end of the sampling period, the valid data was compiled and analyzed to estimate a mean ambient air concentration of observed ambient air toxic metals and particulate matter. The estimate of the mean (or average) concentration was, in turn, used as a surrogate for an inhaled lifetime exposure concentration screening value to inform if the monitored area could be potentially chronically adversely affected. Monitored values were compared to health-based screening values to determine if additional investigation was warranted. It is important to note that observed levels that could be in excess of health-based screening values do not guarantee that health based affects will be observed in the population of a monitored area, but that the potential exists and further investigation should be conducted.

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[1] PM_{10} is ambient airborne particulate matter with aerodynamic diameters of 10 microns or less representing inhalable particles capable of penetrating the thoracic region of the respiratory tract. PM10 concentrations can be more reliable for health based screening as they better represent particles that are inhaled into the lungs.

[2] The 1-in-6 sampling schedule is consistent with the Department's and the U.S. EPA's systematic sampling schedule for 24-hr sampling as part of the National Ambient Air Quality Standard (NAAQS) and National Air Toxics Trend Stations (NAATS) programs.

The data analysis summary in Tables 1 and 2 incorporates statistical summaries of all quality assured ambient air monitoring data collected by DEP in Glasgow Borough in Beaver County from October 26, 2014 through July 5, 2015.

Table 1. Data Collection and Sample Result Summary for TSP Sampler 35IQ

Sampler 35IQ

Method	Hi-Vol TSP on Quartz	Location	Pleasant Hill UMC; Liberty Ave, Glasgow
SAC	3IC	Municipality	Glasgow Borough
Sampling Start	10/26/2014	County	Beaver
Sampling End	7/5/2015	Latitude	40°38'40.17"N
Schedule	1 day in 6	Longitude	80°30'31.41"W
Potential Samples	43	Monitoring Point	35I
Valid Samples	40	AIRS ID	None
% Data Avail (Period)	93%		

Analyte	# Valid Samples	Avg Reporting Limit	Samples less than Reporting Limit	% Non-Detect in Samples	Average of Detects	Minimum Detect	Median Detect	2nd High Maximum Detect	Maximum Detect
Arsenic	40	0.00076	5	13%	0.0023	0.0008	0.0012	0.0077	0.0104
Beryllium	40	0.00026	40	100%	N/A	N/A	N/A	N/A	N/A
Cadmium	40	0.00025	20	50%	0.0005	0.0003	0.0004	0.0012	0.0017
Chromium (TOT)	40	0.00507	21	53%	0.0093	0.0056	0.0079	0.0163	0.0165
Chromiun (VI)*	40	*0.00072*	21	53%	*0.0013*	*0.0008*	*0.0011*	*0.0023*	*0.0024*
Lead (Quartz)**	40	0.00510	28	70%	0.0161	0.0052	0.0091	0.0217	0.0734
Manganese	40	N/A	0	0%	0.5210	0.0365	0.1818	2.0016	2.2286
Nickel	40	0.00510	34	85%	0.0065	0.0054	0.0062	0.0068	0.0089
Part. Matter (TSP)	40	N/A	0	0%	29.9332	2.6181	27.8158	59.2795	64.4095
Zinc	40	N/A	0	0%	0.0323	0.0103	0.0258	0.1068	0.1427

* Hexavalent Chromium concentrations are estimated by dividing observed Total Chromium concentrations by 7

** Analytical interferences with the digested quartz filter matrix and Pb lend to biased Pb concentration results over Pb analyzed with glass filters (Pb NAAQS compliance method). Pb results from quartz filters are for screening purposes only.

Table 2. Data Collection and Sample Summary for PM_{10} Sampler 35IP

Sampler 35IP

Method	Hi-Vol PM10 on Quartz	Location	Pleasant Hill UMC; Liberty Ave, Glasgow
SAC	3IC	Municipality	Glasgow Borough
Sampling Start	10/26/2014	County	Beaver
Sampling End	7/5/2015	Latitude	40°38'40.17"N
Schedule	1 day in 6	Longitude	80°30'31.41"W
Potential Samples	43	Monitoring Point	35I
Valid Samples	41	AIRS ID	None
% Data Avail (Period)	95%		

Analyte	# Valid Samples	Avg Reporting Limit	Samples less than Reporting Limit	% Non-Detect in Samples	Average of Detects	Minimum Detect	Median Detect	2nd High Maximum Detect	Maximum Detect	%PM10 of TSP
Arsenic	41	0.00080	18	44%	0.0020	0.0008	0.0016	0.0040	0.0056	91%
Beryllium	41	0.00027	41	100%	N/A	N/A	N/A	N/A	N/A	0%
Cadmium	41	0.00027	30	73%	0.0005	0.0003	0.0005	0.0008	0.0008	N/A
Chromium (TOT)	41	0.00535	34	83%	0.0071	0.0055	0.0071	0.0081	0.0090	N/A
Chromiun (VI)*	41	*0.00076*	34	83%	*0.0010*	*0.0008*	*0.0010*	*0.0012*	*0.0013*	N/A
Lead (Quartz)**	41	0.00534	32	78%	0.0184	0.0061	0.0092	0.0230	0.0728	N/A
Manganese	41	N/A	0	0%	0.1452	0.0045	0.0595	0.5702	0.8606	28%
Nickel	41	0.00535	41	100%	N/A	N/A	N/A	N/A	N/A	0%
Part. Matter (PM10)	41	N/A	0	0%	16.4686	2.3343	15.2439	34.9265	43.5049	55%
Zinc	41	N/A	0	0%	0.0264	0.0111	0.0237	0.0569	0.0783	82%

* Hexavalent Chromium concentrations are estimated by dividing observed Total Chromium concentrations by 7

** Analytical interferences between the digested quartz filter matrix and Pb lend to biased Pb concentration results over Pb analyzed with glass filters (Pb NAAQS compliance method). Pb results from quartz filters are for screening purposes only.

Table 3 compares estimated mean concentrations with health-based screening values used for this report. The health-based values are generally for respirable particulate that is present in the PM_{10} fraction of the total ambient particulate. The data collected is presented in Tables 4 and 5.

Table 3. Health Based Screening Values and Sources

Compound	Average of Detects (ug/m3)	Non Cancer Health Based Screening Value(s) (ug/m3)	Screening Value Source*	1 in 100,000 cancer risk concentration (ug/m3)**
Arsenic	0.0020	0.0150	CAL EPA	0.023
Beryllium	N/A	0.02	IRIS	0.04
Cadmium	0.0005	0.0100	ATSDR	0.06
Chromium (TOT)	0.0071	N/A	N/A	N/A
Chromiun (VI)**	*0.0010*	0.012	IRIS	0.01
Lead (Quartz)***	0.0184	0.15	NAAQS	N/A
Manganese****	0.1452	0.05 - 0.3	IRIS - ATSDR	N/A
Nickel	N/A	0.09	ATSDR	N/A
Zinc	0.0264	N/A	N/A	N/A
*Key to Sources CAL EPA - California EPA IRIS - U.S. EPA Integrated Risk Info. System ATSDR - Agency for Toxic Substances & Disease Registry NAAQS - National Ambient Air Quality Standard				
** Values for Chromium (VI) are estimates as 1/7 of the Total Chromium concentrations.				
*** Acceptable range of additional lifetime cancer risk is 1 in 1 million to less than 1 in 10,000 additional risk. The listed concentrations estimate at the 1 in 100,000 risk level. Risk values from U.S. EPA Office of Air Quality and Planning Standards				
**** The Standard Error of the Mean (SEM) for the manganese estimate is +/- 0.03 ug/m3 with 95% confidence				
N/A - Not applicable.				

Discussion of Results

A review of the results of the toxic metals analysis indicated that the ambient concentrations of arsenic, cadmium, chromium, lead, and zinc were less than health-based screening values. Beryllium was not detected in any sample. The values for PM_{10} were less than the National Ambient Air Quality Standard (NAAQS) for PM_{10}[3]. This indicates that adverse long-term health effects would not be expected to be observed from those monitored compounds. The average ambient concentration of manganese, however, was above EPA's Integrated Risk Information System (IRIS) and the U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry (ATSDR) long-term screening values for that metal.

On March 30, 2016, the summary report from the Glasgow monitoring project was provided by BAQ to EPA Region III for assistance with the analysis of the ambient air concentrations of manganese. In response to DEP's request for assistance, on April 27, 2016, EPA Region 3 provided the recommended EPA and ATSDR long term screening values. Based on those values, both DEP and EPA believe that long-term exposure to manganese concentrations measured in the Glasgow Borough poses a potential public health hazard. This finding warrants further investigation of manganese emissions from the S.H.

[3] The NAAQS for PM_{10} is no 24-hr sample greater than 150 ug/m3 not to be exceeded more than once per year over three years. No values over 150 ug/m3 were observed during the sampling period.

Bell facility and other metal processing facilities in the community and areas upwind of Glasgow Borough.

Limitations

Ideally, at least one year of data is collected for the purpose of estimating annual mean metals concentrations in order to account for seasonal variation in ambient air. However, for the purposes of health screening evaluation, the eight months of collected data is of sufficient quality to use as a screening value for potential health effects.

This screening evaluation is only for the compounds for which monitoring occurred. Potential impacts of compounds not monitored are not considered.

The use of a single estimated concentration value for comparison to the screening value does not take into consideration inherent measurement uncertainty of the estimate. The manganese concentrations in Table 3 include the standard error of the mean for the manganese estimate.

On site meteorological data was not collected to confirm wind patterns. However, regional wind data and historical knowledge of prevalent wind patterns for that area place the samplers in a generally downwind vector from the S.H. Bell facility.

Inhalation Reference Concentrations (RfCs) used for non-cancer effects screening are generally conservative, with uncertainty factors of 1000 for the IRIS RfC and 300 for the ATSDR minimal risk level (MRL). Additionally, the screening values for Manganese do not always take into consideration sensitive subpopulations that could be present in a monitored location.

Next Steps

The Department, in consultations with EPA Regions III and V and Ohio EPA, will conduct further investigations of manganese emissions from the S.H. Bell facility and other potential sources that could be contributing to elevated manganese emissions in both PA and OH.

The metals sampling screening summary will be sent to the PA Department of Health and ATSDR for further evaluation. The DEP will also determine if additional air monitoring is needed in Glasgow to better ascertain the extent and magnitude of observed concentrations of manganese in the Glasgow area. The Department intends to work closely with EPA Regions III and V and Ohio EPA to reduce ambient concentrations of Manganese in the Glasgow Area.

Table 4. Time Series Summary of Sampling Results for TSP Sampler 35IQ, Glasgow, PA

Site 35IQ	24 hour concentrations in ug/m3																				
Analyte	10/26/14	11/1/14	11/7/14	11/13/14	11/19/14	11/25/14	12/1/14	12/7/14	12/13/14	12/19/14	12/25/14	12/31/14	1/6/15	1/12/15	1/18/15	1/24/15	1/30/15	2/5/15	2/11/15	2/17/15	2/23/15	3/1/15
Arsenic	0.0019	0.0009	0.0009	0.0008	0.0013	VOID	ND	0.0010	VOID	VOID	ND	0.0009	0.0012	0.0010	0.0011	0.0012	ND	ND	0.0023	0.0015	0.0008	0.0024
Beryllium	ND	ND	ND	ND	ND	VOID	ND	ND	VOID	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.0003	ND	0.0003	VOID	ND	ND	VOID	VOID	ND	ND	ND	0.0003	ND	ND	ND	ND	0.0005	0.0003	0.0003	0.0012
Chromium (Total)	0.0165	ND	0.0130	0.0077	0.0087	VOID	ND	ND	VOID	VOID	ND	0.0079	ND	ND	ND	ND	ND	ND	0.0107	ND	ND	ND
Chromium (VI)	0.0024	ND	0.0019	0.0011	0.0012	VOID	ND	ND	VOID	VOID	ND	0.0011	ND	ND	ND	ND	ND	ND	0.0015	ND	ND	ND
Lead (on Quartz)	ND	ND	ND	ND	ND	VOID	ND	ND	VOID	VOID	ND	ND	ND	ND	ND	ND	ND	ND	0.0052	ND	ND	0.0074
Manganese	0.1589	0.1542	0.1801	1.4958	1.5503	VOID	0.1435	0.0414	VOID	VOID	0.0374	1.3724	1.3904	0.4713	0.2710	0.1720	0.0894	0.2920	1.2951	0.3800	0.0951	0.0842
Nickel	ND	ND	ND	ND	ND	VOID	ND	ND	VOID	VOID	ND	ND	ND	ND	ND	ND	ND	ND	0.0055	ND	ND	ND
Particulate Matter (TSP)	20.7	10.8	11.9	27.6	59.3	VOID	10.8	16.3	VOID	VOID	3.9	31.8	20.4	15.8	11.4	23.1	2.6	16.8	47.7	23.3	25.5	22.3
Zinc	0.0287	0.0207	0.0661	0.0291	0.0223	VOID	0.0138	0.0199	VOID	VOID	0.0103	0.0282	0.0168	0.0267	0.0149	0.0201	0.0136	0.0140	0.0383	0.0241	0.0345	0.0284

Site 35IQ	24 hour concentrations in ug/m3																				
Analyte	3/7/15	3/13/15	3/19/15	3/25/15	3/31/15	4/6/15	4/12/15	4/18/15	4/24/15	4/30/15	5/6/15	5/12/15	5/18/15	5/24/15	5/30/15	6/5/15	6/11/15	6/17/15	6/23/15	6/29/15	7/5/15
Arsenic	0.0011	ND	0.0041	0.0011	0.0011	0.0043	0.0022	0.0037	0.0008	0.0010	0.0014	0.0045	0.0015	0.0055	0.0009	0.0010	0.0011	0.0104	0.0077	0.0026	0.0038
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	0.0005	0.0017	0.0003	ND	0.0004	0.0005	0.0008	ND	ND	0.0003	0.0003	ND	0.0004	ND	ND	0.0004	0.0009	ND	0.0007	0.0005
Chromium (Total)	0.0069	0.0079	0.0056	0.0109	0.0071	0.0130	ND	ND	ND	ND	ND	0.0163	0.0065	ND	ND	0.0058	0.0123	0.0088	0.0058	0.0057	ND
Chromium (VI)	0.0010	0.0011	0.0008	0.0016	0.0010	0.0019	ND	ND	ND	ND	ND	0.0023	0.0009	ND	ND	0.0008	0.0018	0.0013	0.0008	0.0008	ND
Lead (on Quartz)	ND	0.0052	0.0734	0.0079	ND	0.0087	0.0214	0.0128	ND	ND	0.0126	ND	ND	0.0217	ND	0.0077	ND	ND	ND	ND	0.0096
Manganese	0.7705	0.1835	0.1734	0.3354	0.4120	1.2223	0.0889	0.0877	0.5146	0.0972	0.1182	1.7371	0.1549	0.1798	0.0717	0.0843	0.2644	2.2286	2.0016	0.4038	0.0365
Nickel	ND	0.0054	ND	0.0061	ND	0.0068	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0089	0.0062	ND	ND
Particulate Matter (TSP)	27.7	40.4	44.4	40.0	36.5	55.5	31.5	42.0	24.7	27.9	41.3	64.4	36.9	37.6	27.0	30.1	46.5	36.6	52.5	20.2	31.5
Zinc	0.0208	0.0377	0.1427	0.0572	0.0305	0.0391	0.0293	0.1068	0.0220	0.0232	0.0339	0.0226	0.0140	0.0248	0.0172	0.0333	0.0524	0.0430	0.0204	0.0205	0.0307

Table 5 - Time Series Summary of Sampling Results for PM10 Sampler 35IP, Glasgow, PA

Site 35IP	24 hour concentrations in ug/m3																					
Analyte	10/26/14	11/1/14	11/7/14	11/13/14	11/19/14	11/25/14	12/1/14	12/7/14	12/13/14	12/19/14	12/25/14	12/31/14	1/6/15	1/12/15	1/18/15	1/24/15	1/30/15	2/5/15	2/11/15	2/17/15	2/23/15	3/1/15
Arsenic	0.0017	0.0008	0.0008	ND	VOID	ND	ND	ND	0.0016	0.0008	ND	ND	ND	0.0009	0.0008	0.0013	ND	ND	0.0013	0.0010	ND	0.0020
Beryllium	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND	ND	0.0007
Chromium (Total)	0.0090	ND	0.0081	ND	VOID	0.0055	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0056	ND	ND	ND
Chromium (VI)	0.0013	ND	0.0012	ND	VOID	0.0008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0008	ND	ND	ND
Lead (on Quartz)	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0061
Manganese	0.0503	0.0045	0.0595	0.5281	VOID	0.2837	0.0214	0.0137	0.0386	0.1384	0.0052	0.3508	0.4185	0.0877	0.0433	0.0468	0.2846	0.0209	0.3410	0.1081	0.0219	0.0100
Nickel	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Particulate Matter (PM10)	12.6	5.4	6.4	14.0	VOID	13.5	6.3	9.0	20.5	8.7	2.3	13.5	10.1	8.2	5.4	15.6	8.1	6.0	23.7	12.2	12.4	15.7
Zinc	0.0349	0.0229	0.0228	0.0283	VOID	0.0253	0.0185	0.0175	0.0319	0.0170	0.0117	0.0191	0.0178	0.0270	0.0111	0.0281	0.0147	0.0147	0.0296	0.0188	0.0203	0.0270

Site 35IP	24 hour concentrations in ug/m3																				
Analyte	3/7/15	3/13/15	3/19/15	3/25/15	3/31/15	4/6/15	4/12/15	4/18/15	4/24/15	4/30/15	5/6/15	5/12/15	5/18/15	5/24/15	5/30/15	6/5/15	6/11/15	6/17/15	6/23/15	6/29/15	7/5/15
Arsenic	ND	ND	0.0034	ND	ND	VOID	0.0018	0.0038	ND	ND	0.0016	0.0026	0.0012	0.0056	ND	0.0010	ND	0.0040	0.0039	0.0016	0.0036
Beryllium	ND	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.0007	ND	ND	VOID	0.0003	0.0008	ND	ND	0.0003	ND	ND	0.0004	ND	ND	0.0003	0.0008	ND	0.0007	0.0005
Chromium (Total)	ND	ND	ND	0.0071	ND	VOID	ND	ND	ND	ND	ND	0.0079	ND	ND	ND	ND	0.0067	ND	ND	ND	ND
Chromium (VI)	ND	ND	ND	0.0010	ND	VOID	ND	ND	ND	ND	ND	0.0011	ND	ND	ND	ND	0.0010	ND	ND	ND	ND
Lead (on Quartz)	ND	ND	0.0728	0.0068	ND	VOID	0.0184	0.0083	ND	ND	0.0133	ND	ND	0.0230	ND	0.0077	ND	ND	ND	ND	0.0092
Manganese	0.1505	0.0700	0.0455	0.1154	0.1527	VOID	0.0141	0.0529	0.0997	0.0233	0.0569	0.4901	0.0546	0.0735	0.0220	0.0298	0.0803	0.5702	0.8606	0.1025	0.0105
Nickel	ND	ND	ND	ND	ND	VOID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Particulate Matter (PM10)	15.2	21.3	22.5	19.5	16.5	VOID	19.1	24.6	12.3	15.1	23.7	28.7	23.9	23.3	17.9	18.5	34.9	23.2	43.5	15.2	26.7
Zinc	0.0172	0.0323	0.0783	0.0550	0.0249	VOID	0.0203	0.0395	0.0212	0.0161	0.0297	0.0166	0.0199	0.0237	0.0148	0.0569	0.0469	0.0345	0.0244	0.0245	0.0250