

Air Quality Monitoring Program for Northwest Portland
Interim Report #2 - by Robert Amundson, PhD
March 2001 – August 2001

History

Five air quality-monitoring activities occurred during this reporting period. First, dust samples were collected from September 2000 through June 2001 and analyzed for metals contents. Second, analyses of volatile organic compound (VOC) concentrations associated with odor events occurred in July. Third, the program manager worked with scientists at Portland State University to locate a new type of VOC analyzer in the neighborhood. Fourth, glass beaker dust collectors were placed at 12 locations throughout the neighborhood from mid-July to late August to determine “hot spots” with elevated metals contents in the dust. Finally, neighbors continued to fill out odor response forms.

Rationale for Types of Sampling during this time interval

The current Northwest-neighborhood air-quality sampling program builds on information gathered by neighbors since 1997 and adds to information obtained by DEQ from previous hazardous air quality sampling programs. This air quality sampling study has focused on three issues: What toxic compounds and their concentrations are in the air? What are their sources? Are the concentrations high enough to be of concern?

Methods and Materials

Metal contents and concentrations of dust. When the absolute amount of dust is not determined for a collection period but the surface area of the collection device is known, then metals contents are reported as amount of metal per area (micrograms per square foot). This convention of metals contents in micrograms per square foot is used for ease of comparison with the Environmental Protection Agency’s standard for lead in household dust (40 micrograms per square foot).

When the amount of dust can be determined per sample then a concentration of metal can be reported (e.g. mg of metal per kg of dust). Concentrations of metals in soils are used, in part, to identify EPA “super fund” sites. If metals concentrations are high enough, a remediation action to reduce the concentrations of the metals is mandated. To be clear, the higher the metal content per surface area or the higher the metal concentration in a sample of dust, the greater the risk of injury from metals such as lead and arsenic. Other metals may be essential to good health at low concentrations, but can cause problems when elevated above their health threshold (e.g. chromium, copper, manganese, and zinc). A particular concern of the neighbors is the presence of chromium. At this time, we are unable to determine how much if any of the very toxic chromium VI contributes to the elevated levels of chromium that are found.

Dust was collected at one location, for various times from September 2000 through June 2001. These samples provide information on metals in dust throughout the winter months. In addition, a single collection of accumulated dust from the same location was analyzed for the concentrations of the metals in dust. This dust sample was sent to two analytical laboratories for comparison of their results. In addition, dust fall was collected in 500-ml glass beakers at 12 houses across the neighborhood from July 11 until August 23 to determine “hot spots” with elevated levels of metals.

Volatile Organic Compounds. The project manager and the neighborhood advisory group chose to use a new technology developed by scientists at Portland State University to monitor for VOCs. The new instrument samples 24 times per day to detect concentrations of VOCs. We located the instrument at a residence near the industrial area where a great number of odor events had been noted. Start-up and calibration of the instrument took longer than anticipated; therefore, reliable data collection started in September and those results will be reported in the next report. In addition, neighbors used “bucket samplers” to test for VOCs during three odor events in early August.

Odor complaints. Neighbors continued to record odor complaints throughout this period. Neighbors, Robert Davies and Caroline Skinner, compiled the odor complaints.

Results and Discussion

Metal content of dust in 2500 block of NW Savier. Dust was collected on a porch in the 2500 block of NW Savier for three sample periods: 9-23 September 2000, 17 October 2000- 28 January 2001 and 26 November 2000 – 1 July 2001. Not surprisingly, longer sample periods resulted in higher amounts of metals in the samples (Table 1). For two time intervals (9-23 September 2000 and 26 November 2000 – 1 July 2001), duplicate samples were taken to determine variability in metals contents between samples. The variability between metal contents suggests that the metals are not evenly deposited by dust falling on the porch. One possible explanation for the variability in metals contents between samples is that large sized particulates contribute disproportionately to the elevated metals in dust at this site. Analyses of particle size distribution and metals contents of each particle size category could be valuable in discriminating between newly emitted metals or metals from dust that is easily re-intruded because of smaller particle size.

In general, as the content of the most abundant metal, iron, increases, contents of other metals increase (Table 1). The lead contents are particularly troubling because lead is deposited in unacceptable levels even over the two-week interval in September 2000. The presence of arsenic in 3 of the five samples is also troubling.

The levels of antimony, barium, chromium, cobalt, manganese, molybdenum, nickel, and zinc also indicate elevated levels of metals in dust at this location.

Metal concentrations in dust in 2500 block of NW Savier. On 3 March 2001 a larger sample of dust was collected from the porch located on the 2500 block of NW Savier.

For this sample, a known weight of dust was analyzed and thus values are reported as concentration of metal in mg/kg. Two different laboratories analyzed subsamples of the dust collected on 3 March 2001 as a test for accuracy. Fortunately, the values reported by both laboratories are very similar (Table 2) and lend credence to their accuracy. Laboratory 2 tested for more metals than Laboratory 1; thus, comparisons of results for all metals can not be made. The high metal concentrations of this sample are troubling. In particular, the lead levels are quite high as are other toxic heavy metals.

Metal content of dust at 12 locations in NW Portland collected from mid- July to late August 2001.

Areas closest to the ESCO Foundry had the highest levels of metal (Table 3). The location closest to the ESCO Foundry had the highest levels of iron as well as lead, manganese, nickel and barium. A location in the 1600 block of NW 24th had the second highest level of iron and the highest levels of copper, silver, zinc, cadmium, chromium and cobalt. A third location on the 2500 block of NW Savier had a relatively low level of iron but had the highest levels of selenium, thallium, antimony and arsenic. A fourth location on the 3000 block of NW Wilson also had a high level of iron and the highest levels of vanadium and beryllium. The heavy loading of metals in the samples taken closest to the ESCO Foundry are well illustrated in maps 1-3 showing the distribution of lead, nickel and chromium found in the neighborhood.

Are these levels of metals in dust normal? A 1988 study done by the U. S. Environmental Protection Agency showed that total suspended particulates (TSP) from NW Portland contained measurable amounts of beryllium, barium, cadmium, chromium, copper, iron, lead, manganese, molybdenum, nickel, vanadium, and zinc (Appendix III) compared to TSP collected in SW and SE Portland and Medford. The 1988 results suggest that such metal contents in TSP are not normal.

Volatile Organic Compounds in Odor events. Neighbors used the older “bucket samplers during three odor events in August 2001. Unknown to the project coordinator, the analytical laboratory switched to a more automated VOC analyzer. Unfortunately, an internal standard of the new VOC analyzer is contaminated by a chemical emitted from the Tedlar bags used in the “bucket samplers”. This contamination reduced the new equipment’s ability to detect low concentrations of VOCs. Therefore, the 3 samples taken did not detect the 15 to 17 VOCs that are normally detected in NW Portland air, because their concentrations at the time of sampling were below the abnormally elevated detection limit of the VOC analyzer.

Even though few VOCs were detected; some results are notable. High levels of VOCs were detected in the 2200 block of NW Johnson as a result of emissions from a North Portland brush fire on 8 August. At that time, acrolein concentrations measured high enough to cause eye irritation and respiratory distress (Table 4).

At 8:30 AM on August 6th a burnt rubber, burnt toast and metallic odor measured with high levels of isopropyl alcohol, decane, undecane and dodecane (Table 4). The later

three compounds are products of incomplete combustion. ESCO was named as the probable source of odors detected at 7:00 AM in the 1800 block of NW 25th and at 11:30 AM in the 2500 block of NW Savier (see appendix 1, odor survey forms). It is most likely that this odor and the associated VOCs were from ESCO.

Odor complaints. Neighbors detected and recorded 35 odor complaints in July and 38 in August 2001 (see Appendices I and II).

Table 1. Metals in Dust Collected from Porch on 2500 Block of NW Savier, Portland, Oregon.

Metal	9 - 23 Sept 2000		17 Oct 2000 - 28 Jan 2001		26 Nov 2000 - 1 July 2001	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
	Metals per surface area micro gr/sq. ft		Metals per surface area micro gr/sq. ft		Metals per surface area micro gr/sq. ft	
Antimony	74	19	86	88	47	88
Arsenic	6	nd	7	nd	6	nd
Barium	41	69	524	353	316	353
Beryllium	nd*	nd	<1	nd	nd	nd
Cadmium	<1	1	6	nd	1	nd
Chromium	15	20	68	61	78	61
Cobalt	1	1	9	9	7	9
Copper	28	51	294	316	nd	316
Iron	1748	3128	16560	17651	13935	17651
Lead	18	32	212	260	288	260
Manganese	699	1012	3956	5110	4181	5110
Molybdenum	11	1	11	15	16	15
Nickel	14	15	506	47	90	47
Selenium	4	1	9	nd	nd	nd
Silver	nd	nd	<1	nd	nd	nd
Thallium	nd	nd	nd	nd	nd	nd
Vanadium	4	37	61	56	54	56
Zinc	147	232	1012	883	1022	883

nd* = not detected

Table 2. Comparison of Laboratory Concentrations of Metals in Dust Collected from Porch on 2500 Block of NW Savier, Portland, Oregon.

Metal	Metal Concentrations in Dust (mg/kg)	
	Laboratory 1	Laboratory 2
Aluminum		8000
Antimony	3.9	nd*
Arsenic	3.4	
Barium	320	305
Beryllium	nd	nd
Boron		19
Cadmium	1.7	2
Calcium		14000
Chromium	51	78
Cobalt	11	13
Copper	250	256
Iron	22000	26500
Lead	330	242
Magnesium		3710
Manganese	520	572
Molybdenum		11
Nickel	41	52
Phosphorus		1040
Potassium		1520
Selenium	nd	
Silver	1.1	nd
Sodium		2180
Strontium		107
Thallium	nd	
Tin		19
Titanium		2140
Vanadium	65	82
Zinc	680	890

nd* = not detected

blank cell = not analyzed

Table 3. Metals in dust collected at 12 locations in NW Portland from 11 July to 22 August 2001.

Location	Metals in Dust (micrograms per square foot)									
	Sb Antimony	As Arsenic	Ba Barium	Be Beryllium	Cd Cadmium	Cr Chromium	Co Cobalt	Cu Copper		
2200 NW Johnson	1	nd	87	nd	nd	26	2	96		
2500 NW Savier	9.6	6.3	93	0.2	nd	26	2	93		
2800 NW Thurman	2.4	nd	102	nd	nd	41	3	149		
3000 NW Wilson	1.5	3.6	315	0.5	nd	56	10	195		
2400 NW Thurman	4.2	0.6	210	nd	nd	53	4	210		
2100 NW 23rd	1	nd	165	nd	nd	77	5	165		
2700 NW Pettigrove	0.8	2	99	0.2	nd	32	3	165		
1800 NW 24th Place	3.6	3.3	885	0.3	nd	165	9	435		
2900 NW 53rd	0.2	5.7	98	nd	nd	57	13	375		
2800 NW Upshur	1.7	0.8	225	nd	nd	44	3	143		
2400 NW Quimby	1.8	1.8	180	nd	1	44	4	180		
1600 NW 24th	8.7	4.5	810	0.2	18	180	21	495		

nd = not detected

Table 3. Metals in dust collected at 12 locations in NW Portland from 11 July to 22 August 2001.

Location	Metals in Dust (micrograms per square foot)										
	Fe Iron	Pb Lead	Mn Manganese	Mo Molybdenum	Ni Nickel	Se Selenium	Ag Silver	Tl Thallium	V Vanadium	Zn Zinc	
2200 NW Johnson	4050	39	132	nd	21	nd	0.2	1.3	16.5	360	
2500 NW Savier	5550	69	180	nd	27	2.4	nd	2.7	17	300	
2800 NW Thurman	7050	60	240	nd	20	nd	0.3	2.4	26	810	
3000 NW Wilson	25500	57	600	nd	33	0.6	0.2	1.1	77	660	
2400 NW Thurman	10200	240	270	nd	47	nd	0.6	0.5	24	735	
2100 NW 23rd	12450	71	315	nd	69	nd	nd	0.5	32	510	
2700 NW Pettigrove	10050	87	285	nd	23	nd	0.8	0.6	24	825	
1800 NW 24th Place	30000	330	780	nd	180	nd	0.8	0.3	54	915	
2900 NW 53rd	12000	38	540	nd	26	nd	0.4	0.2	35	945	
2800 NW Upshur	9000	50	360	nd	24	nd	0.4	nd	27	870	
2400 NW Quimby	7650	59	285	nd	38	nd	0.6	nd	29	435	
1600 NW 24th	25500	285	660	nd	138	nd	2.7	0.4	63	2550	

nd = not detected

Table 4. Volatile Organic Compound Concentrations Monitored during August 2001.

Sample number	NWDA-2-2001	NWDA-3-2001	NWDA-4-2001
Sample location	2200 NW Johnson	2800 NW Thurman	2800 NW Thurman
Sample date	8/8/01	8/6/01	8/1/01

CAS #	COMPOUND	RESULT	RESULT	RESULT	REPORTING
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	LIMIT $\mu\text{g}/\text{m}^3$
75-71-8	Dichlorodifluoromethane	ND	ND	ND	10
74-87-3	Chloromethane	ND	ND	ND	5.0
76-14-2	Dichlorotetrafluoroethane	ND	ND	ND	15
75-01-4	Vinyl Chloride	ND	ND	ND	5.0
106-99-0	1,3-Butadiene	ND	ND	ND	5.0
74-83-9	Bromomethane	ND	ND	ND	10
75-00-3	Chloroethane	ND	ND	ND	5.0
64-17-5	Ethanol	22	22	47	5.0
75-05-8	Acetonitrile	ND	ND	ND	5.0
107-02-8	Acrolein	6.3	ND	ND	5.0
67-64-1	Acetone	27	19	17	5.0
75-69-4	Trichlorofluoromethane	ND	ND	ND	10
67-63-0	Isopropyl Alcohol	22	63	22	5.0
107-13-1	Acrylonitrile	5.7	ND	ND	5.0
75-35-4	1,1-Dichloroethene	ND	ND	ND	5.0
75-09-2	Methylene chloride	8.3	8.1	ND	5.0
107-05-1	Allyl Chloride	ND	ND	ND	5.0
76-13-1	Trichlorotrifluoroethane	ND	ND	ND	15
75-15-0	Carbon Disulfide	ND	ND	ND	5.0
156-60-5	trans-1,2-Dichloroethene	ND	ND	ND	5.0
75-34-3	1,1-Dichloroethane	ND	ND	ND	5.0
1634-04-4	Methyl tert-Butyl Ether	ND	ND	ND	5.0
108-05-4	Vinyl Acetate	ND	ND	ND	5.0
78-93-3	2-Butanone (MEK)	ND	ND	ND	5.0
156-59-2	cis-1,2-Dichloroethene	ND	ND	ND	5.0
110-54-3	n-Hexane	ND	ND	ND	5.0
67-66-3	Chloroform	ND	ND	ND	5.0
107-06-2	1,2-Dichloroethane	ND	ND	ND	5.0
71-55-6	1,1,1-Trichloroethane	ND	ND	ND	5.0
71-43-2	Benzene	5.7	ND	ND	5.0
56-23-5	Carbon Tetrachloride	ND	ND	ND	5.0
78-87-5	1,2-Dichloropropane	ND	ND	ND	5.0
75-27-4	Bromodichloromethane	ND	ND	ND	5.0
79-01-6	Trichloroethene	ND	ND	ND	5.0
123-91-1	1,4-Dioxane	ND	ND	ND	5.0
106-89-8	Epichlorohydrin	ND	ND	ND	5.0
10061-01-5	cis-1,3-Dichloropropene	ND	ND	ND	5.0
108-10-1	4-Methyl-2-pentanone	ND	ND	ND	5.0
10061-02-6	trans-1,3-Dichloropropene	ND	ND	ND	5.0
79-00-5	1,1,2-Trichloroethane	ND	ND	ND	5.0
108-88-3	Toluene	13	18	16	5.0
591-78-6	2-Hexanone	ND	ND	ND	5.0

Table 4. Volatile Organic Compound Concentrations Monitored during August 2001.

Sample number	NWDA-2-2001	NWDA-3-2001	NWDA-4-2001
Sample location	2200 NW Johnson	2800 NW Thurman	2800 NW Thurman
Sample date	8/8/01	8/6/01	8/1/01

CAS #	COMPOUND	RESULT	RESULT	RESULT	REPORTING LIMIT
		µg/m ³	µg/m ³	µg/m ³	µg/m ³
124-48-1	Dibromochloromethane	ND	ND	ND	5.0
106-93-4	1,2-Dibromoethane	ND	ND	ND	5.0
123-86-4	Butyl Acetate	ND	ND	ND	5.0
127-18-4	Tetrachloroethene	ND	ND	ND	5.0
108-90-7	Chlorobenzene	ND	ND	ND	5.0
100-41-4	Ethylbenzene	ND	ND	ND	5.0
136777-61-2	<i>m,p</i> -Xylenes	ND	5.7	ND	5.0
75-25-2	Bromoform	ND	ND	ND	5.0
100-42-5	Styrene	ND	ND	ND	5.0
95-47-6	<i>o</i> -Xylene	ND	ND	ND	5.0
111-84-2	<i>n</i> -Nonane	ND	ND	ND	5.0
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	ND	5.0
98-82-8	Cumene	ND	ND	ND	5.0
80-56-8	α -pinene	ND	ND	ND	5.0
622-96-8	4-Ethyltoluene	ND	ND	ND	5.0
108-67-8	1,3,5-Trimethylbenzene	ND	ND	ND	5.0
95-63-6	1,2,4-Trimethylbenzene	ND	ND	ND	5.0
100-44-7	Benzyl Chloride	ND	ND	ND	5.0
541-73-1	1,3-Dichlorobenzene	ND	ND	ND	5.0
106-46-7	1,4-Dichlorobenzene	ND	ND	ND	5.0
95-50-1	1,2-Dichlorobenzene	ND	ND	ND	5.0
5989-27-5	<i>d</i> -Limonene	ND	ND	ND	5.0
96-12-8	1,2-Dibromo-3-Chloropropane	ND	ND	ND	5.0
120-82-1	1,2,4-Trichlorobenzene	ND	ND	ND	5.0
91-2-3	Naphthalene	ND	ND	ND	5.0
87-68-3	Hexachlorobutadiene	ND	ND	ND	5.0

ND = Compound was analyzed for, but not above lab reporting limit.

Retention Time (min.) Tentatively Identified Compounds in micrograms per cubic meter

4.27	Hexafluoropropene	10	
4.51	Propane + Carbonyl Sulfide	10	
4.56	Propene	10	
5.25	<i>n</i> -Butane	10	7
6.89	<i>n</i> -Pentane	10	8
8.72	2-Methylpentane	10	
23.83	<i>n</i> -Decane	30	10
24.35	<i>n</i> -Decane	30	
25.98	<i>n</i> -Undecane	90	10
26.39	<i>n</i> -Dodecane	30	
27.60	<i>n</i> -Dodecane	90	20
28.90	<i>n</i> -Tridecane	10	

Appendix I. Odor survey responses for July 2001.

A	B	C	D	E	F	G	H	I	J	K	L
Day, m/flme	odor	Intensif	phys e	susp sou	wind dir/	location	disc	19th & Ever	loc	DEG	
1 A	B	C	D	E	F	G	H	I	J	K	L
2	2-Jul 8:00 AM	mtal	cls		Esco		2420 NW Guiln #14				yes
3	3-Jul 10:15 AM	mtal	cls		Esco		2420 NW Guilmbly #quite strg/2 hrs				
4	5-Jul 8:55 AM	Brub/mt	strong	cls	Esco	NW breeze	2518 NW Savler				
5	5-Jul 10:10 AM	mtal	cls		Esco	NW breeze	2518 NW Savler				
6	5-Jul 11:00 AM	mtal	cls		Esco	breezy	2420 NW Guilmbly				
7	6-Jul 10:05 AM	Bst	cls		Esco/Ko	NW Breez	2518 NW Savler				
8	6-Jul 10:40 AM	mtal	cls		Esco	NW breeze	2518 NW Savler				
9	9-Jul Noon	mtal			Esco	still	2518 NW Savler		24th & Thurman		
10	9-Jul Noon	mtal	cls		Esco		2420 NW Guilmbly #14				
11	10-Jul 12:00 AM	swt cher			?	still	2518 NW Savler		31st & Thurman		
12	11-Jul 5:00 AM	br mtal	strong		Esco		2217 NW Johnson				
13	11-Jul 6:45 AM	br mtal	strong		Esco		2217 NW Johnson		25th & Johnson		
14	11-Jul 5:00 PM	Esco ocl v.	strong	nausea	Esco		2217 NW Johnson		25th Pl/Dover		
15	12-Jul 2:45 AM	burning	strong	wake	Esco		2217 NW Johnson				
16	12-Jul 6:30 AM	Esco ocl strong			Esco		2217 NW Johnson				
17	12-Jul 7:15 AM	Esco ocl strong			Esco		2217 NW Johnson		25th & Westover		
18	12-Jul 9:20 AM	mtal	cls		Esco		2420 NW Guilmbly #14				
19	13-Jul 7:54 AM	Esco ocl v.	strng		Esco		2217 NW Johnson				
20	17-Jul 1-2 PM	chem	cls	throat	?		2856 NW Thurman				yes
21	18-Jul 8:30 AM	gas/fuel	lrr	throat			2856 NW Thurman				yes
22	19-Jul 8:42 AM	mtal	cls		Esco		2420 NW Guilmbly				
23	19-Jul 9:10 AM	mtal	cls		Esco		2420 NW Guilmbly				
24	19-Jul 11:00 AM	mtal/soil	cls		Faulknei		2856 NW Thurman				yes
25	20-Jul 2:00 PM	chlorine	lrr	head	?		1427 NW 23rd		Montg Park		
26	20-Jul 11:30 AM	mtal	cls/lrr		Faulknei		2856 NW Thurman				yes
27	25-Jul 8:00 AM	mtal	cls		Esco		2420 NW Guilmbly				
28	26-Jul 8:30 PM	other	cls		brewery		2856 NW Thurman		str yeasty smell		yes
29	26-Jul 9:37 AM	mtal	cls	?	Esco	N/NW?	2518 NW Savler				
30	26-Jul AM	mtal	cls		Esco		2420 NW Guilmbly				
31	27-Jul 9:35 AM	mtal	cls		Esco		2420 NW Guilmbly				
32	30-Jul 11-noon	mtal	cls		Faulknei		2856 NW Thurman		28th & Thurm		yes
33	31-Jul 8:55 AM	mtal	cls		Esco		2420 NW Guilmbly				
34	31-Jul 11:05 AM	mtal	cls		Faulknei		2856 NW Thurman				yes

Appendix II. Odor survey responses for August 2001.

A	B	C	D	E	F	G	H	I	J	K	L
Day, mo/yr	time	odor	Intensif	phys ef	susp sour	wind dir	location			loc	DEG
1	A										
2	1-Aug	11:05 AM	mtal	clis			2856 NW Thurman				yes
3	1-Aug	7:54 AM	sul	anoy	none		2065 NW 29th #7				yes
4	6-Aug	7:00 AM	bstf/mtal	anoy/cnose/th	Esco	NW	1842 NW 25th #23				
5	6-Aug	8:30 AM	bstf/mtal	clis/lir	throat		2856NW Thurman				yes
6	6-Aug	11:30 AM	mtal	v string		still	2518 NW Savier		also @ PO		
7	7-Aug	8:55 AM	mtal	clis	Esco		2420 NW Quimby #14				
8	7-Aug	9:00 AM	bstf/viny/	anoy/lr	nose, e/	Esco	1842 NW 25th #23				
9	7-Aug	9:55 AM	acr/char	clis	Esco?	sit NW	2518 NW Savier		also 25 & Thurm		
10	8-Aug	7:00 AM	garbage	clis		sit NW	2518 NW Savier				
11	8-Aug	8:00 AM	mtal	clis	noscl/lr	Esco	2420 NW Quimby #14				yes
12	8-Aug	2:30 PM	yeasty	clis	brewery		5856 NW Thurman				
13	9-Aug	3:30 PM	brub	anoy	none	D/K	2055 NW 29th #7				yes
14	10-Aug	11:30 PM	bnt mtal	clis	lir	Esco?	2420 NW Quimby #24				yes
15	13-Aug	6:00 AM	bstf/viny/	anoy/cnose/e	Esco	calm	1842 NW 25th #23				
16	13-Aug	6:45 AM	mtal	clis	Esco	calm	2420 NW Quimby #14				
17	14-Aug	11:15 AM	mtal/bstf	clis	Esco	still/sit	2518 NW Savier				
18	14-Aug	2:30 PM	brub	anoy	none	NW	2055 NW 29 #7				yes
19	20-Aug	8:00 AM	brub	clis	Esco	?	1427 NW 23 #7				
20	20-Aug	3:10 PM	bstf/mtal	string		W/NW	2518 NW Savier				
21	21-Aug	4:36 PM	plastic	anoy	none	W/NW	2055 NW 29 #7				yes
22	22-Aug	5:30 PM	mtal	anoy	none	W/NW	2055 NW 29 #7				yes
23	23-Aug	10:30 AM	bstf	anoy	none	NW	2055 NW 29 #7				yes
24	27-Aug	1:00 PM	mtal	anoy	none	NW	2055 NW 29 #7				yes
25	27-Aug	7:00 AM	bstf/mtal	anoy/lr	nose/e	Esco	1842 NW 25th #23				
26	27-Aug	8:00 PM	bstf/mtal	anoy/lr	nose/e	Esco	1842 NW 25th #23				
27	27-Aug	10:30 AM	brub/bstf	clis	Esco/coff		2856 NW Thurman		also @ Wash Park		
28	28-Aug	9:00 AM	mtal	clis	Esco	calm	2420 NW Quimby #14				
29	28-Aug	10:00 AM	brub	clis	Esco		2856 NW Thurman		at Wallace Pk		
30	28-Aug	11:00 AM	brub	clis	Esco		2856 NW Thurman		23 & Pettygr		
31	29-Aug	7:00 AM	bstf	anoy	nose/th	Esco	1842 NW 25th #23				
32	29-Aug	8:00 AM	clis		oil/gas		2856 NW Thurman				
33	29-Aug	10:00 AM	oth	clis	oil/gas		2856 NW Thurman				
34	29-Aug	10:30 PM	chem	lir	asth/bt	Galvanize	2055 NW 29th #7				yes
35	30-Aug	8:15 AM	bstf	anoy	none	Esco	2055 NW 29th #7				yes
36	30-Aug	6:57 PM	brub	anoy	none	NW	2055 NW 29 #7				yes

Appendix II. Odor survey responses for August 2001 (cont.).

	A	B	C	D	E	F	G	H	I	J	K	L
38	31-Aug	11:30 AM	gas	cls	strng	diesel/exl		2856 NW Thurman				

Appendix III. EPA Analysis of selected substances in TSP collected in Portland and Medford, Oregon during 1988.

Substance / Total Suspended Particles	UG/CU meters	Trancon 3182 NW 26th				55 SW Ash				5824 SE Lafayette				Medford			
		Max Value	Mean Value 19 Observations	Mean Value 13 Observations	Mean Value 12 Observations	Mean Value 14 Observations											
Arsenic		.0118	.0040	.0113	.0030	.0027											
Beryllium		.00	.03														
Barium		.0978	.0342														
Cadmium		.006	.002														
Chromium		.1975	.0513	.0097	.0052	.0052											
Cobalt		.0048	.0019	.0010	.0009	.0009											
Copper		.3178	.1576														
Iron		7.878	3.554														
Lead		.11	.06														
Manganese		.2002	.0854														
Molybdenum		.0141	.0045														
Nickel		.0571	.0196														
Vanadium		.039	.016														
Zinc		.7054	.2554														
Benzo(A)Pyrene		1.51	.24	.53	.35	3.74											

Figure 2. Nickel content of dust collected on NW Portland porches from 11 July to 22 August 2001.

Nickel
August 2001

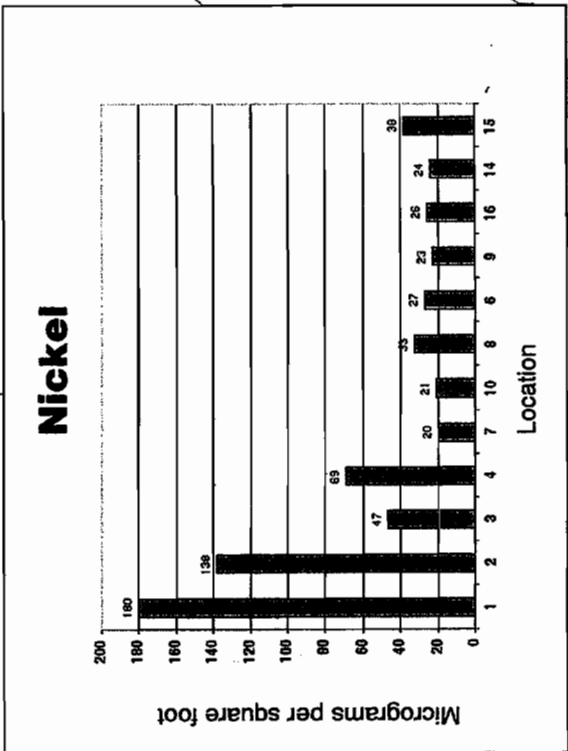
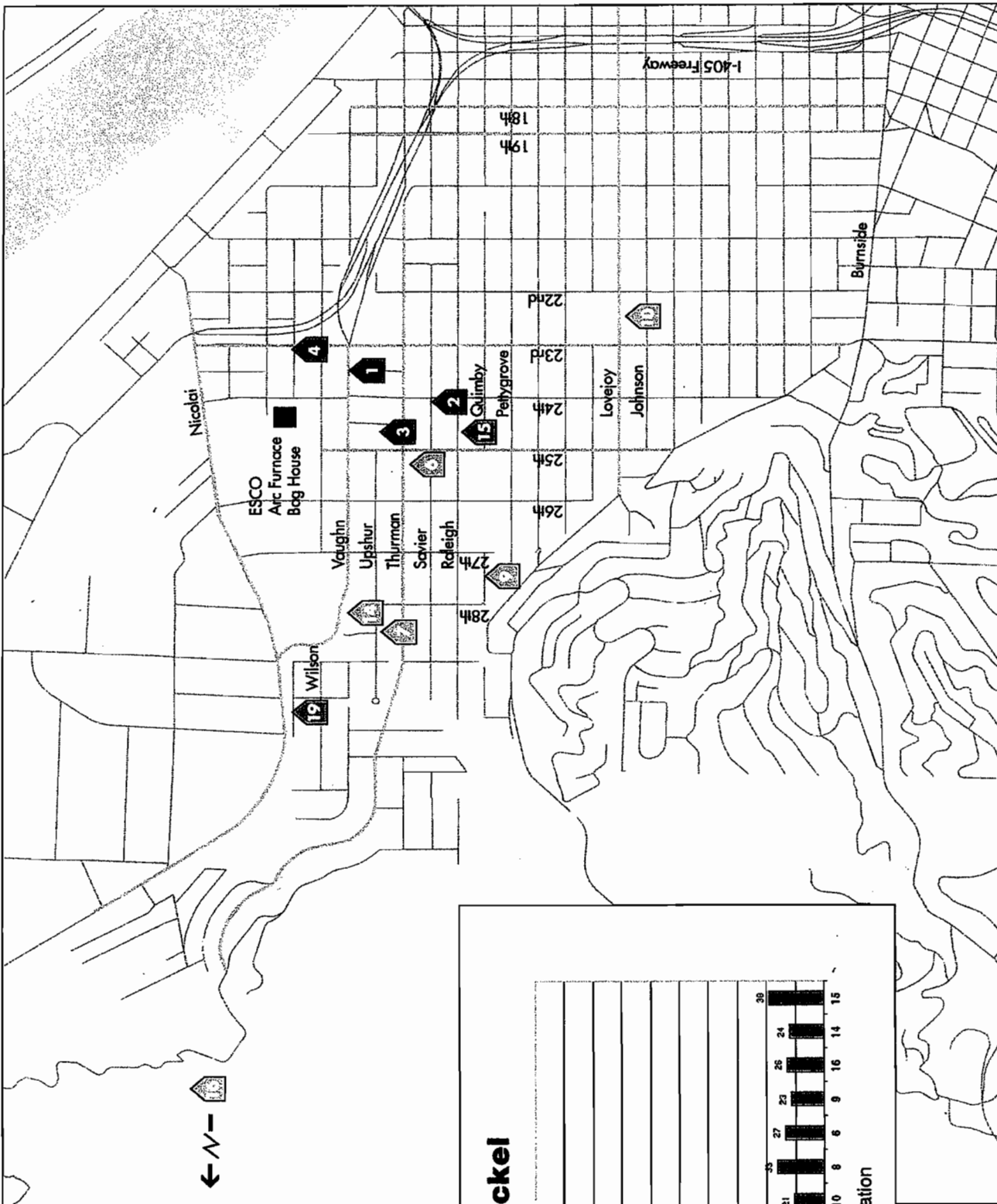


Figure 3. Chromium content of dust collected on NW Portland porches from 11 July to 22 August 2001.

Chromium
August 2001

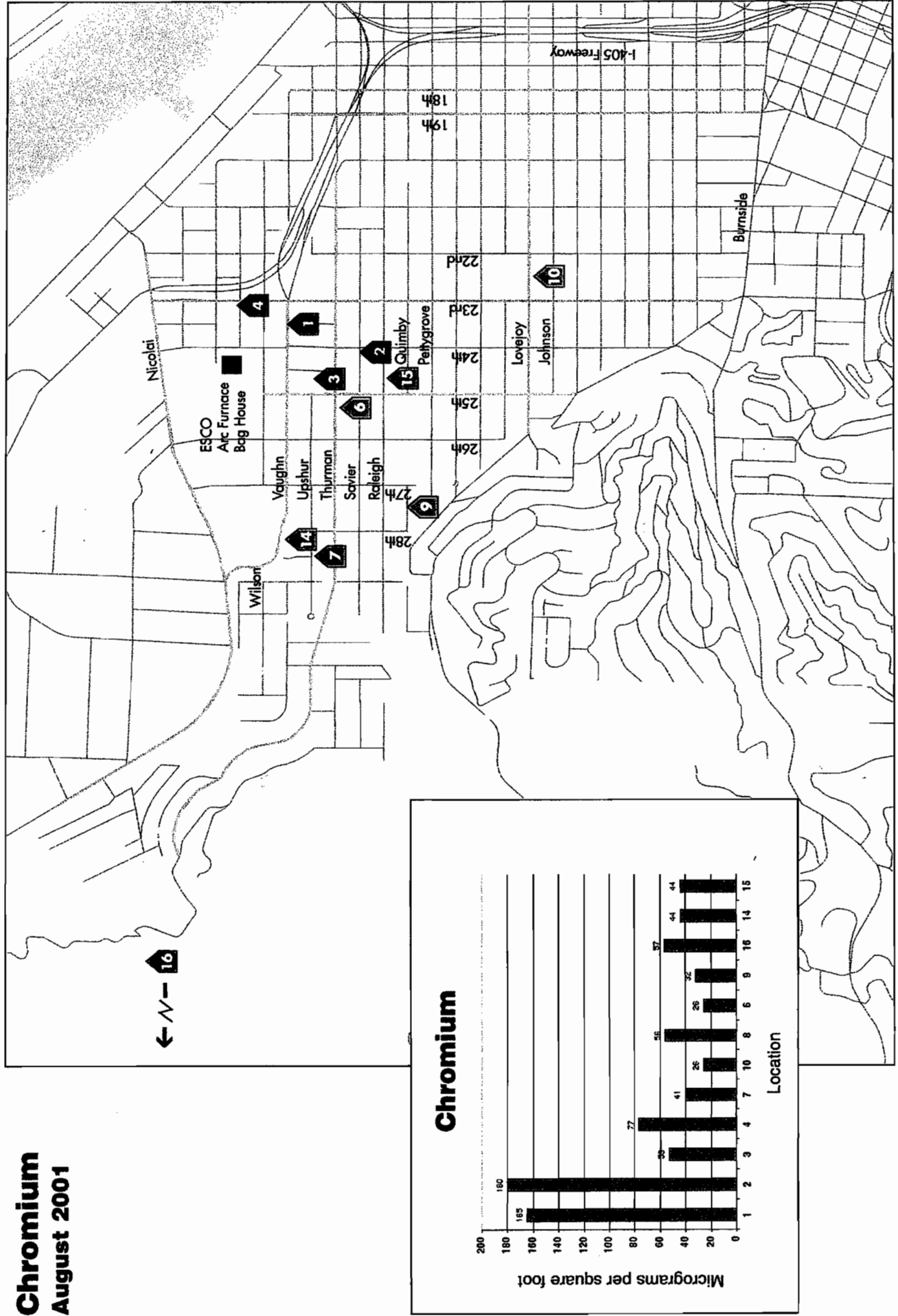


Figure 1. Lead content of dust collected on NW Portland porches from 11 July to 22 August 2001.

**Lead
August 2001**

