GeoHealth

Supporting Information for

Using Community Science to Better Understand Lead Exposure Risks

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Introduction

Supporting text, including links to the data and code repository for the manuscript, are included below, as well as supporting figures.

Text S1.

Link to GitHub repository of data, R code, mobile app files, and logistic regression model output: https://github.com/dietrimj/Community-Science-Pb-Prediction

Note: The input CSV file has been updated to include a sample that contained survey responses and a Pb value of 80 mg/kg (right at our threshold for determination of high/low Pb). This was added to the testing data set a posteriori, which changed the confusion matrix output of the rmd file from 3 samples misclassified as "Low" Pb when they were really "High" Pb to 4 misclassified samples. This has been updated in Table 2 in the main manuscript.

Text S2.

Questions in the online DustSafe survey for the variables used in the logistic regression model in the manuscript and Table 1.

Approximately what year was your house built in?

_____

Does the exterior of your house have any large areas of peeling paint?

Yes/No

Does the interior of your house have any large areas of peeling paint?

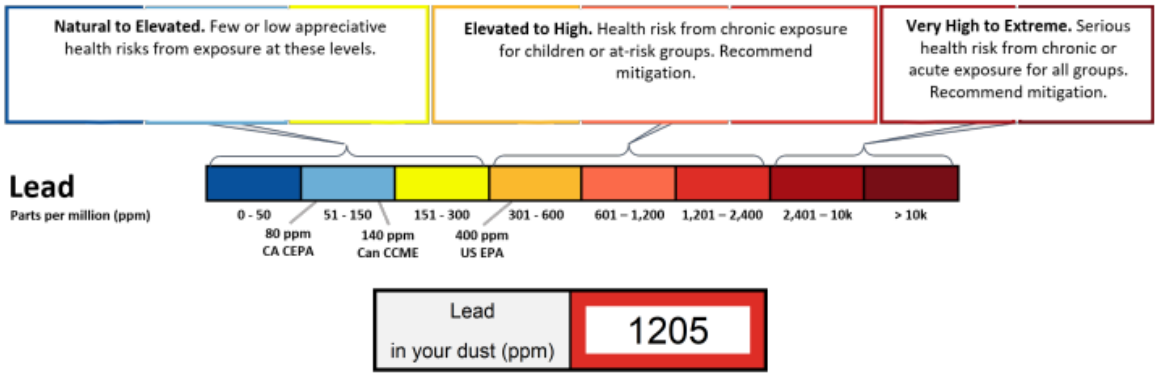
Yes/No

Understanding Contaminant Risk

Lead (Pb)

People often associate lead exposure with contaminated water; however, for most people around the world, **the dominant exposure pathway for lead is through dust**. Lead in house dust comes from a variety of sources, both inside and outside the home. Lead occurs naturally in the environment in small amounts, but leaded gasoline, lead-based paint, agricultural pesticides, and industrial pollution have all artificially increased lead levels in soil, especially near urban centers. Not all urban homes will have high lead in their soil/dust, but if you live in a city, being aware of the risks and getting your soil/dust tested are important first steps. Rural homes may have lead contaminated soil and dust as well. For example, if your home was built before 1980 it may contain some kinds of interior and exterior lead-based paint. Furthermore, rural and suburban homes constructed on land formerly used for agriculture, especially for fruit orchards, may have soil contaminated by lead-based pesticides.

Lead is equally toxic when it is inhaled as a dust or ingested in water. It accumulates in bones and is distributed throughout the blood to most organ systems, including the brain, where it acts as a neurotoxin. The US Agency for Toxic Substance and Disease Registry considers lead so toxic they list **no** acceptable Minimal Risk Level (MRL) for oral (water) or particulate inhalation (dust). Lead-based paint is especially dangerous to young children because of its sweet taste. As older lead-based paint ages and flakes, children may be tempted to eat the flakes because of this sweetness. Even low levels of lead exposure during early childhood can result in lifelong reduced IQ, decreased attention span, decreased impulse control and increased antisocial behavior. People who experience childhood lead poisoning make less money over their lifetime and are more likely to be incarcerated than their peers.



Additional information about lead as an environmental contaminant can be found here:
`https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=22`

Figure S1: Example of a part of the report issued back to households participating in DustSafe, with lead (Pb) specifically shown as the reported element.

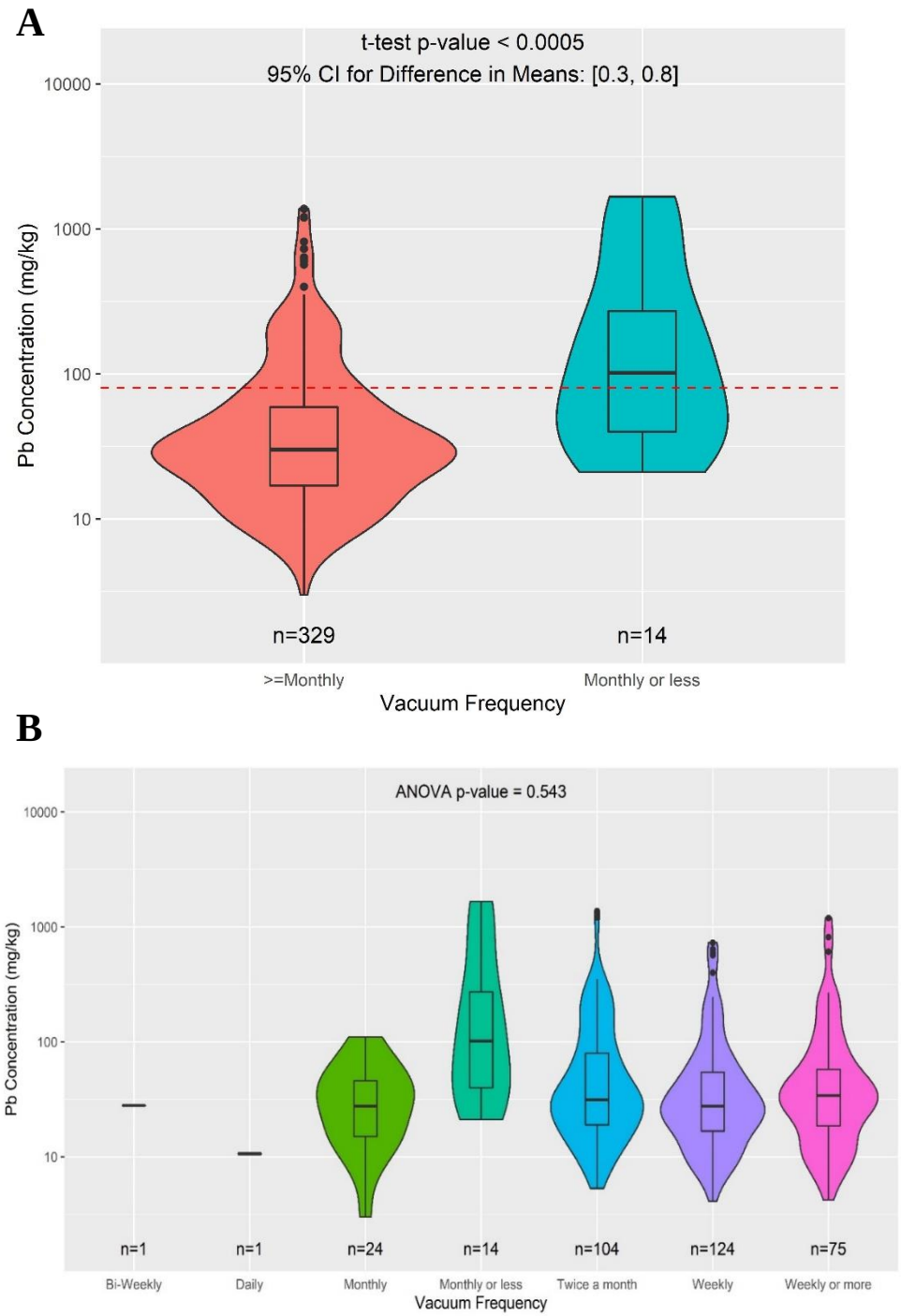


Figure S2: Embedded boxplots within violin plots for both monthly resolution vacuum frequency (A) and weekly resolution vacuum frequency (B). The boxes represent the interquartile range (IQR) of 25th-75th percentiles of data, the horizontal line is the median, and the whiskers represent 1.5 times the IQR. A two-sample paired t-test result between yes/no responses in (A) are also provided, while an ANOVA test p-value is provided in (B). The y-axes are transformed on a $\log_{10}$ scale, and the red dashed line in (A) represents California's safe screening level for soil Pb at 80 ppm.

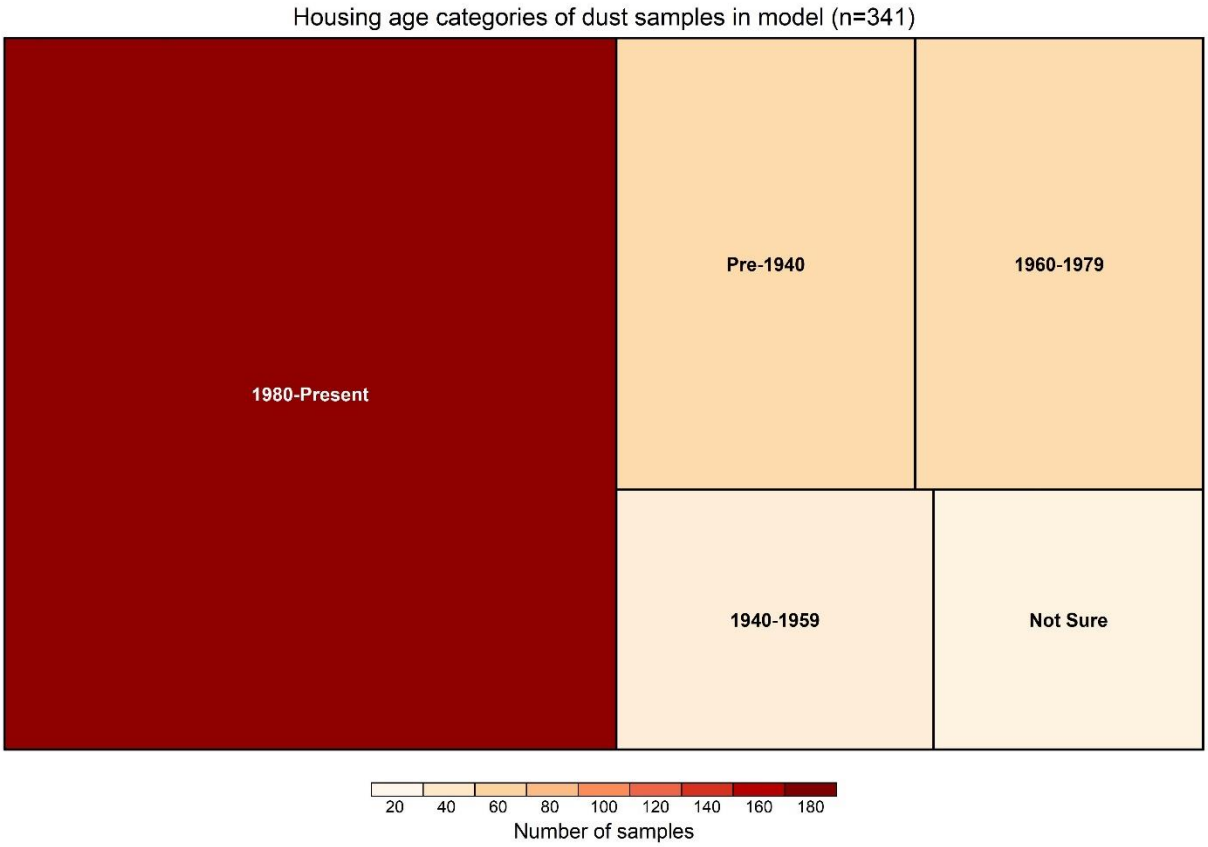


Figure S3: Treemap displaying the proportions (size of rectangles) and raw values (color shading) of housing age category responses from surveys that were included in the logistic regression model.

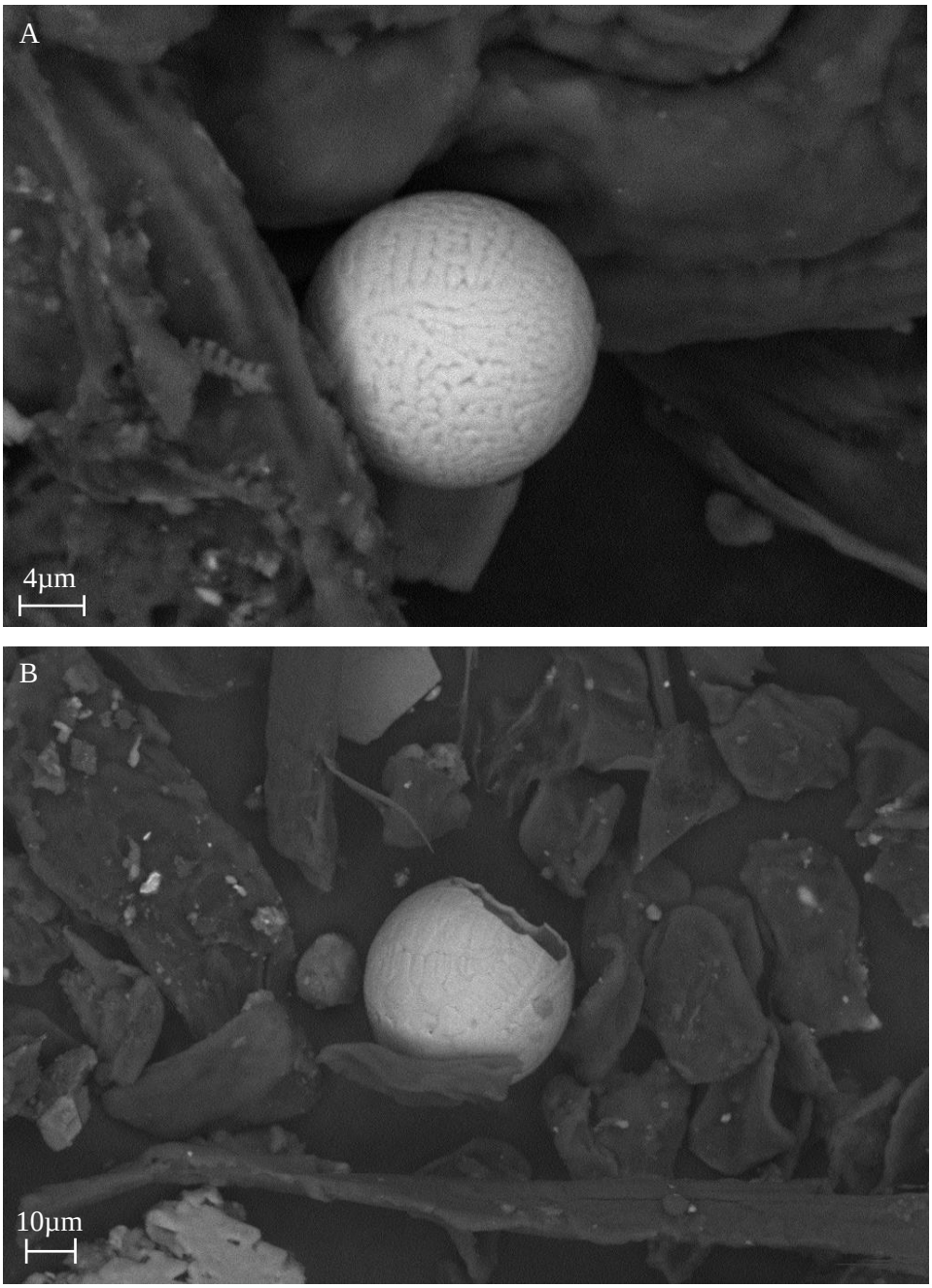


Figure S4: SEM imagery of technogenic Fe-oxide spherules likely of anthropogenic origin found in house dust (A—Sample AA0078, B—Sample AA0254).

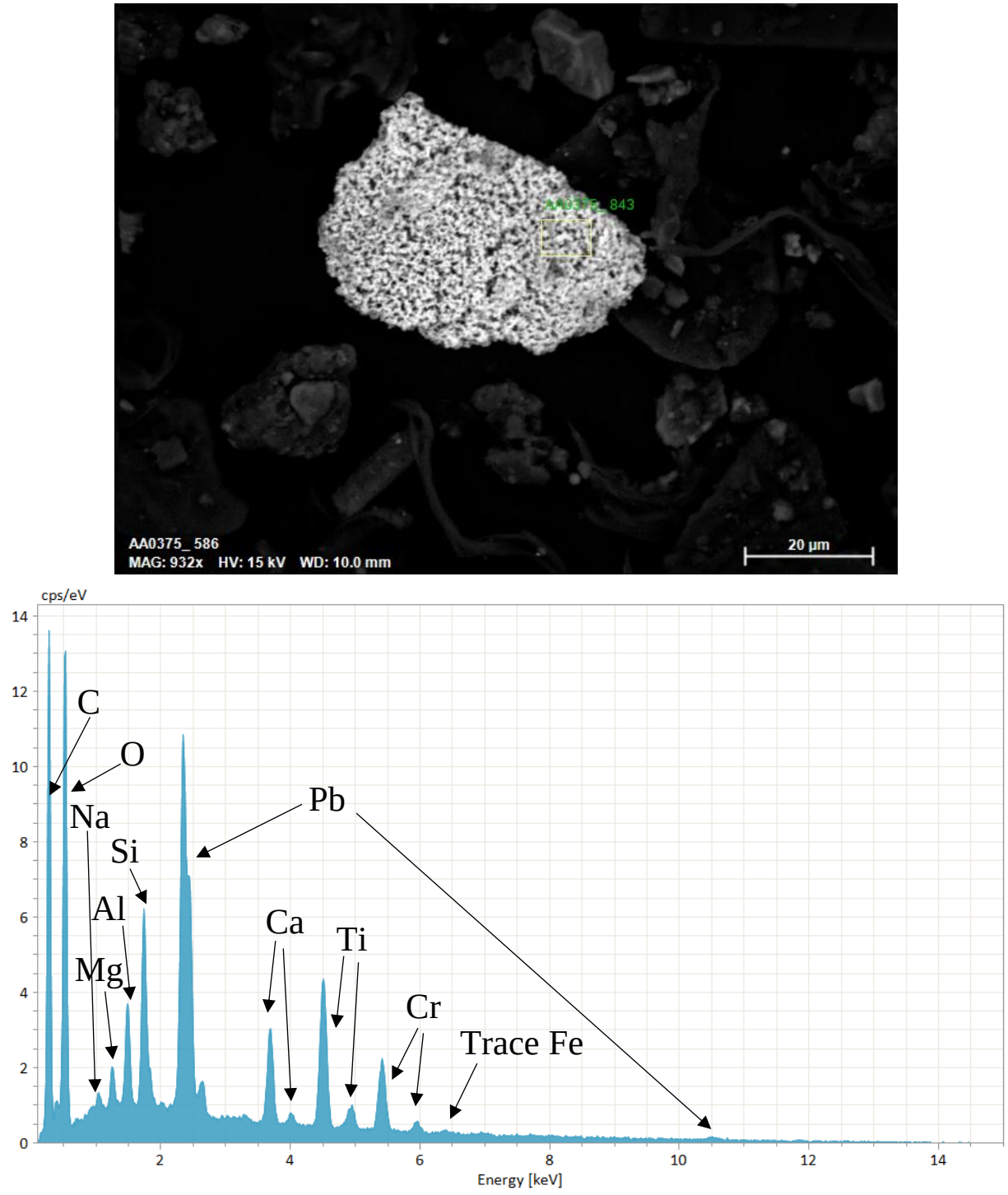
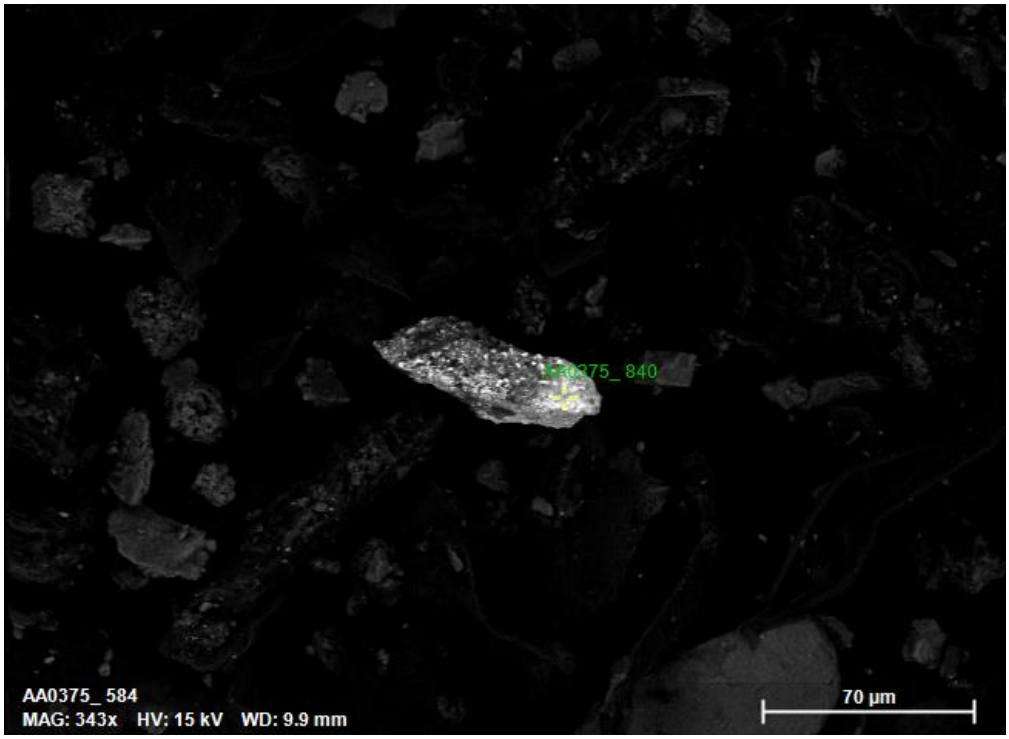


Figure S5: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5A.



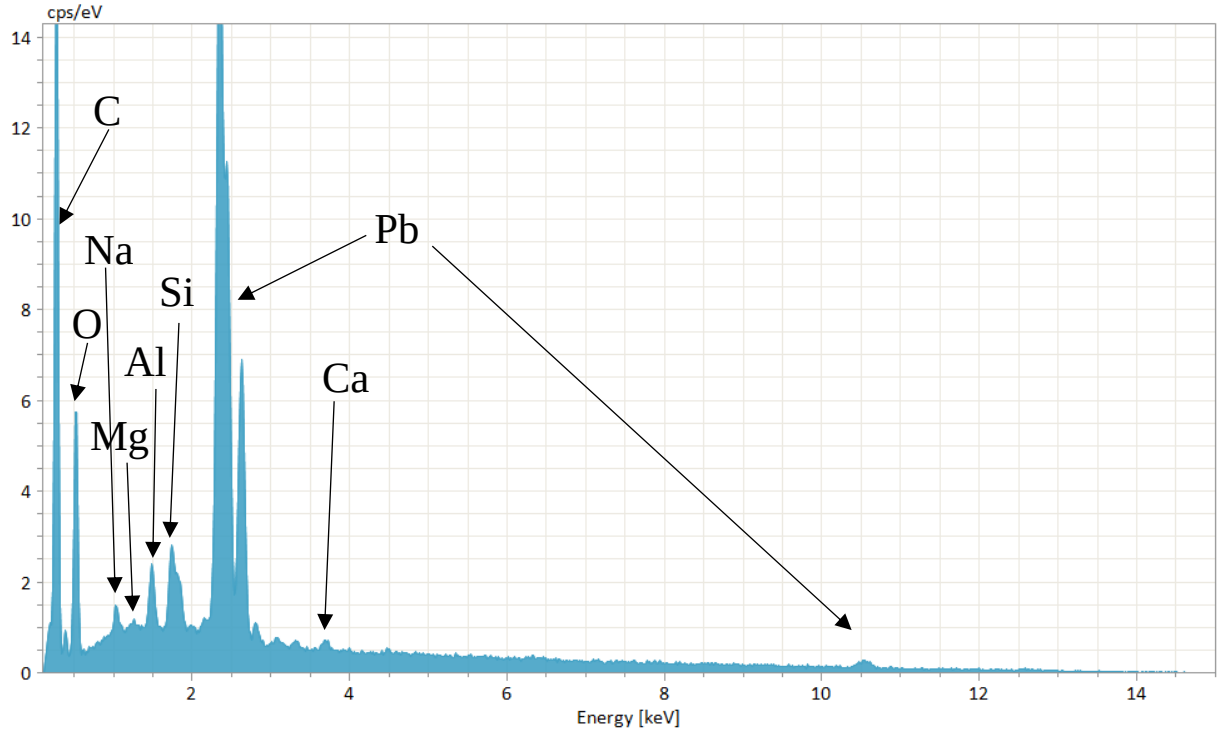
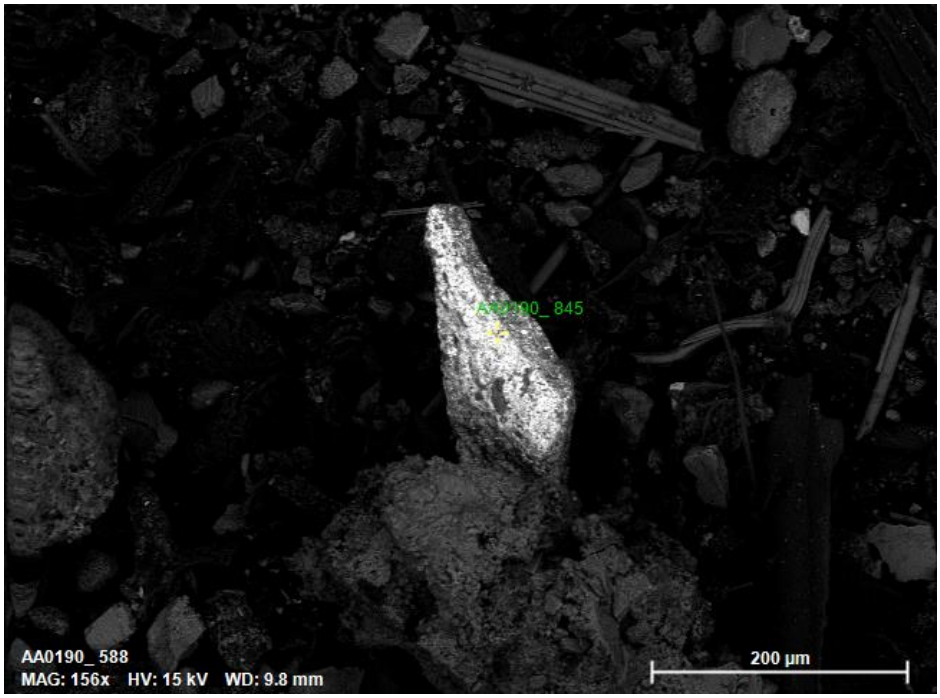


Figure S6: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5B.



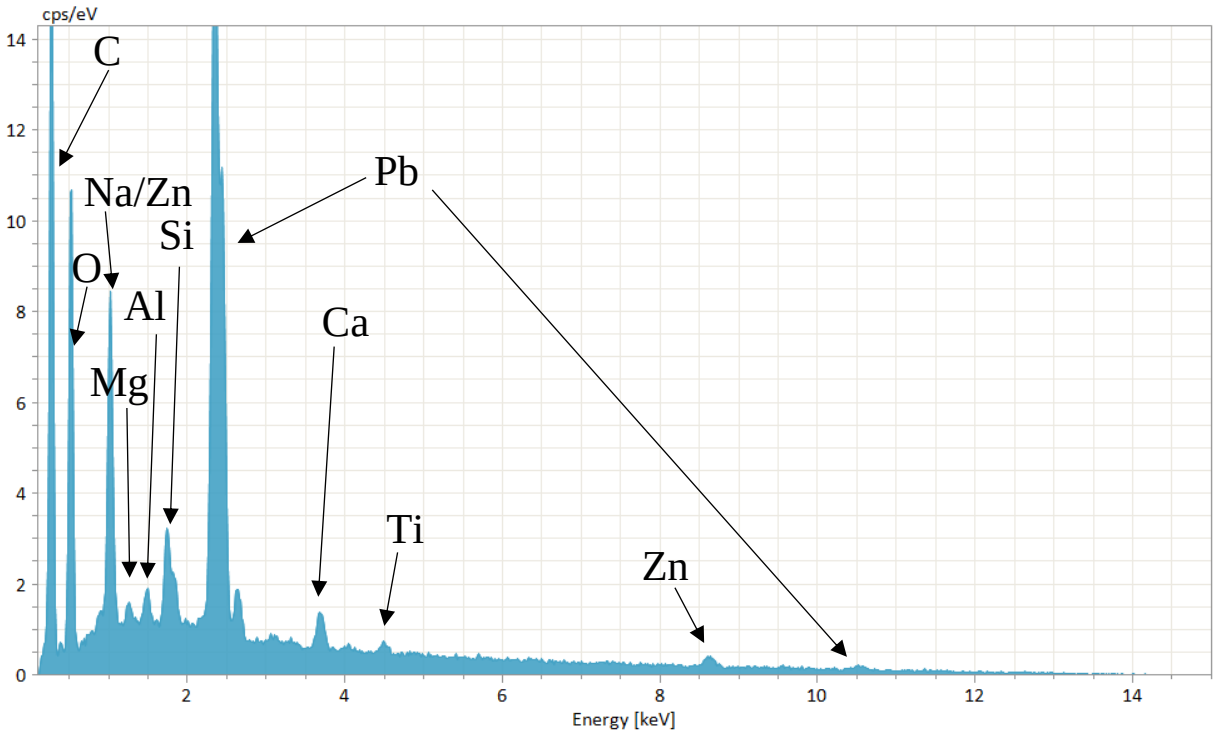
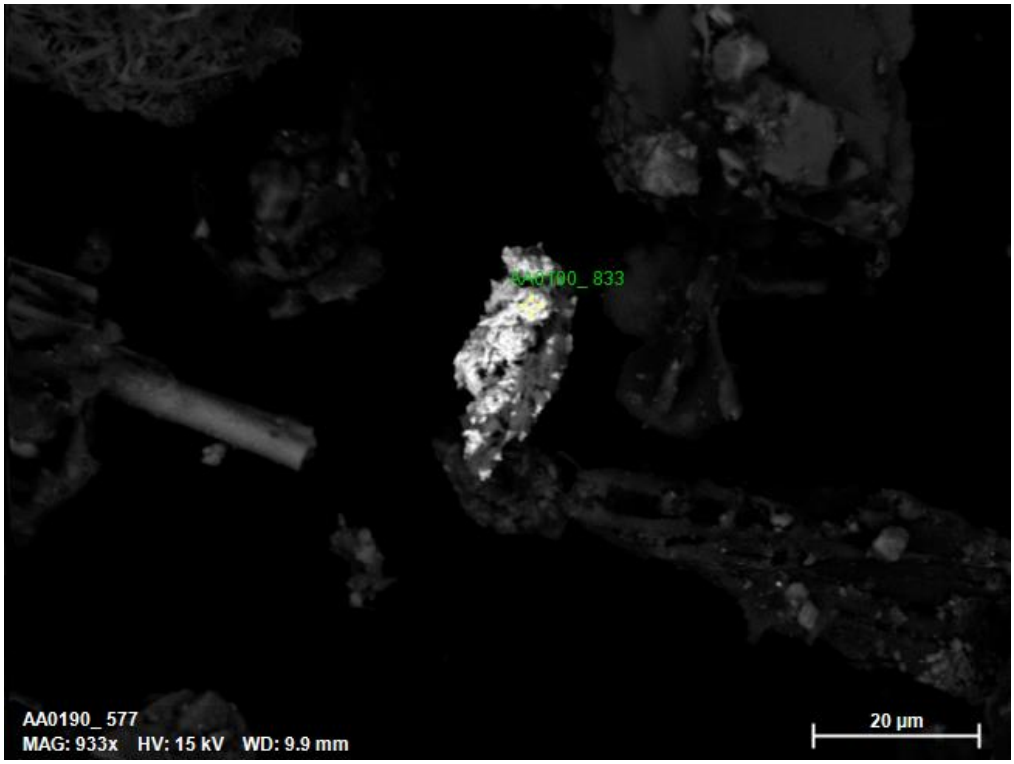


Figure S7: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5C.



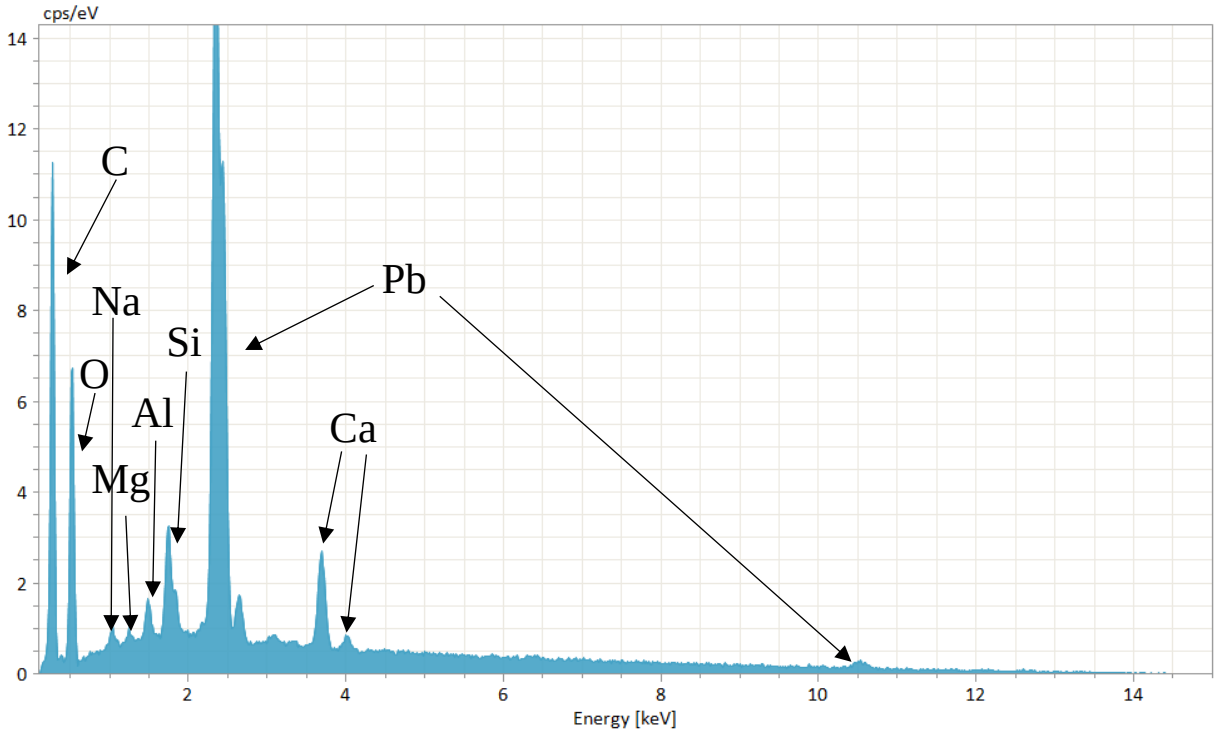
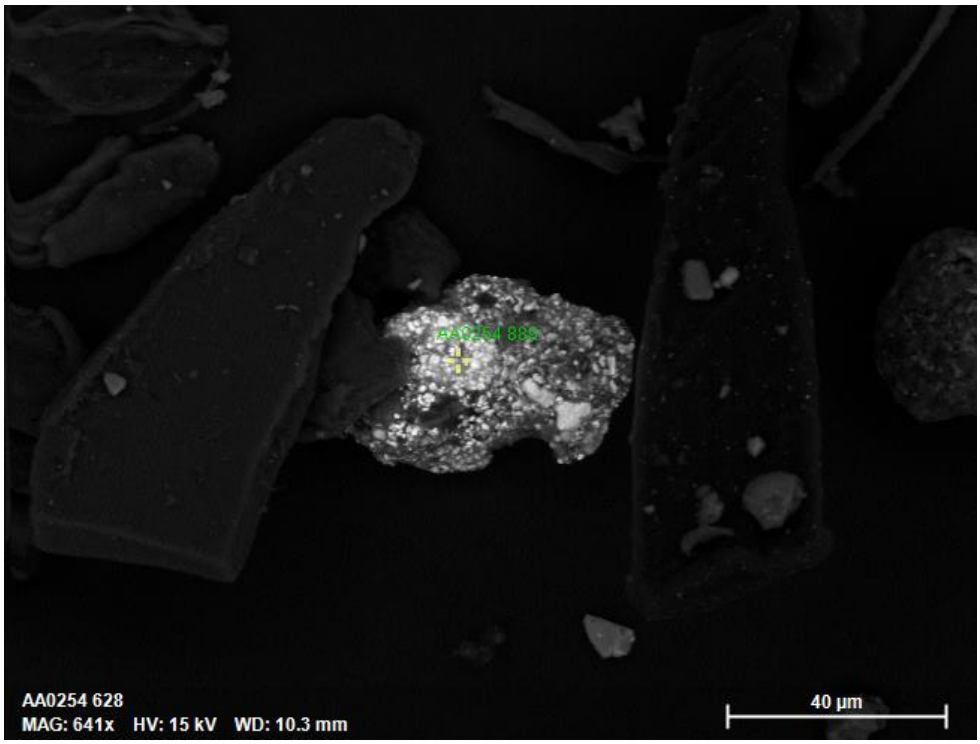


Figure S8: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5D.



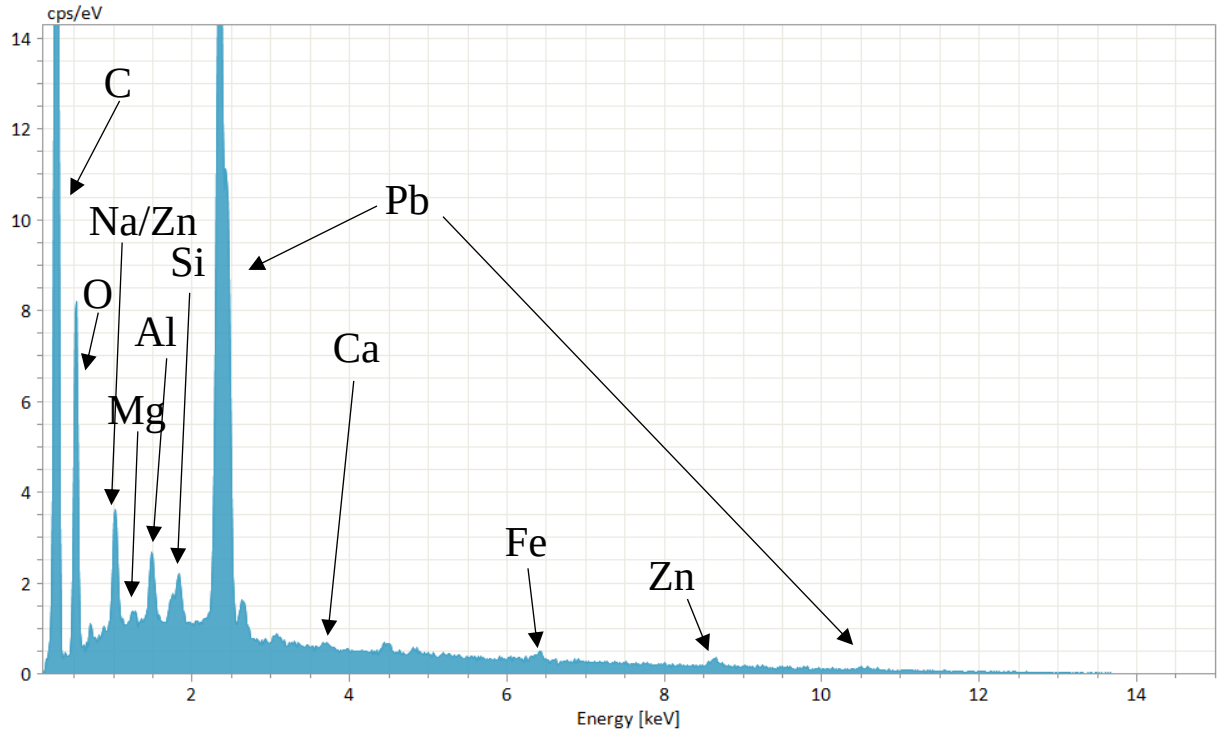


Figure S9: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5E.

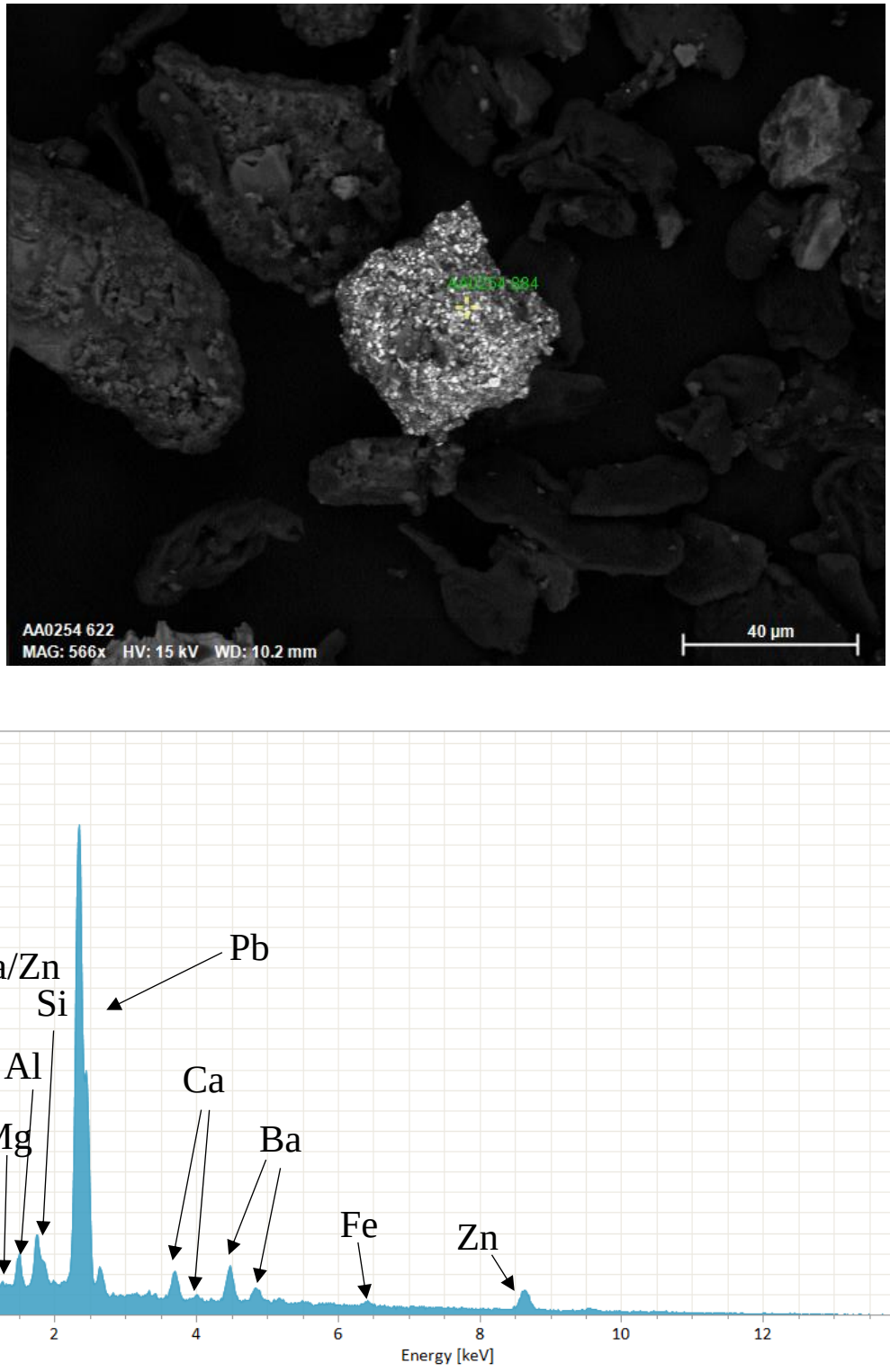


Figure S10: EDS spot point for analysis and the resulting spectra, with major peaks of detected elements labeled. For Pb particle in Fig. 5F. It is noted that the Pb spectra may be complicated by the presence of barite ($BaSO_4$).