Supplementary Information

Using community science for detailed pollution research: A case-study approach in Indianapolis, IN, USA

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Supplementary Text

Test S1-Instrument Analyses

The Pb isotopes ^{204}Pb, ^{206}Pb, ^{207}Pb, and ^{208}Pb were detected along with ^{202}Hg, ^{203}Tl, and ^{205}Tl with a Nu Plasma II Multicollector Inductively Coupled Plasma Mass Spectrometer (MC-ICP-MS). All Pb isotope results were Hg-corrected, albeit the Hg correction was nominally zero, and corrected on-line for mass discrimination using the known Tl ratio of the NIST 997 spike. All results were then normalized offline to values reported by Galer and Abouchami (1998) for the NIST 981 standard (^{206}Pb/^{204}Pb = 16.9405, ^{207}Pb/^{204}Pb = 15.4963, and ^{208}Pb/^{204}Pb = Pb 36.7219). The errors are derived from the reproducibility of the NIST 981 Pb standard over the course of the run.

Text S2-Quality Control

To address any possible metal contamination through sieving the household soil and dust samples, 5 subsamples of NIST SRM 2702 – Inorganics in Marine Sediment were processed through either dust sieves (NIST_2702_1 and NIST_2702_2) or a 2 mm soil sieve (remaining SRM 2702 samples), as well as through the rest of the sample prep (i.e., digestions). The elements Cd, Tl, Pb, and Sb were deemed acceptable based on mean % recoveries between 80-106% (Table S1), and Pb isotopic contamination was deemed minimal based on low standard deviations for all isotope ratios within the SRM 2702 samples (Table S2), and good agreement with the peer review published ^{207}Pb/^{206}Pb avg value of 0.8377 (calculated from ^{206}Pb/^{207}Pb ratio of 1.1937 for SRM 2702; Jeong et al., 2021—99.62% similarity of our mean ratio to the published ratio).

As a quality control check on sample preparation and analysis, ICP-MS samples included periodic blanks run between samples, which confirmed background levels negligible. Isotopic

analyses via MC-ICP-MS included the analysis of a USGS reference material (AGV-2a), prepared and processed as an unknown sample, which was in agreement with previously published isotopic compositions (Table S2), and multiple analyses of an unknown sample during the analytical session (within analytical error of one another), which confirmed instrument stability across the analysis period.

Supplementary Figures

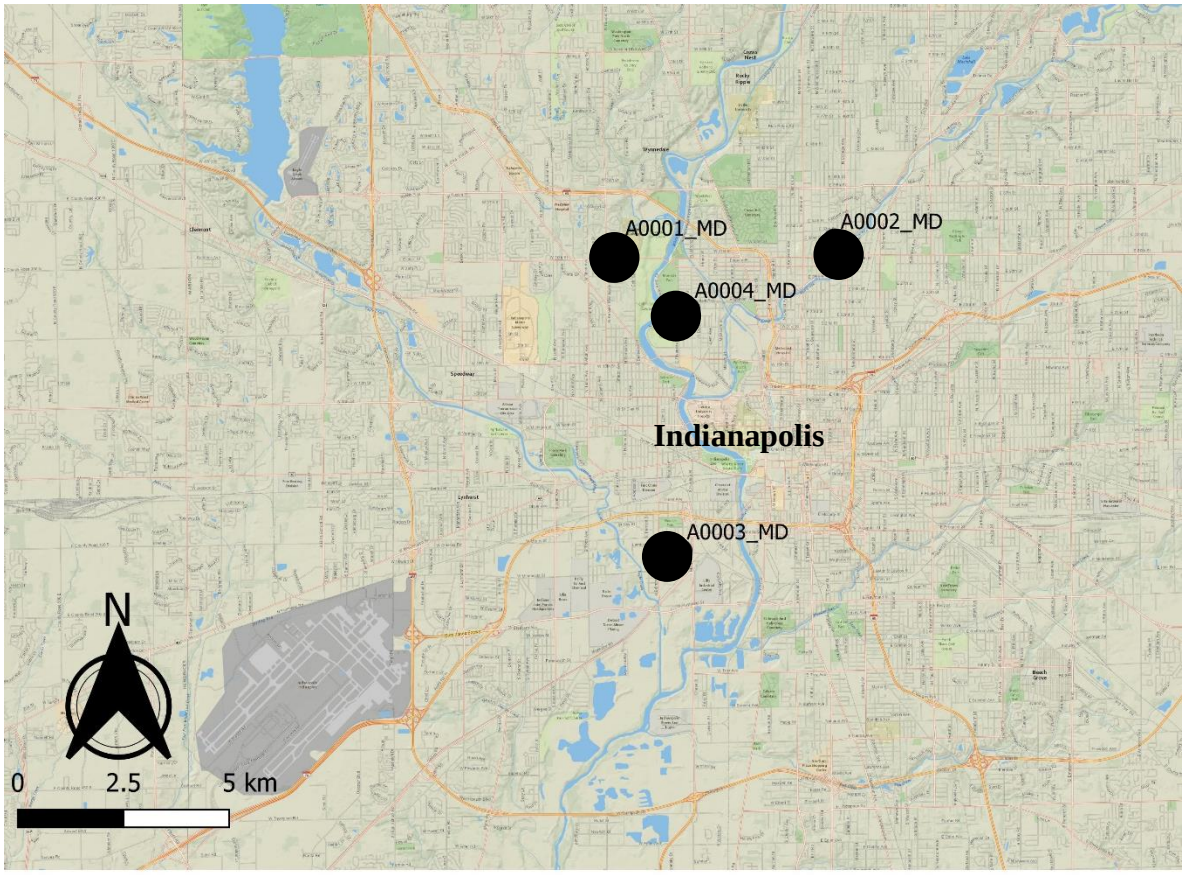


Fig. S1: Locations of the homes that provides samples, with symbol size enlarged and the map zoomed out to protect privacy.

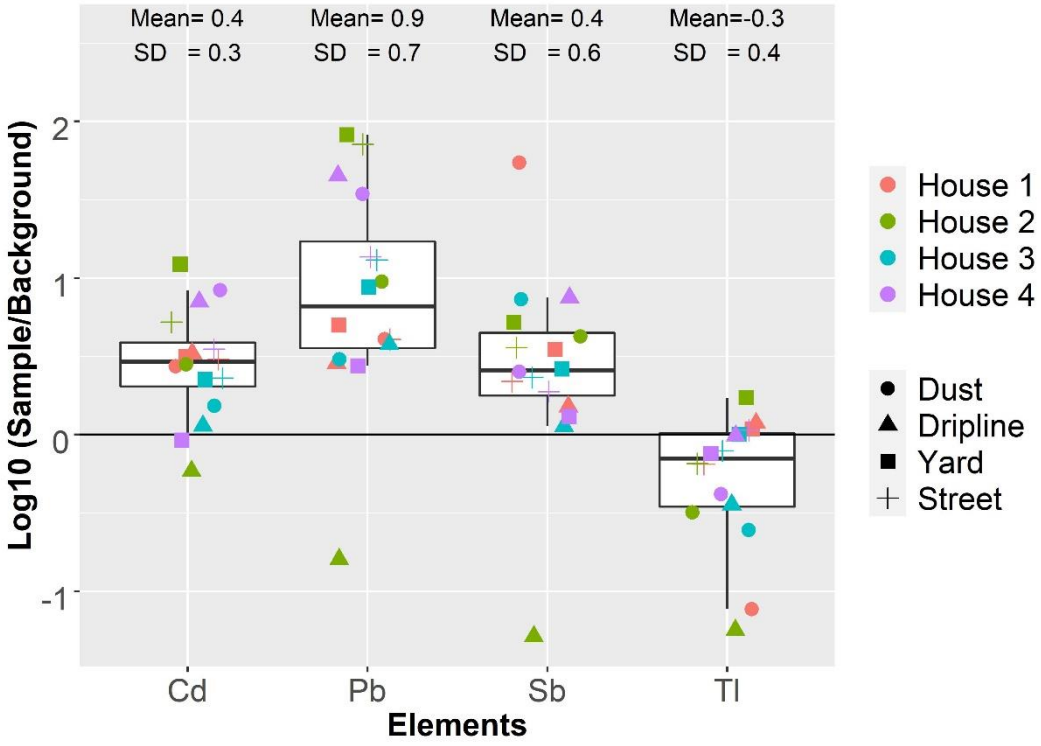


Fig. S2: Bulk metal concentrations of dust and soil samples normalized to the 75th percentile of Indiana top 0-5cm background soil values from Smith et al. (2013). All values >0 represent enrichment relative to the 75th percentile of background soil metal concentrations in Indiana, U.S.

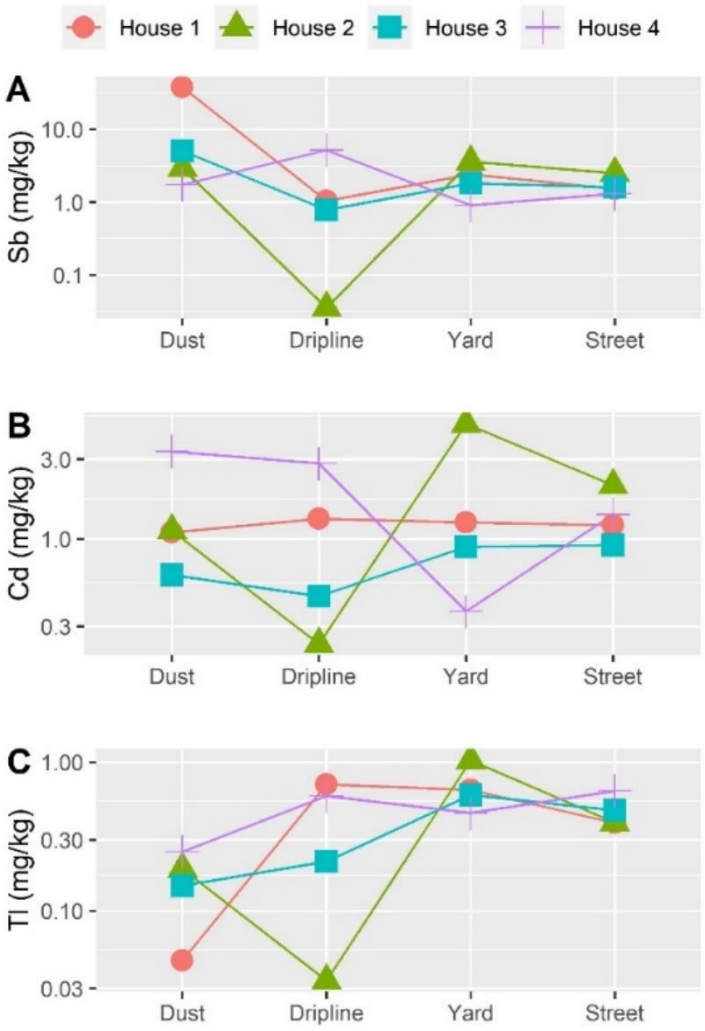


Fig S3: Bulk metal concentrations (mg/kg) for each household based on sampling location.

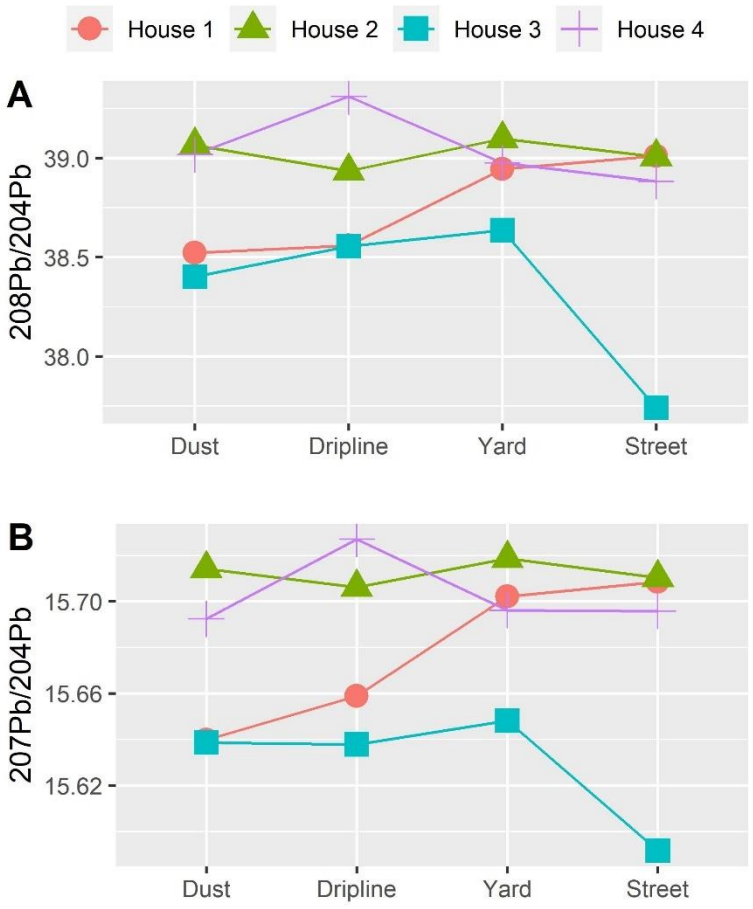
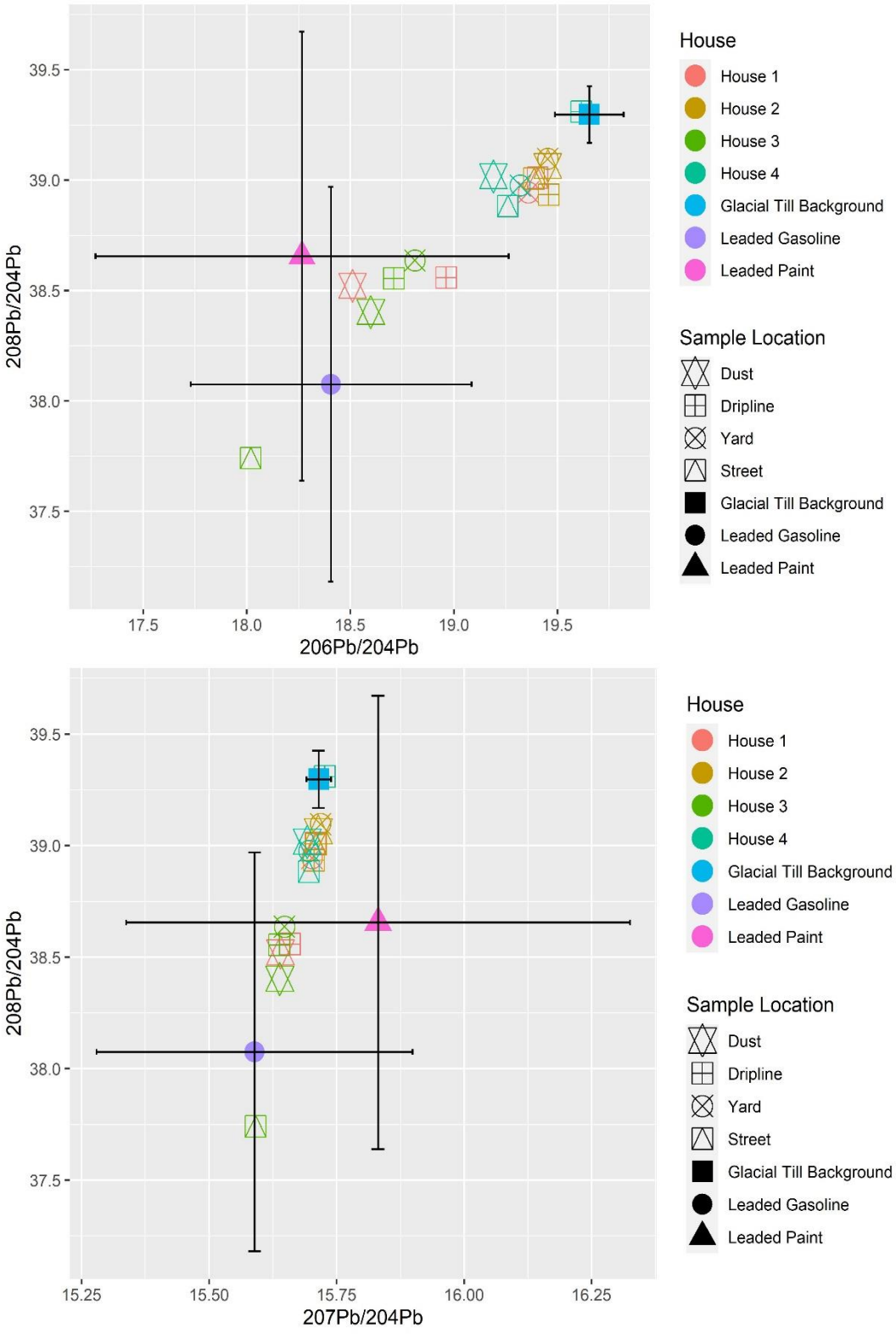
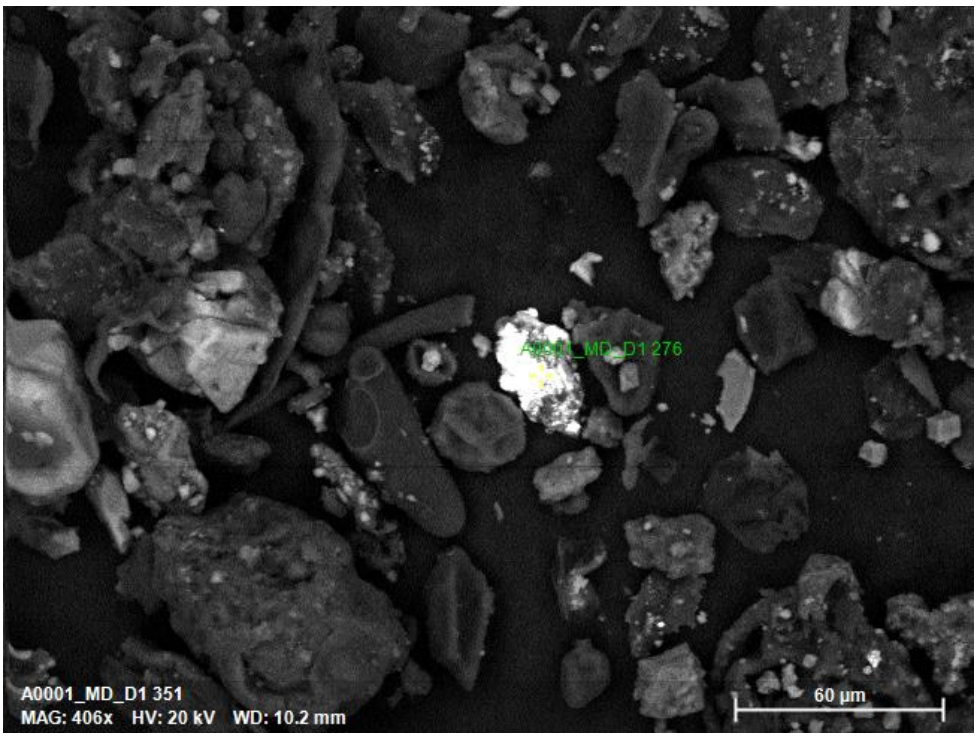


Fig. S4: Additional Pb isotope plots for each household based on sampling location.



169 **Fig. S5:** Bivariate plots of Pb isotopic ratios for all samples and main potential pollution source
170 endmembers, with error bars representing 1σ variability in the source endmembers (Midwest

U.S. Glacial Till/Soil Background—Kousehlar and Widom, 2020, LeGalley et al., 2013; U.S. Leaded Gasoline—Dietrich et al., 2021 and the references therein; Leaded Paint—Wang et al., 2019 and the references therein). 2σ sample analytical variability is minimal relative to the symbol sizes, and thus only displayed in Table S2.



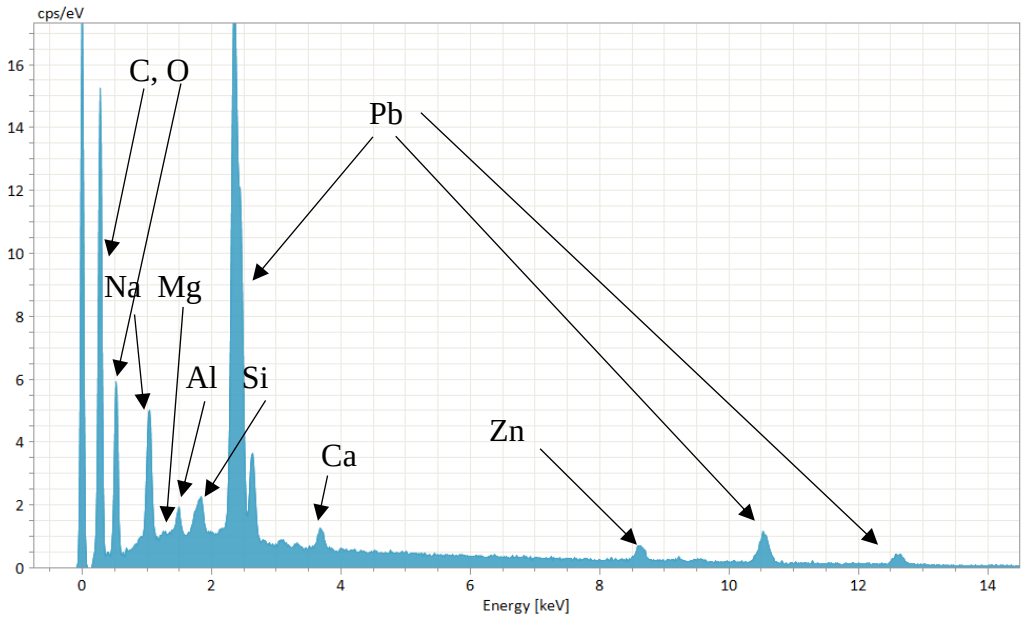


Fig. S6: EDS spot analysis of House 1: Indoor Dust[1].

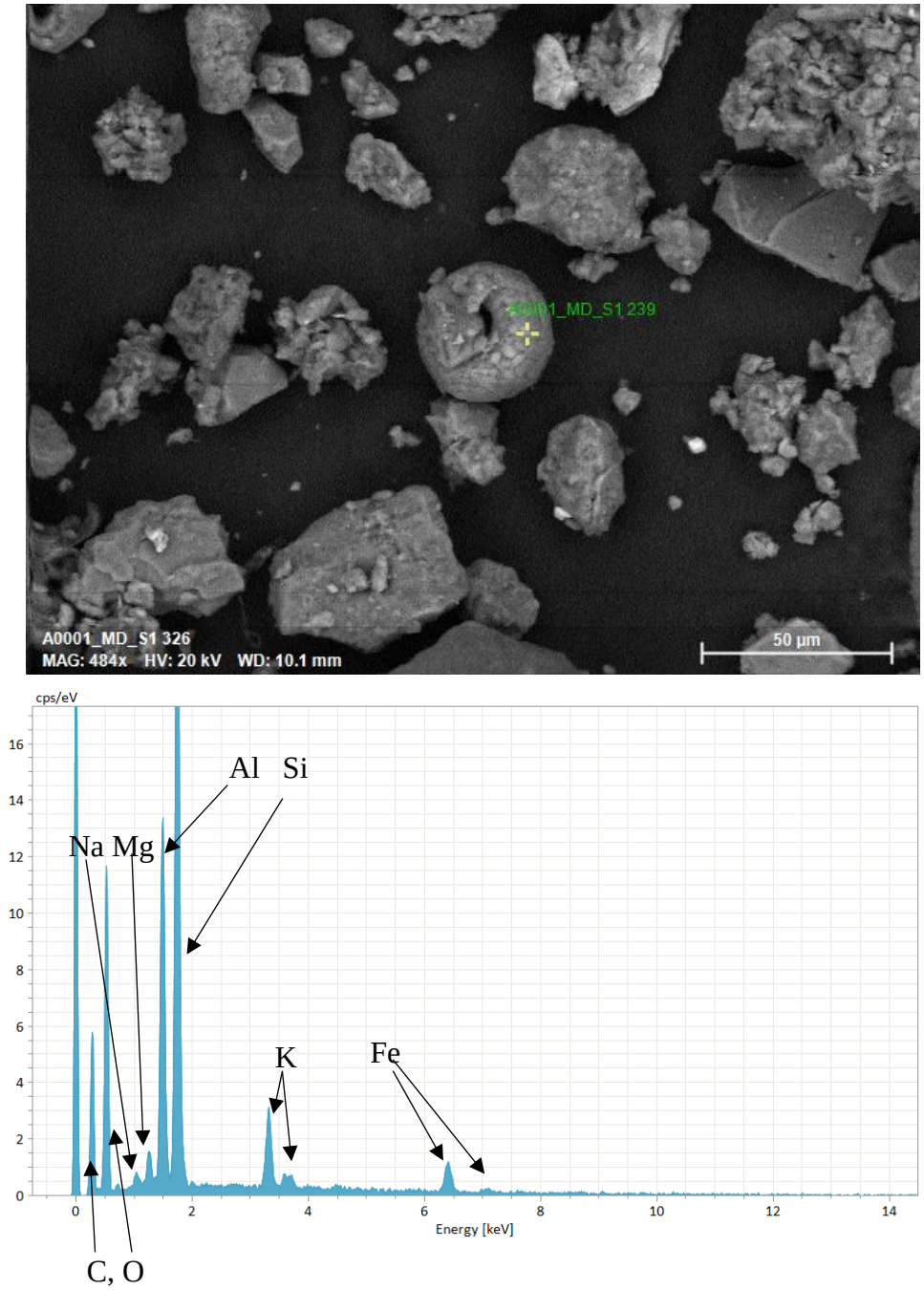


Fig. S7: EDS spot analysis of House 1: Dripline[2].

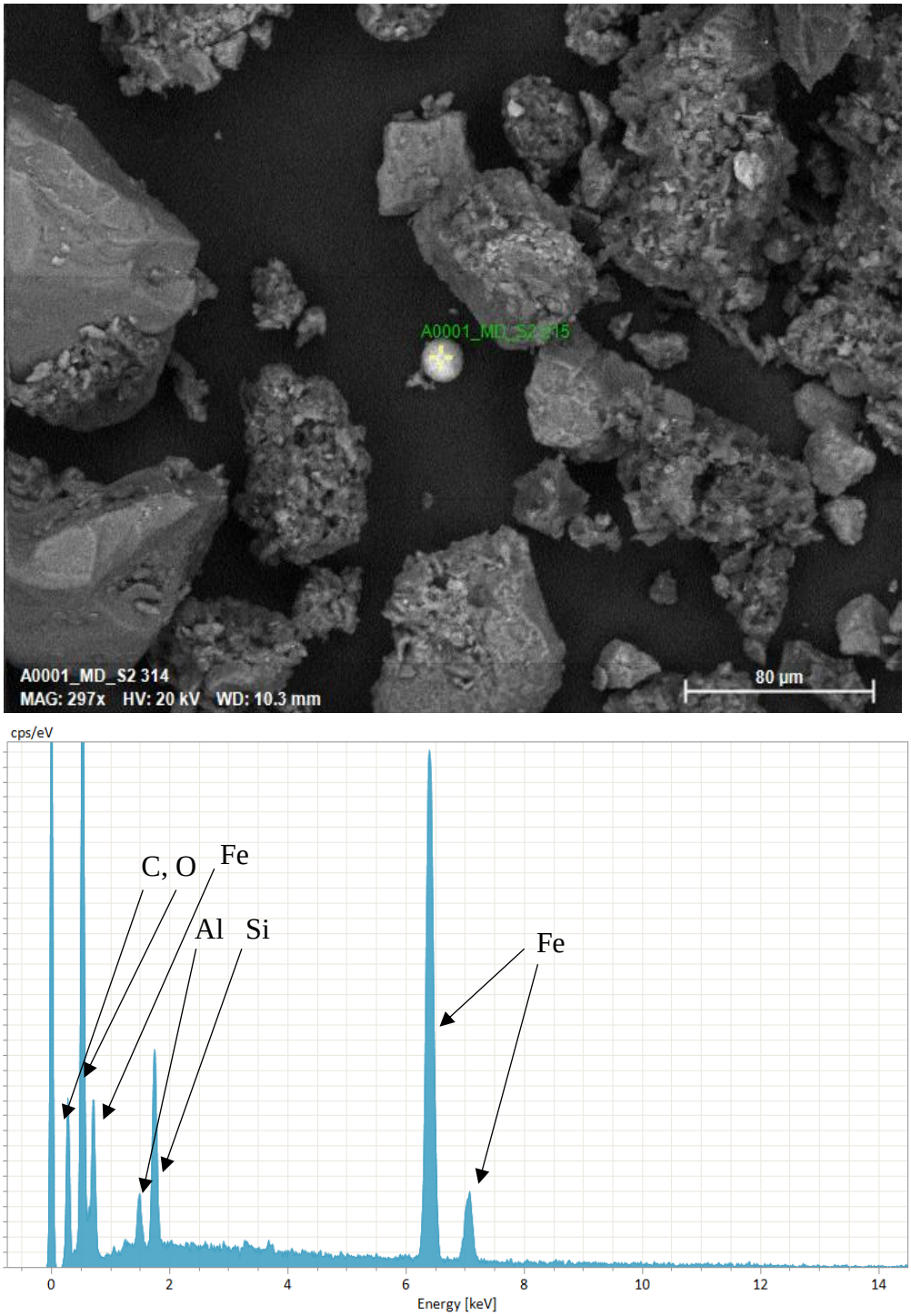
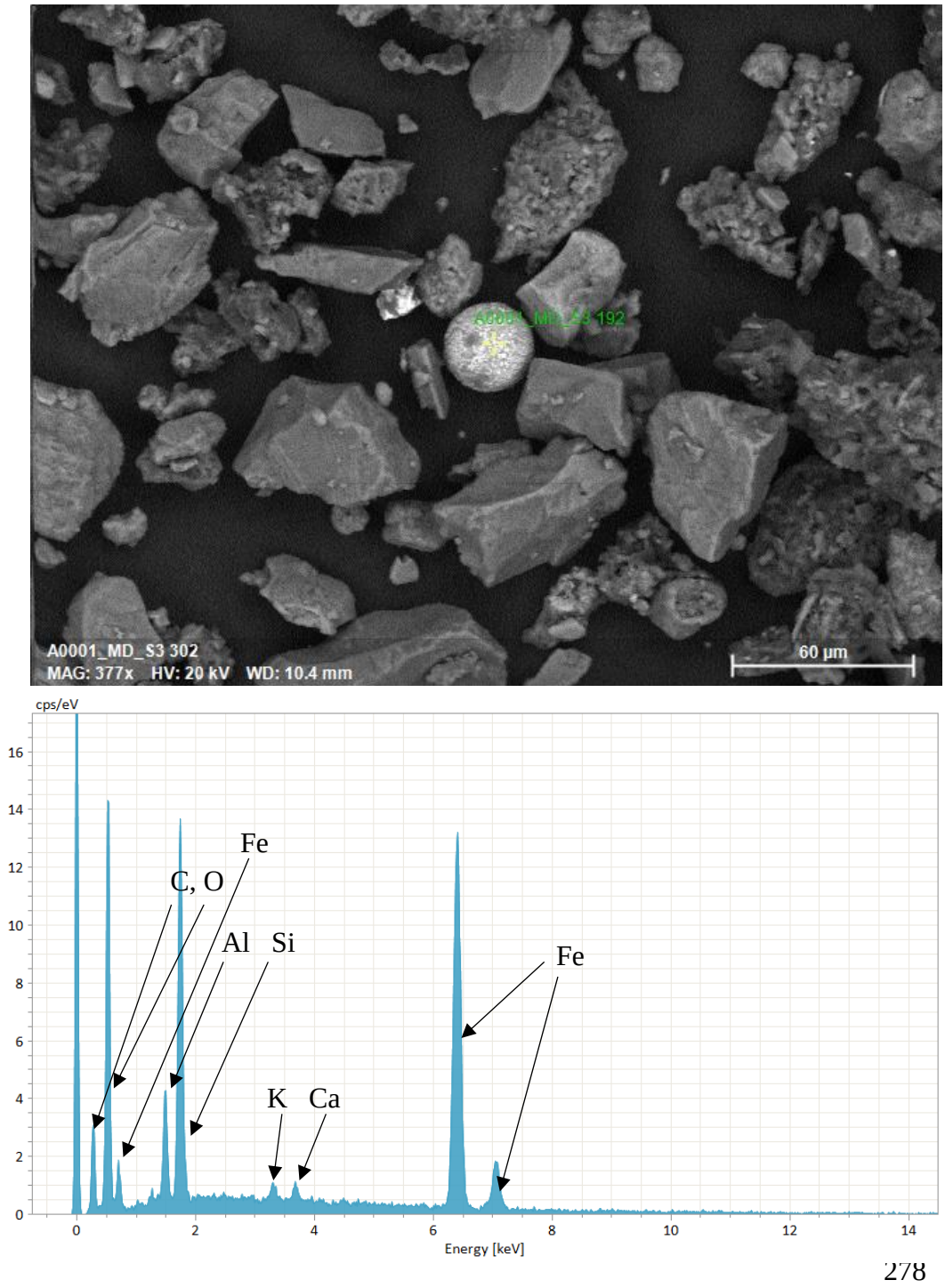


Fig. S8: EDS spot analysis of House 1: Streetside[3].



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279 **Fig. S9:** EDS spot analysis of House 1: Yard[4].

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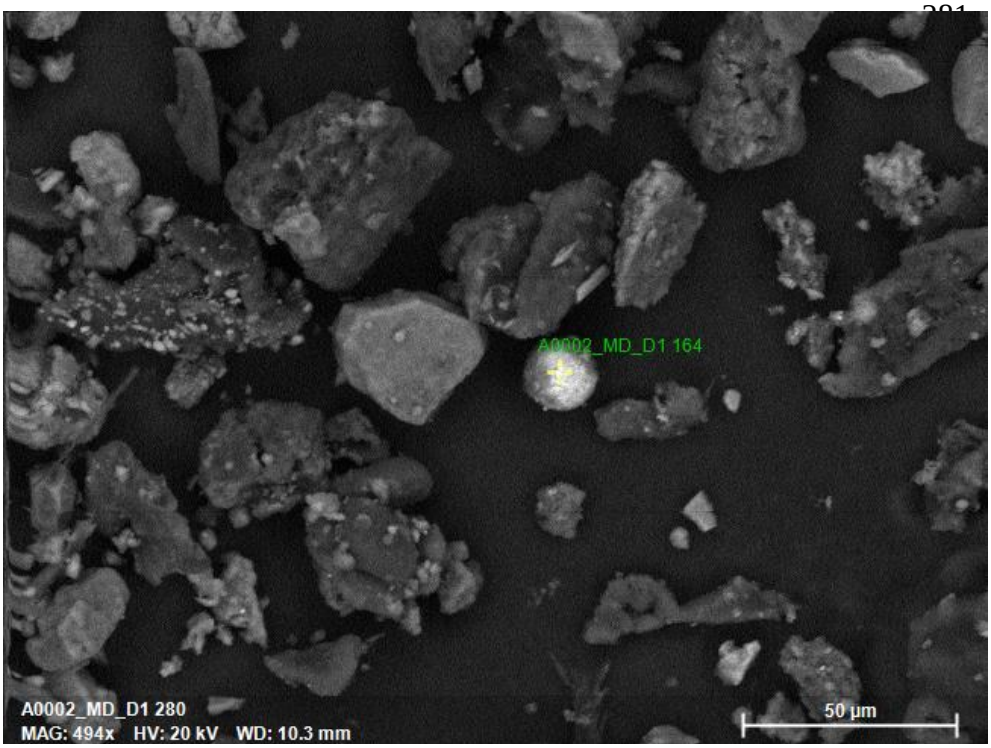


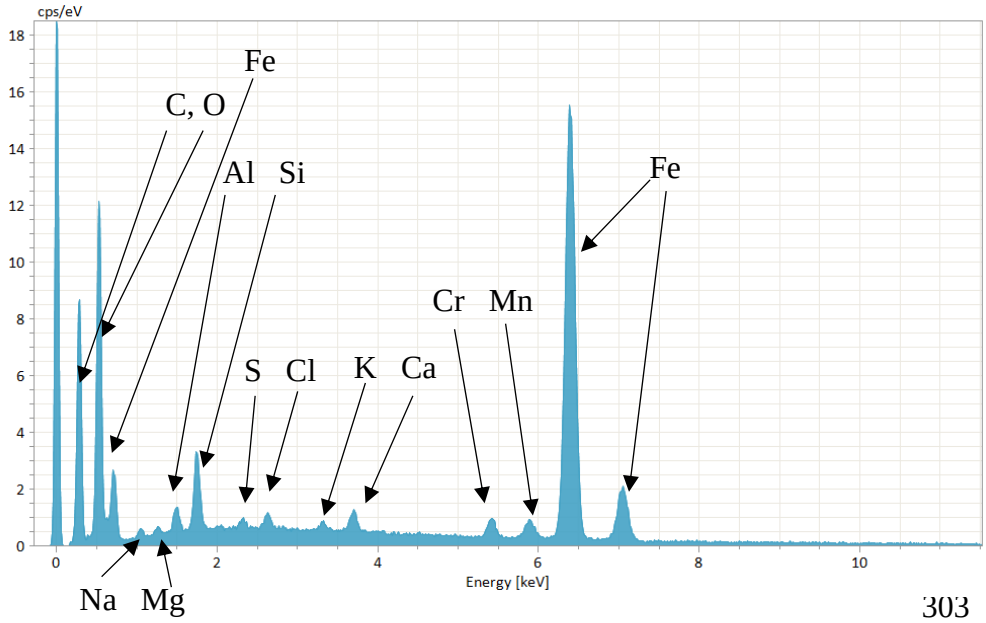


Fig. S10: EDS spot analysis of House 2: Indoor Dust[5].

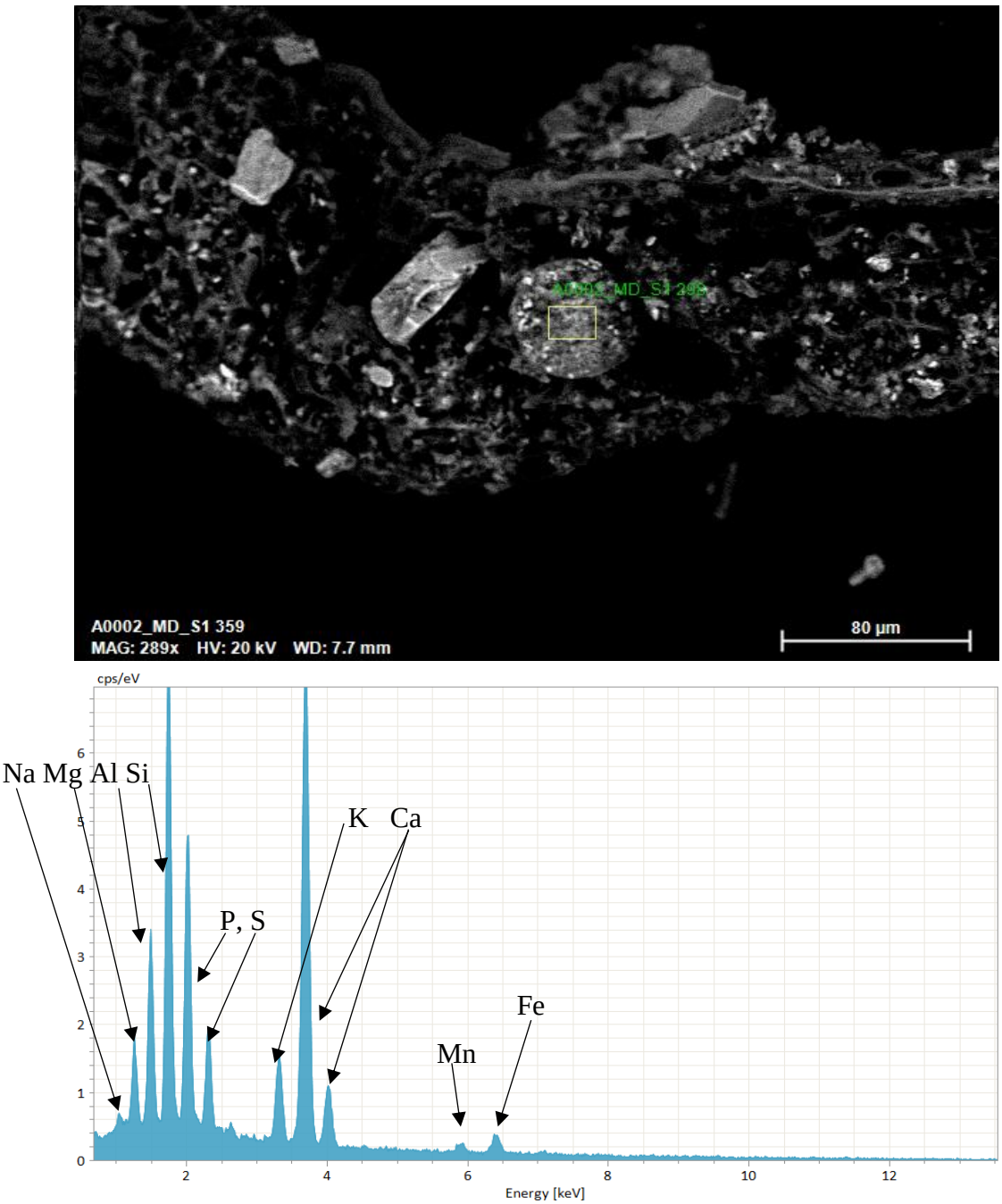


Fig. S11: EDS spot analysis of House 2: Dripline[6].

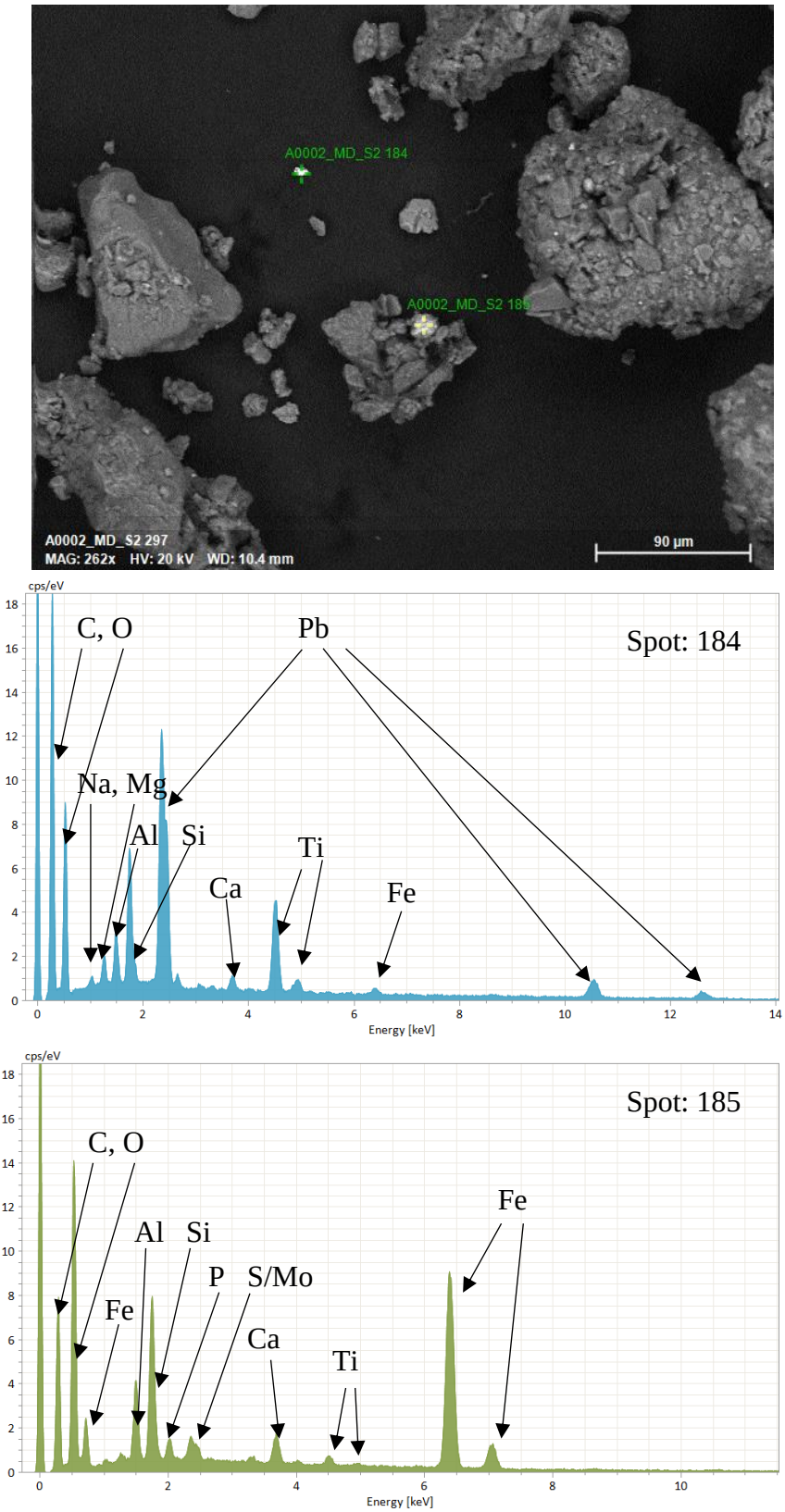


Fig. S12: EDS spot analyses of House 2: Streetside[7].

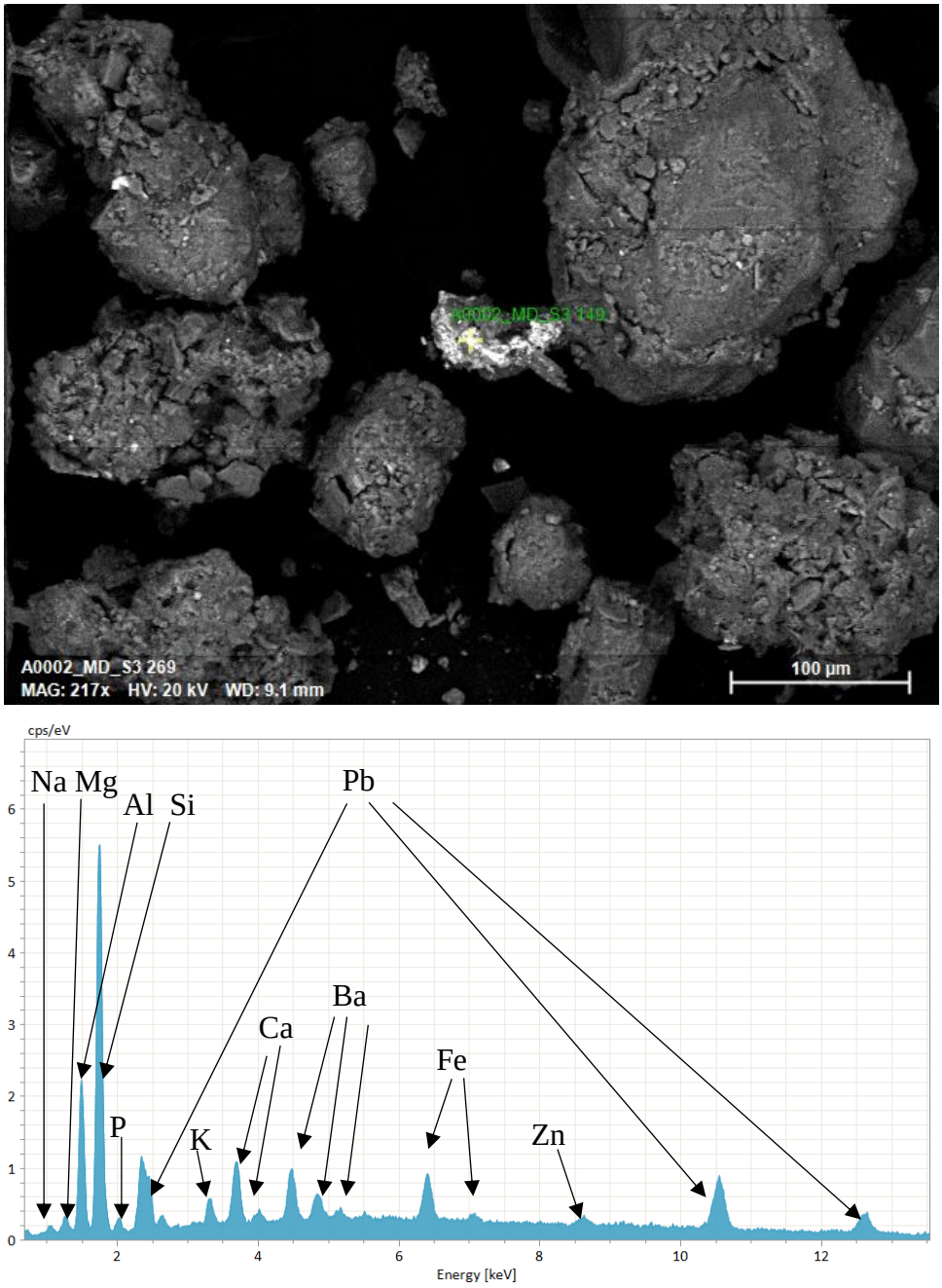
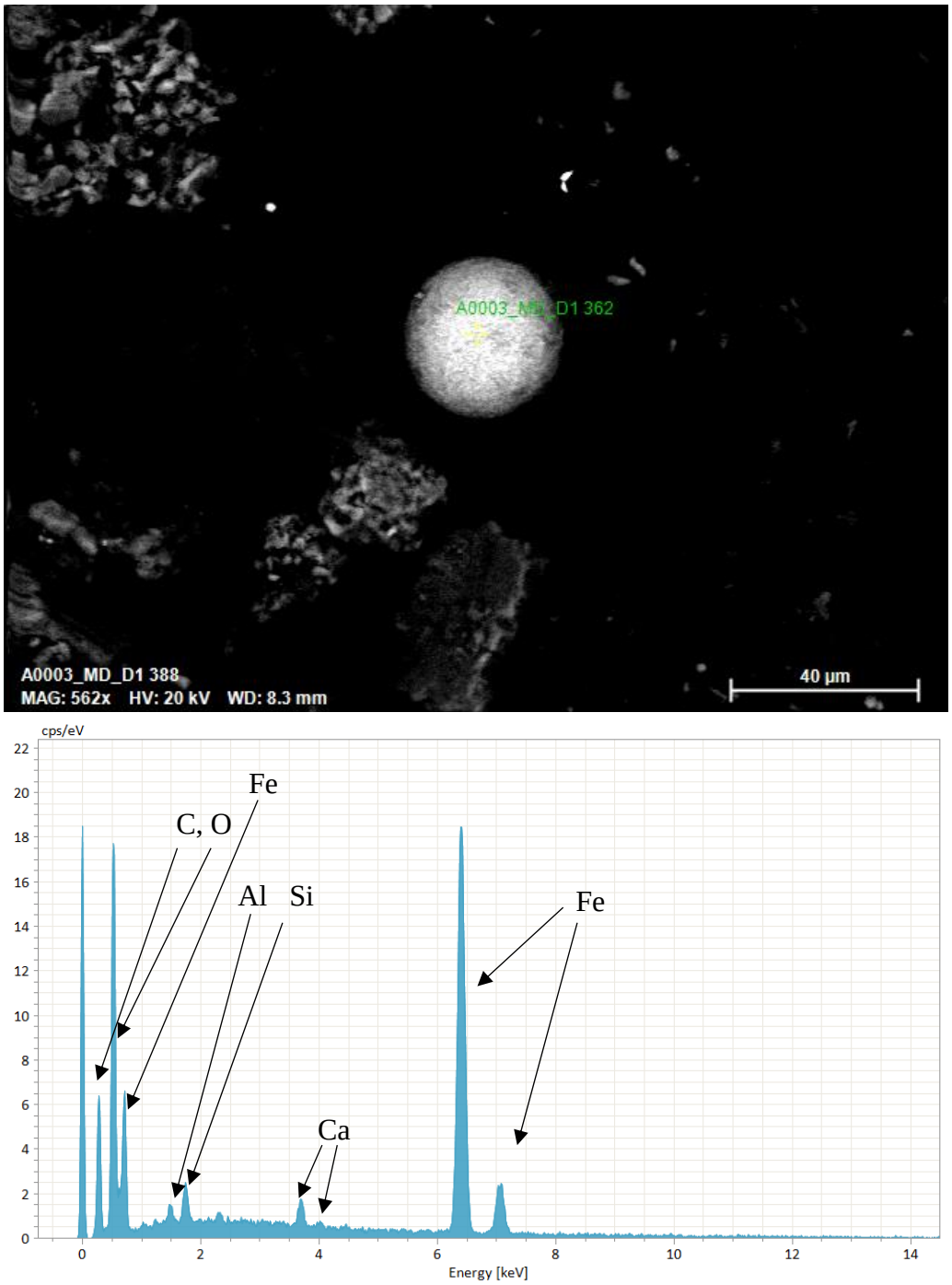


Fig. S13: EDS spot analysis of House 2: Yard[8].



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416 **Fig. S14:** EDS spot analysis of House 3: Indoor Dust[9].

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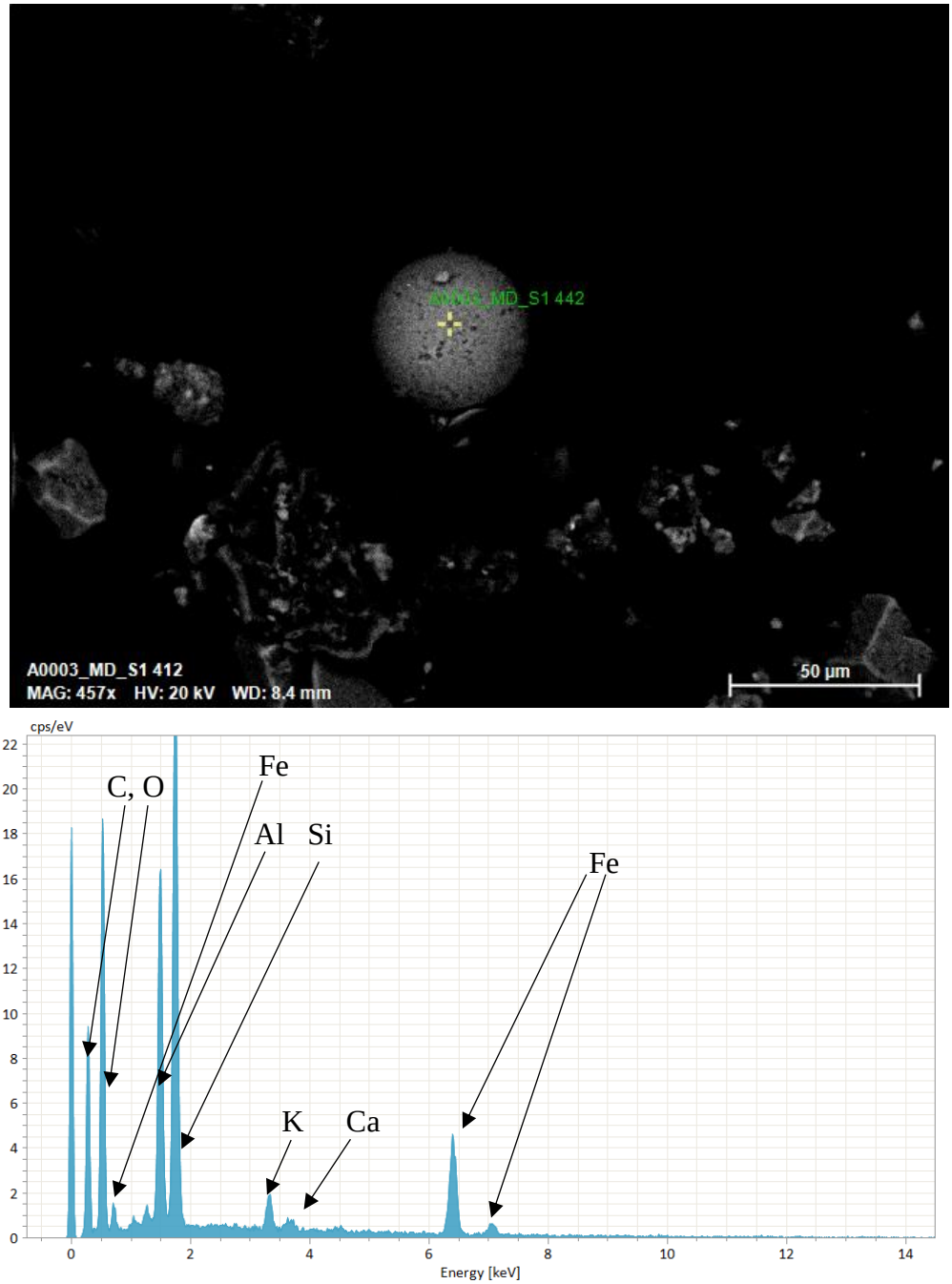
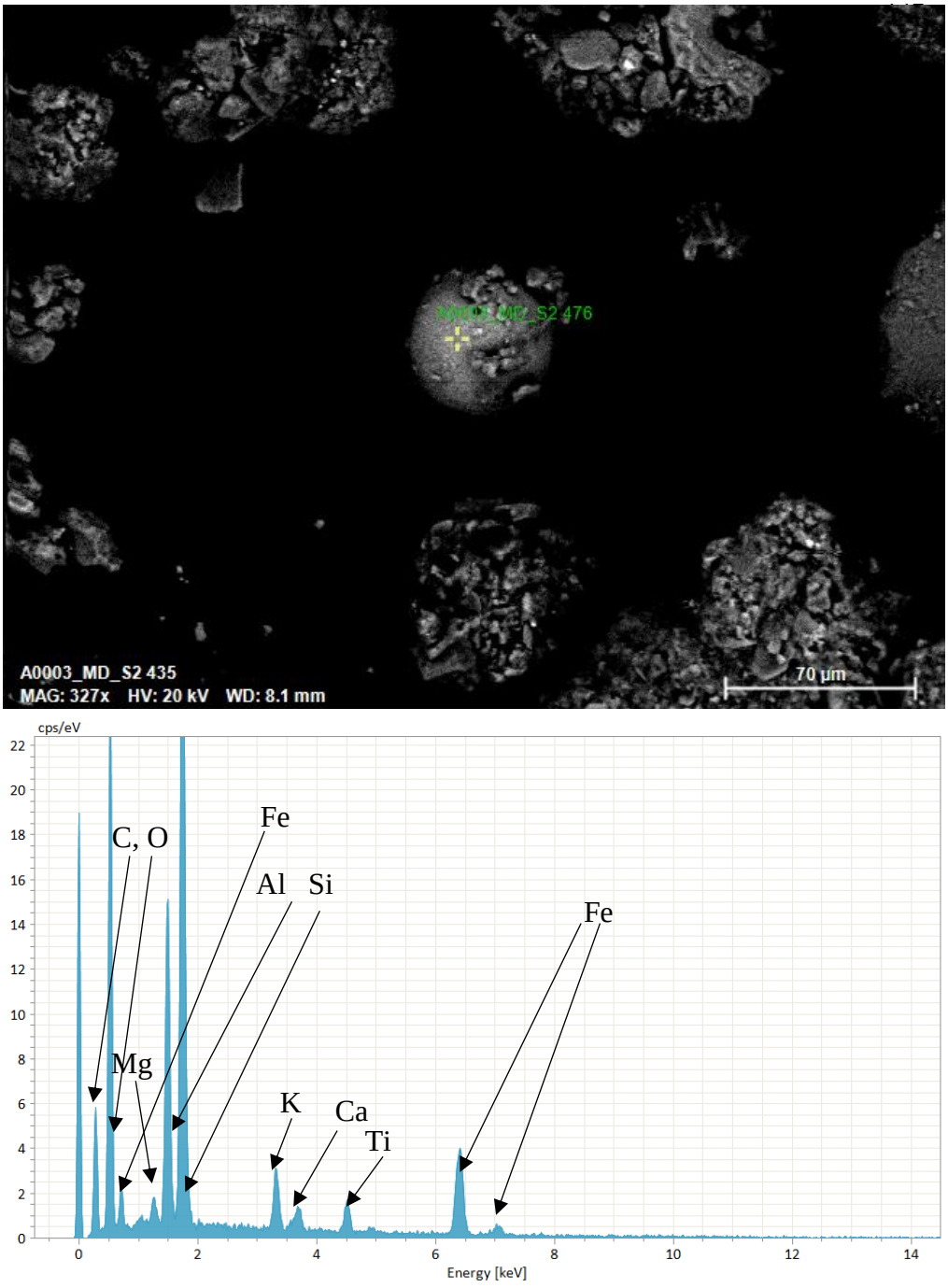


Fig. S15: EDS spot analysis of House 3: Dripline[10].



468 **Fig. S16:** EDS spot analysis of House 3: Streetside[11].

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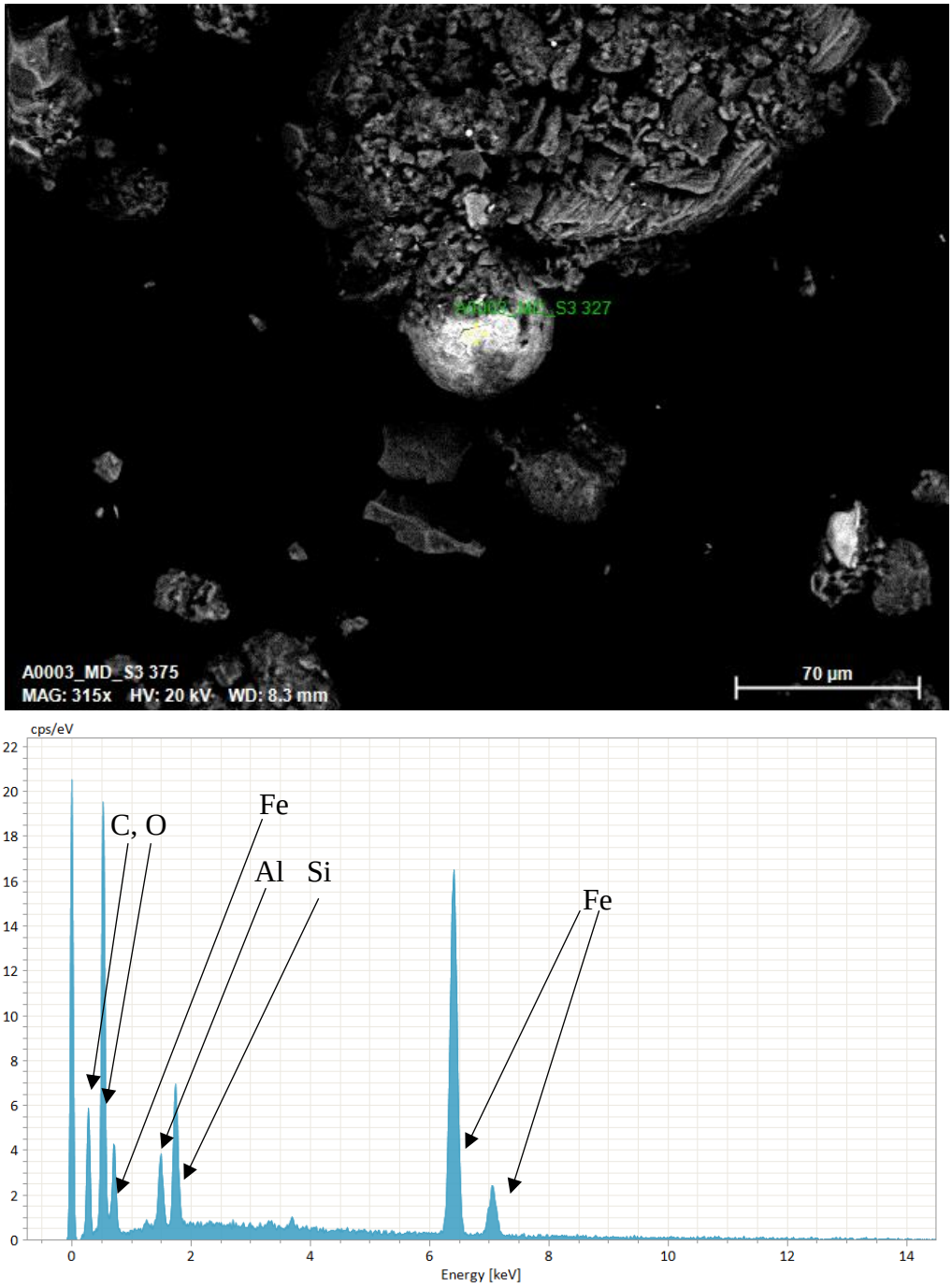

Fig. S17: EDS spot analysis of House 3: Yard[12].

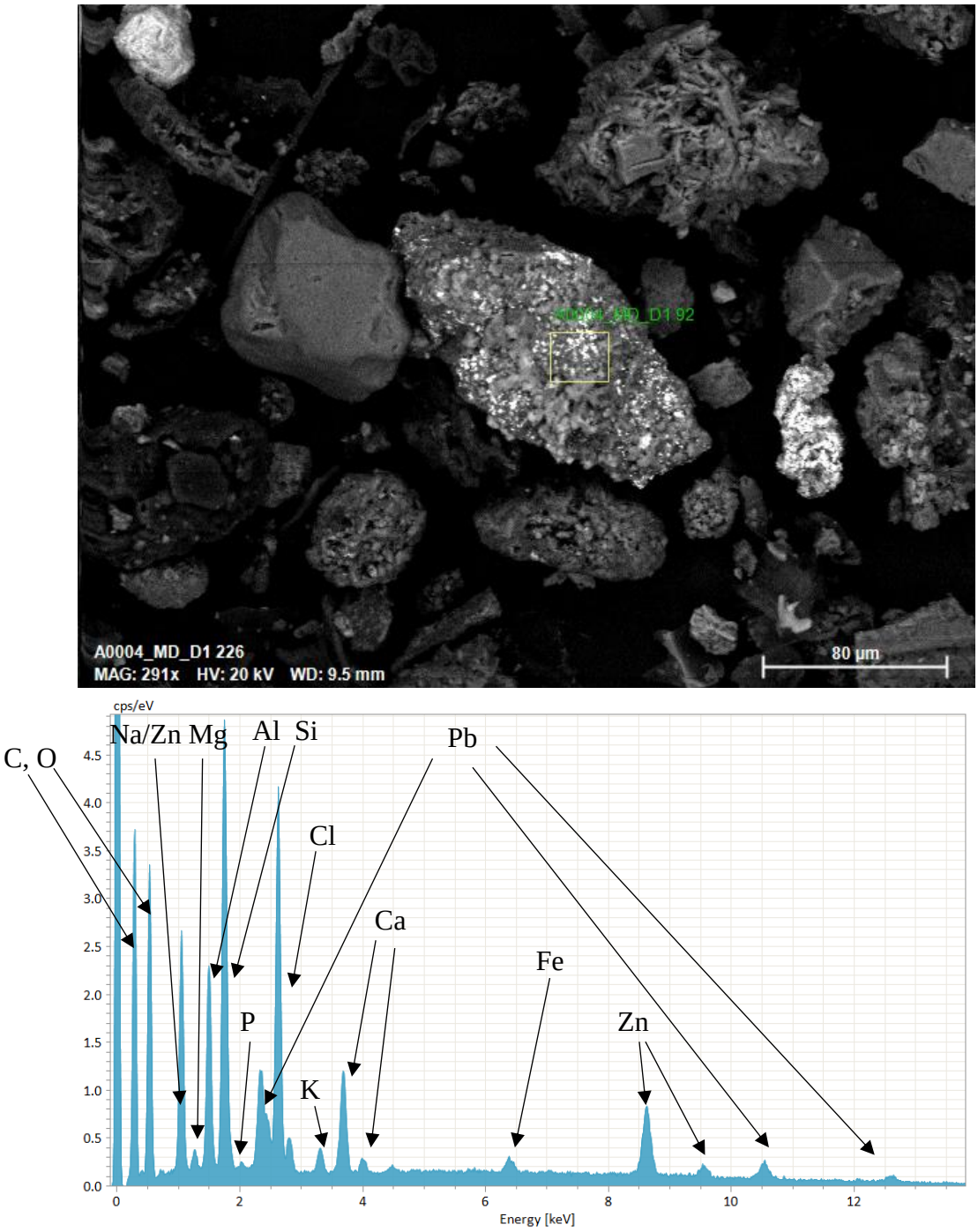

Fig. S18: EDS spot analysis of House 4: Indoor Dust[13].

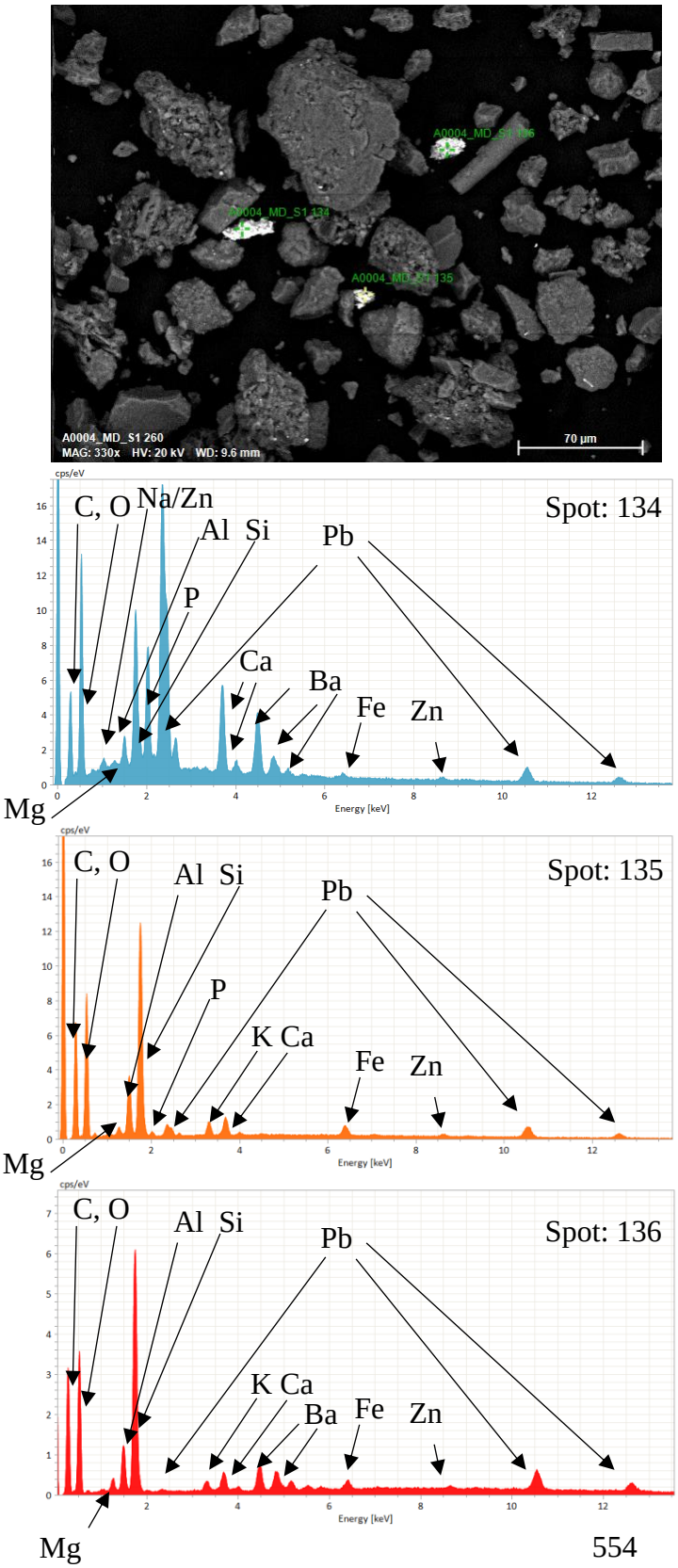

Fig. S19: EDS spot analyses of House 4: Dripline[14]. Spot 134 appears likely to be Pb-dominated paint, while Spots 135 and 136 contain much less of an initial Pb peak, indicative of possible X-ray shadowing due to an uneven spot surface. The general compositional similarity between the particles is indicative of Pb paint with slightly different elemental composition, possibly from different paint layers.

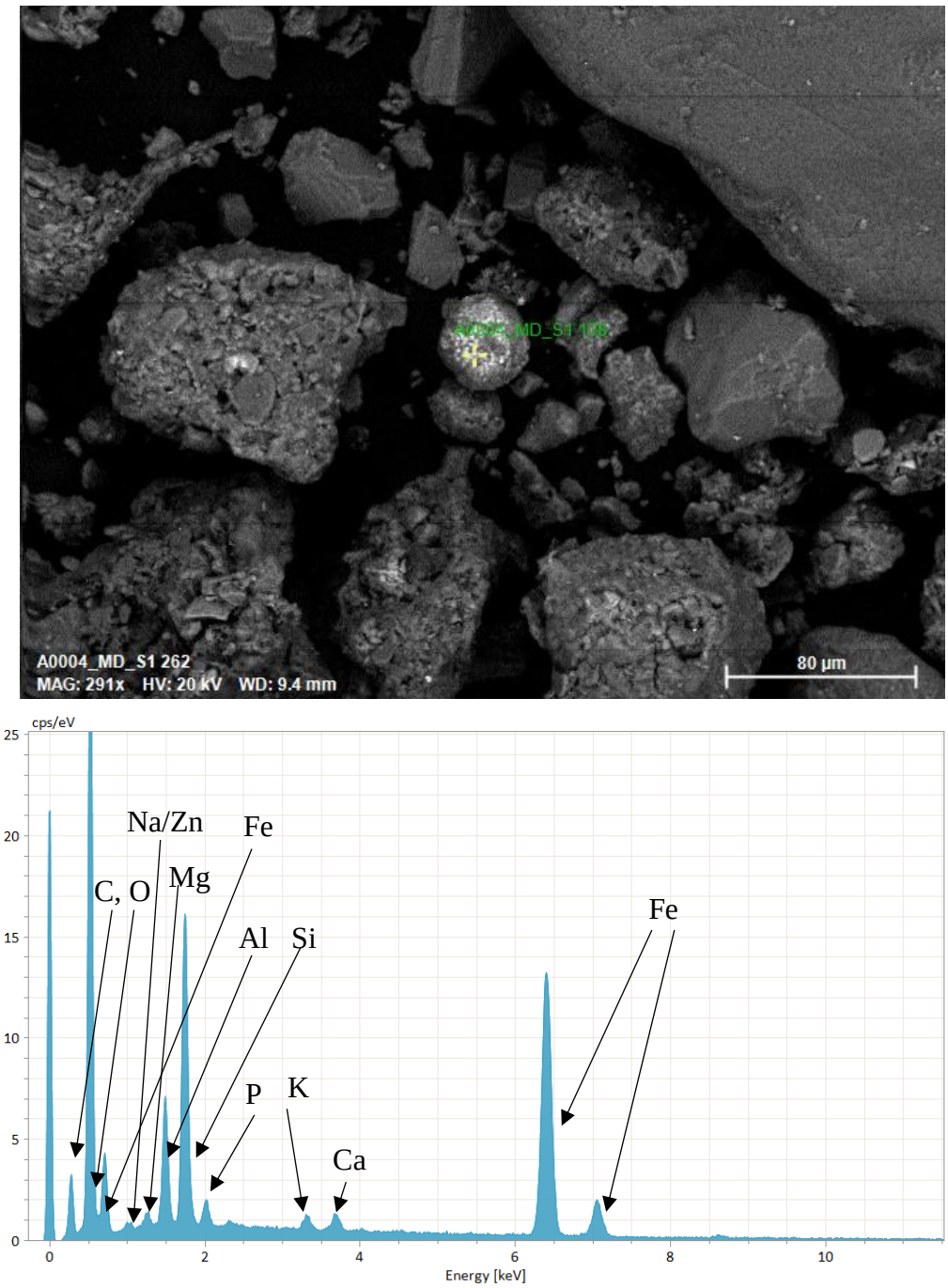

Fig. S20: EDS spot analysis of House 4: Dripline[15].

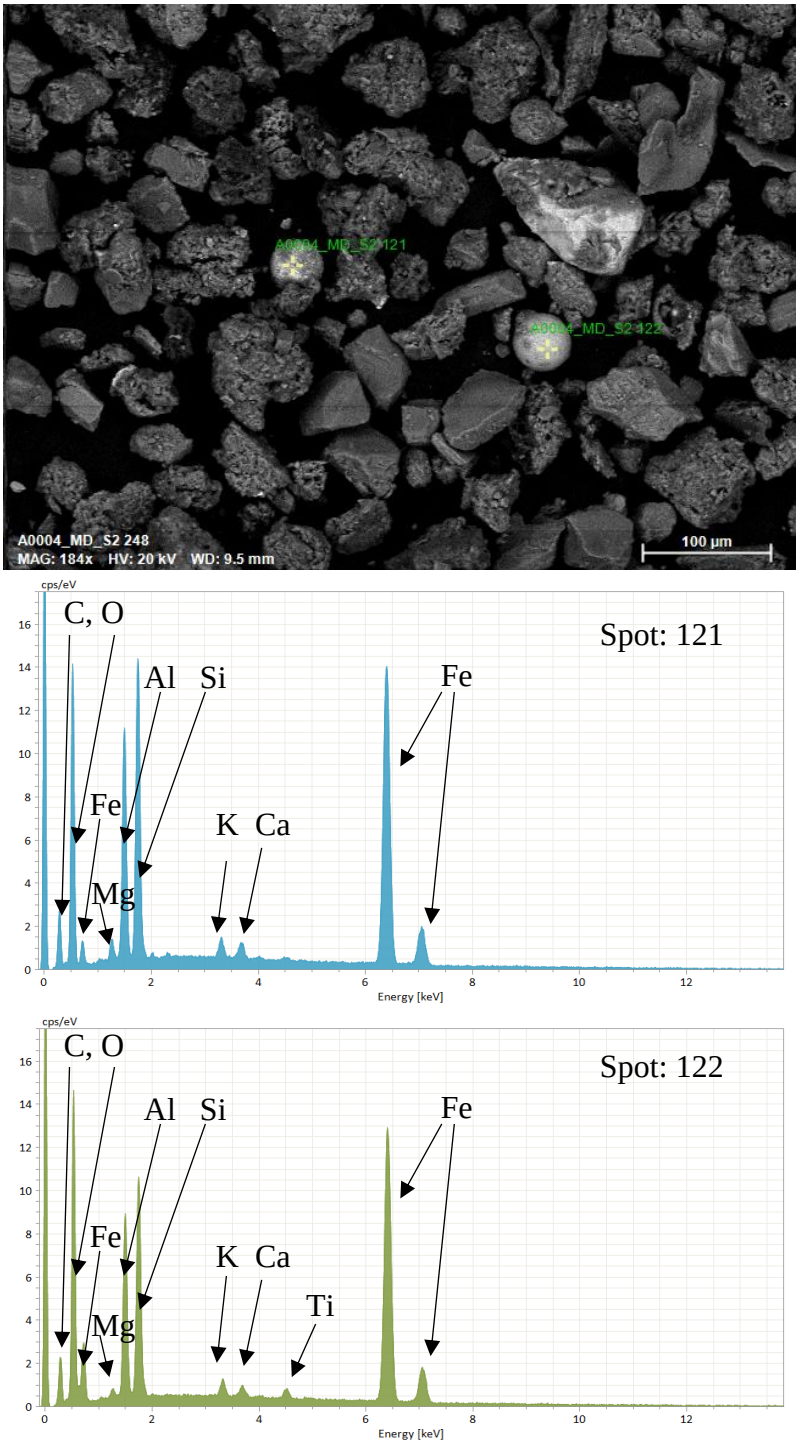

Fig. S21: EDS spot analyses of House 4: Streetside[16].

Supplementary Tables

Table S1: Bulk metal concentrations (mg/kg) and % recovery relative to certified values for five subsamples of NIST SRM 2702 – Inorganics in Marine Sediment.

	Cd	Sb	Tl	Pb
Limits of Detection (LOD) (ppb)	0.02	0.03	0.004	0.02
NIST_2702_1	0.67	5.42	0.73	126.20
NIST_2702_2	0.71	5.08	0.76	130.76
NIST_2702_3	0.64	6.23	0.75	127.61
NIST_2702_4	0.66	6.70	0.80	113.82
NIST_2702_5	0.61	6.26	0.77	95.27
Certified Values (mg/kg)	0.817	5.6	0.8267	132.8
% Recoveries	81.51	96.74	87.82	95.03
	87.25	90.64	92.12	98.47
	78.05	111.34	91.06	96.09
	80.78	119.57	96.87	85.71
	74.16	111.73	92.86	71.74
Avg % Recovery	80.35	106.00	92.14	89.41
Std Dev % Recovery	4.82	11.91	3.27	11.00

Table S2: Pb isotopic ratios for NIST SRM 2702 following sample prep that was the same as soil/dust samples, and Pb isotopic ratios for AGV-2a following standard clean lab protocol, with the given USGS values. 2σ overall analytical error for all analyses is also provided (based on the reproducibility of NIST SRM 981 over the course of the analytical session).

Reference Standard		***208/206***	***207/206***	***208/207***	***206/204***	***207/204***	***208/204***
	981 2σ external error	0.0001	0.0000	0.0001	0.0014	0.0014	0.0044
	external error (%)	0.005%	0.002%	0.003%	0.008%	0.009%	0.012%
NIST_2702_1		2.05574	0.83455	2.46329	18.77388	15.66794	38.59431
NIST_2702_2		2.05504	0.83421	2.46344	18.78221	15.66851	38.59835
NIST_2702_3		2.05595	0.83479	2.46282	18.76686	15.66631	38.58354
NIST_2702_4		2.05620	0.83479	2.46314	18.76782	15.66712	38.59037
NIST_2702_5		2.05561	0.83441	2.46355	18.77909	15.66944	38.60262
NIST_2702 Std dev		0.00044	0.00025	0.00029	0.00675	0.00121	0.00734

AGV-2a	2.04293	0.82777	2.46799	18.86955	15.61955	38.54962
AGV-2a USGS values				18.864	15.609	38.511
2σ external error				0.007	0.006	0.020
AGV-2a published range	*2.0413 - 2.049*	*0.8271 - 0.8295*		*18.851 - 18.889*	*15.609 - 15.639*	*38.511 - 38.7127*

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621 **Table S3:** Bulk metal concentrations for soil and dust samples in mg/kg, as well as assigned
622 house number and sample location.

Sample	Cd	Sb	Tl	Pb	*House*	*Sample Location*
A0001_MD_D1	1.09	37.60	0.05	104.14	House 1	Dust
A0001_MD_S1	1.32	1.04	0.71	73.05	House 1	Dripline
A0001_MD_S2	1.21	1.50	0.39	103.77	House 1	Street
A0001_MD_S3	1.25	2.42	0.65	127.69	House 1	Yard
A0002_MD_D1	1.12	2.92	0.19	242.47	House 2	Dust
A0002_MD_S1	0.23	0.04	0.03	4.10	House 2	Dripline
A0002_MD_S2	2.09	2.48	0.39	1823.68	House 2	Street
A0002_MD_S3	4.89	3.59	1.03	2098.49	House 2	Yard
A0003_MD_D1	0.61	5.05	0.15	77.61	House 3	Dust
A0003_MD_S1	0.45	0.78	0.21	96.41	House 3	Dripline
A0003_MD_S2	0.92	1.59	0.47	332.93	House 3	Street
A0003_MD_S3	0.90	1.81	0.60	223.74	House 3	Yard
A0004_MD_D1	3.34	1.74	0.25	878.37	House 4	Dust
A0004_MD_S1	2.83	5.17	0.59	1152.48	House 4	Dripline
A0004_MD_S2	1.40	1.30	0.64	347.80	House 4	Street
A0004_MD_S3	0.37	0.90	0.45	70.33	House 4	Yard

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624 **Table S4:** Pb isotope ratios for soil and dust samples.

Samples	*208/206*	*207/206*	*208/207*	*206/204*	*207/204*	*208/204*
A0001_MD_D1	2.081	0.845	2.463	18.510	15.640	38.521
A0001_MD_S1	2.033	0.826	2.462	18.963	15.659	38.558
A0001_MD_S2	2.010	0.810	2.483	19.404	15.708	39.011
A0001_MD_S3	2.012	0.811	2.480	19.360	15.702	38.944
A0002_MD_D1	2.008	0.808	2.486	19.453	15.714	39.063
A0002_MD_S1	2.001	0.807	2.479	19.458	15.706	38.934
A0002_MD_S2	2.012	0.810	2.483	19.387	15.710	39.006
A0002_MD_S3	2.010	0.808	2.487	19.453	15.719	39.096
A0003_MD_D1	2.065	0.841	2.456	18.599	15.639	38.402
A0003_MD_S1	2.061	0.836	2.465	18.710	15.638	38.554

A0003_MD_S2	2.095	0.865	2.421	18.019	15.592	37.741
A0003_MD_S3	2.054	0.832	2.469	18.812	15.648	38.636
A0004_MD_D1	2.033	0.818	2.486	19.190	15.692	39.017
A0004_MD_S1	2.004	0.802	2.500	19.615	15.727	39.310
A0004_MD_S2	2.019	0.815	2.477	19.261	15.696	38.882
A0004_MD_S3	2.017	0.812	2.483	19.320	15.696	38.976

Table S5: Relative distance between the adjacent main road and front of the household property to the nearest meter, determined via the Google Maps "Measure distance" tool, oldest annual average daily traffic (AADT) data available for the closest major street to the household from the Indiana Department of Transportation* (oldest available data was used to try and match historical traffic flow when leaded gasoline was prominent, although it is noted there is a large disconnect of over 20-30 years from leaded gasoline usage and reported traffic data), and potential industrial sources of pollution with distance determined via the Google Earth measurement tool.

Sample	House	Distance from road to home (meters)	AADT	Potential industrial sources of pollution (distance in km)
A0001_MD	1	14	12,772[1]	Indianapolis Motor Speedway (2.4 km), lumber facility (1.3 km)
A0002_MD	2	8	2,339[2]	Indiana state fairgrounds (1.8 km), former American Lead facility (2.4 km), fabricated metals facility (1.7 km)

A0003_MD	3	7	21,979[3]	Industrial Park: Oils/solvents, automobile parts, construction company, storage units, pallets (<1 km)
A0004_MD	4	8	2,203[4]	Fabricated metals facility (1.7 km), Indianapolis Motor Speedway (3.6 km)

[1]W. 30th Street, 2013.
[2]N. Washington Blvd, 2013.
[3]S. Harding Street, 2016.
[4]N. Harding St., 2013.
*Traffic Count Database System (TCDS) (ms2soft.com)

Supplementary References

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