MEMORANDUM

Pima County Department of Environmental Quality

DATE: January 14, 2010

TO: Raul Ochoa
Assistant Superintendent Operations & Facilities Planning

FROM: Beth Gorman
Program Manager

RE: July 22, 2009 Sunnyside Transportation Site Beryllium Detection

Attached is a letter from Dr. Eric Betterton from the University of Arizona to Ursula Kramer, Director of Pima County Department of Environmental Quality providing an analysis of the data from the particulate matter filters at the Sunnyside Transportation Building Site and the Orange Grove monitoring site on July 22, 2009.

As you may recall, July 22 was a day when this region had very high airborne dust levels from an unusual dust storm that came in from the Casa Grande area. It is also the only day, so far, where the beryllium levels were found to be above the Practical Quantitation Level (PQL) during the PDEQ Beryllium Monitoring Project. The Sunnyside Unified School District Governing Board requested additional analysis of beryllium from other monitors in the Tucson area that were operating on July 22. This information would be used to determine the probable source of the detectable beryllium levels recorded at the Transportation Building for July 22. Based upon Dr. Betterton's review of the data, it appears the beryllium detected on July 22 originated from the soil.

In addition, data from other days in July are also included in Dr. Betterton's analysis to provide data points for comparison purposes.

Attachment

Cc: Ursula Kramer, Pima County Department of Environmental Quality Director
Richard Grimaldi, Pima County Department of Environmental Deputy Director

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January 11, 2010

Ms. Ursula Kramer
Director, Pima County Department of Environmental Quality
150 W. Congress Street, Suite 109
Tucson, AZ 85701-1317

July 22, 2009 Sunnyside Transportation Beryllium Observation

Dear Ursula,

On July 22, 2009, beryllium was detected in the PM_{10} aerosol sample collected at the Sunnyside Transportation Building site, for the first time. It was unusually windy and dusty on that day and so it was thought that the beryllium might originate from airborne soil, and not from Brush Ceramic Products, because the soil is known to contain natural beryllium.

To test this idea, three archived PM_{10} aerosol samples from PDEQ's Orange Grove site were recovered and analyzed. This site is located approximately 15 miles *upwind* from Brush Ceramic Products and so if there was also high beryllium at Orange Grove on July 22, then one could reasonably conclude that the beryllium at both sites was due to the dust. For your convenience, I have summarized the relevant beryllium results in the Table below.

Based on these data, it appears as if the Sunnyside July 22, 2009 beryllium originated from wind blown soil, and not from Brush Ceramic Products emissions.

a) At Orange Grove on July 22, the beryllium value was about 7 times higher than on two non-dusty days at the same site (7/10 and 7/16). Specifically, the beryllium concentration was 0.66 nanogram/cubic meter on July 22, compared to the non-dusty day average of just 0.09 nanogram/cubic meter. This suggests that the beryllium originated naturally from the dust because there is no other known beryllium source nearby.

b) Manganese is an element that is commonly found in soils so one would expect that manganese would also be high at both sites on the dusty day. This is indeed the case. Manganese concentrations were high at both Orange Grove and Sunnyside on July 22, 2009. This provides further evidence that dust was the source of the beryllium. This is best seen by calculating the ratio of beryllium (Be) to manganese (Mn), which should be approximately equal at both Orange Grove and Sunnyside if the same type of dust was sampled. Indeed, the Orange Grove Be/Mn ratio on July 22 was 0.26%. This is close to the Sunnyside Be/Mn ratio of 0.30% on the same day, i.e., the two sites appear to have sampled the same wind blown soil

(within natural variability) because both beryllium and manganese were higher in approximately the same proportion.

c) Similarly, the ratio of beryllium to PM_{10} (i.e. to "dust") is approximately equal at both Orange Grove (2.4 ppm) and Sunnyside (2.1 ppm), as one would expect if the beryllium was due to airborne dust. These ratios are reasonably close to the known concentration of beryllium in local soils (not PM_{10}), which ranges from about 0.2 to 1.2 ppm.

Sincerely,

Eric A. Betterton, Professor

Summary of Relevant Analytical Data

	Sample Date	Sample ID	Element	Concentration	Unit
Sunnyside Transportation Building					
	7/22/2009	2009081264	beryllium	**0.27**	ng/m^3
(repeat analysis)	**7/22/2009**	2009081264	beryllium	**0.35**	ng/m^3
	7/22/2009	2009081264	manganese	104.21	ng/m^3
	7/22/2009		PM10	149.7	μg/m^3
			Be/Mn	0.30	%
			Be/PM10	2.1	ppm
Orange Grove*					
	7/22/2009	2009110364	beryllium	**0.66**	ng/m^3
	7/22/2009	2009110364	manganese	254.17	ng/m^3
	7/22/2009		PM10	270	μg/m^3
			Be/Mn	0.26	%
			Be/PM10	2.4	ppm
	7/10/2009	2009110362	beryllium	0.10	ng/m^3
	7/10/2009	2009110362	manganese	20.94	ng/m^3
	7/16/2009	2009110363	beryllium	0.08	ng/m^3
	7/16/2009	2009110363	manganese	30.33	ng/m^3

* No blank correction was possible because no filter blanks are available for these archived PM_{10} samples. The beryllium values obtained for 7/10 and 7/16 might approximate the true blank for the filter material.

Pima County Regional Wastewater Reclamation Department
Compliance and Regulatory Affairs Office
7101 N. Casa Grande Highway

Sample ID	Parameter	Sample Date	Analysis Method	Analysis Date	Extraction Method	HF Acid Extracted	Blank Conc. ng/filter	Analysis Result ug/l	Conversion Factor ng/ug	Digested Volume L	Strips per filter	Air Volume L	L/m^3	Final Value ng/M3	Units	MDL	PQL	Data Qualifier(s)
Orange Grove #2																		
T9536281																		
2009110362	Arsenic	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.531	1000	0.05	1	21500	21.5	3.56	ng	0.76	5.81	
2009110362	Beryllium	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.042	1000	0.05	1	21500	21.5	0.10	ng	0.02	2.32	
2009110362	Cadmium	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.2	1000	0.05	1	21500	21.5	0.47	ng	0.51	4.41	
2009110362	Chromium	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	2.089	1000	0.05	1	21500	21.5	4.86	ng	0.49	4.18	
2009110362	Cobalt	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.119	1000	0.05	1	21500	21.5	0.28	ng	0.02	2.32	
2009110362	Lead	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.32	1000	0.05	1	21500	21.5	3.07	ng	0.05	2.32	
2009110362	Manganese	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	9.006	1000	0.05	1	21500	21.5	20.94	ng	0.35	2.32	
2009110362	Nickel	7/10/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.703	1000	0.05	1	21500	21.5	3.96	ng	0.35	2.44	
T9536325																		
2009110363	Arsenic	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.512	1000	0.05	1	21500	21.5	1.19	ng	0.76	5.81	
2009110363	Beryllium	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.034	1000	0.05	1	21500	21.5	0.08	ng	0.02	2.32	
2009110363	Cadmium	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.155	1000	0.05	1	21500	21.5	0.36	ng	0.51	4.41	
2009110363	Chromium	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.989	1000	0.05	1	21500	21.5	4.63	ng	0.49	4.18	
2009110363	Cobalt	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.177	1000	0.05	1	21500	21.5	0.41	ng	0.02	2.32	
2009110363	Lead	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.214	1000	0.05	1	21500	21.5	2.82	ng	0.05	2.32	
2009110363	Manganese	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	13.04	1000	0.05	1	21500	21.5	30.33	ng	0.35	2.32	
2009110363	Nickel	7/16/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.246	1000	0.05	1	21500	21.5	2.90	ng	0.35	2.44	
T9536354																		
2009110364	Arsenic	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.416	1000	0.05	1	21600	21.6	3.28	ng	0.76	5.81	
2009110364	Beryllium	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.287	1000	0.05	1	21600	21.6	0.66	ng	0.02	2.32	
2009110364	Cadmium	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	0.155	1000	0.05	1	21600	21.6	0.36	ng	0.51	4.41	
2009110364	Chromium	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	5.062	1000	0.05	1	21600	21.6	11.72	ng	0.49	4.18	
2009110364	Cobalt	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	1.619	1000	0.05	1	21600	21.6	3.75	ng	0.02	2.32	
2009110364	Lead	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	5.488	1000	0.05	1	21600	21.6	12.70	ng	0.05	2.32	
2009110364	Manganese	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	109.8	1000	0.05	1	21600	21.6	254.17	ng	0.35	2.32	
2009110364	Nickel	7/22/2009	IO-3.5	12/11/2009	IO 3.1	Yes	0	3.27	1000	0.05	1	21600	22	7.57	ng	0.35	2.44	