The following is an example of how metals concentrations were reported to participating urban farms and gardens in the Safe Urban Harvests study.

We sampled soil, water, and produce from 104 urban farms and gardens during the 2017 growing season, and tested them for levels of heavy metals. We interpreted the results and shared confidential site-specific reports to each participating site prior to writing or publishing our study-wide summary report or scientific manuscripts.

We received the soil and water results sooner than the produce results. To disseminate results as soon as we received them, soil and water results reports were distributed in summer 2018 and produce results reports were distributed in summer 2019.

Along with sharing these individual reports, we also spoke with most site representatives and gave them recommendations regarding how to reduce exposure to contaminants.

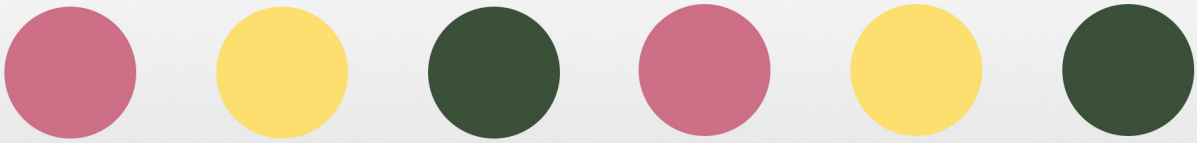
The following document represents an example of one individual site's soil and water results report. **This report does not reflect conditions at all sites.**

Results prepared for:

NAME REDACTED

ADDRESS REDACTED

Updated: [January 28, 2019 10:42 AM]



SAFE URBAN HARVESTS

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If you have any questions about the information contained in this report, please contact the study team at: safeurbanharvests@jhu.edu or 410-223-1707.

For study updates, additional resources, and a final report of city-wide results, visit the Safe Urban Harvests Study website: https://www.jhsph.edu/clf/suh.

This document was inspired by documents created by Hannah Shayler, Murray McBride, and others, as part of the Healthy Soils, Healthy Communities project. We thank them for their permission to adapt their materials for the Safe Urban Harvests study.

SUMMARY OF SOIL AND WATER RESULTS FOR: NAME REDACTED

SOIL

To help interpret your results, we compared the levels of metals in each soil sample to the New York State Department of Environmental Conservation Soil Cleanup Objectives for Residential Land Use*. The lower the level of metal is below this public health recommendation, the better. More information about why we picked these standards is available in "*Methods: How samples were collected, analyzed, and interpreted*."*

Arsenic was higher than the New York Soil Cleanup Objective in 1 soil sample. Chromium was higher than the New York Soil Cleanup Objective in 2 soil samples. All other metals were lower than the New York Soil Cleanup Objective in all other soil samples.

GROWING AREAS

GROWING AREA MIXTURE(S):

- Chromium was higher than the New York Soil Cleanup Objective in 1 soil sample. All other metals were lower than the New York Soil Cleanup Objective in all other soil samples.

NON-GROWING AREAS

(E.G., WALKWAYS, UNCULTIVATED SECTIONS)

- Arsenic was higher than the New York Soil Cleanup Objective in 1 soil sample. Chromium was higher than the New York Soil Cleanup Objective in 1 soil sample. All other metals were lower than the New York Soil Cleanup Objective in all other soil samples.

For more information, please see: Soil results.

IRRIGATION WATER

*To help interpret your results, we compared the levels of metals in each water sample to the Environmental Protection Agency (EPA)'s drinking water standards. The lower the level of metal is below this public health recommendation, the better. More information about why we picked these standards is available in "*Methods: How samples were collected, analyzed, and interpreted.*"*

All metals were lower than the drinking water standard in all water samples.

For more information, please see Irrigation water results.

COMING SOON: CITY-WIDE RESULTS

Please note that we are still receiving soil and produce results for other sites in the study. When all results are received, city-wide results will be available on the Safe Urban Harvests website. Stay tuned for the community workshops we will host this summer/fall to share these city-wide findings (https://jhsph.edu/clf/suh).

RECOMMENDATIONS FOR NAME REDACTED

It is not unusual to find levels of metals in urban soils higher than guidance values. Soil levels of these metals are common in Baltimore and are not necessarily an immediate health concern. It is important to be aware that farming or gardening can increase your contact with urban soils, and therefore may increase your contact with these metals. It is always a good idea to follow "General recommendations for reducing contact with metals in urban soils" provided in this report.

At least one soil sample from the growing area in your garden had high levels of chromium. It is not uncommon for soils in Baltimore to have high levels of chromium. We recommend reducing your contact with soils in this area of the garden whenever possible. All other samples at your site had good results. Keep gardening!

We also found a slightly elevated level of arsenic in a sample of soil that isn't used for gardening (in a walkway in the garden area). We recommend you limit contact with soil in this area, perhaps by mulching between raised beds.

NOTES FOR NAME REDACTED

In some soils at your site, total chromium was higher than the New York Soil Cleanup Objective. Chromium exists in two forms, one that is more harmful than the other. We expect that most of the chromium at your site is the less harmful trivalent (III) form, as opposed to the more toxic hexavalent (VI) form. We are conducting further analysis to better answer this question for Baltimore and will provide these findings as soon as possible.

CONTENTS

SAFE URBAN HARVESTS STUDY OVERVIEW

WHAT IS THE SAFE URBAN HARVESTS STUDY?

The Safe Urban Harvests study aims to measure metal contaminants in the soil, water, and produce from Baltimore's farms and community gardens.

WHY DID THE STUDY FOCUS ON METAL CONTAMINANTS?

Metals are a group of substances/elements that exist naturally in the earth but can be released into the environment by human activities. Some metals (e.g., arsenic, barium, cadmium, chromium, lead, nickel) are harmful and can make people sick. Other metals (e.g., calcium, copper, iron, magnesium, manganese, phosphorus, potassium, zinc) are considered essential for human and plant health and can be beneficial in certain amounts.

WHAT DOES THIS REPORT CONTAIN?

This report contains information about the levels of harmful and essential metals measured in your soil and irrigation water. Information about the levels of these metals in any fruits and/or vegetables from your site that we sampled will be available later in the summer. This report also includes information about low-cost or free ways to reduce contact with these harmful metals.

HOW SHOULD THE RESULTS BE INTERPRETED?

In addition to providing the levels of metals in soil and irrigation water, this report compares these levels to existing guidance values. If you have any questions, the study team is available to answer them.

We did not collect information about gardeners' and farmers' health status, or the amount of contact they have with metals at farms or gardens. We, therefore, cannot answer questions about direct health impacts.

Additional information is available on the Safe Urban Harvests study website: https://www.jhsph.edu/clf/suh.

Note: Most soils, water, and plants have some small amounts of harmful metals. Engaging in urban agriculture may increase contact with these harmful metals but does not necessarily mean you will get sick. Remember there are also many health benefits to growing and eating your own fruits and vegetables. It's important to balance these considerations when making decisions in your farm or garden. However, to address concerns about contact with these harmful metals, this report includes information about low-cost or free ways you can reduce your contact.

SOIL RESULTS

All soil samples were tested for six metals harmful to human health and eight other elements that support plant growth. We also measured pH and electrical conductivity in each soil sample. For information about how soil samples were collected and analyzed, see **"**Methods: How samples were collected, analyzed, and interpreted.**"**

In all soil samples, we measured the levels of six metals that are harmful to human health:

- arsenic
- barium
- cadmium
- chromium
- lead
- nickel

To help interpret your results, we compared the levels of metals to the New York State Department of Environmental Conservation Soil Cleanup Objectives for Residential Land Use. The lower the level of metal is below this public health recommendation, the better. More information about why we picked these standards is available in **"**Methods: How samples were collected, analyzed, and interpreted.**"**

There is no clear line of what is considered "safe." In most cases, there is no immediate health concern to engaging in urban agriculture. However, there may be increased risks with higher levels of exposure over long periods of time. If the level of a metal in soil is higher than the Soil Cleanup Objective, it is wise to reduce contact with soil whenever possible. It is always a good idea to follow **"**General recommendations for reducing contact with metals in urban soils" provided in this report.

For the levels of all metals measured in soils at your site, see the Appendix.

SOIL RESULTS FOR NAME REDACTED

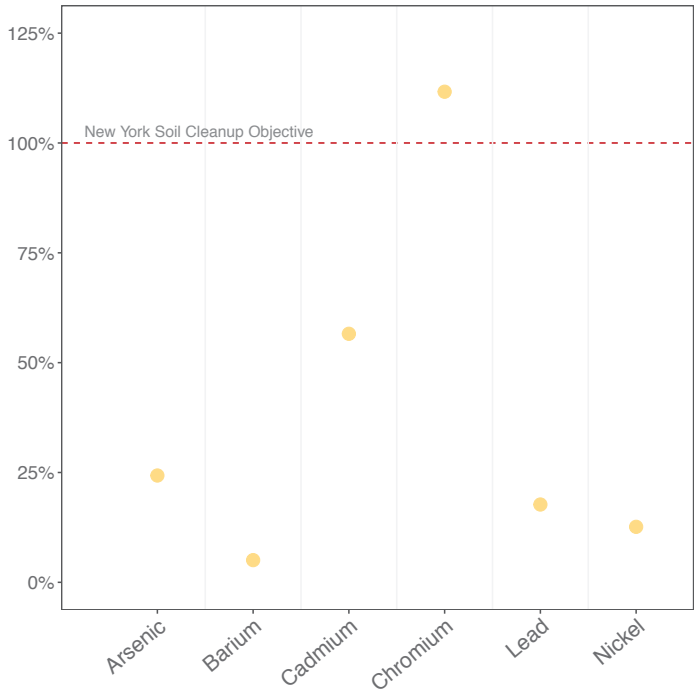
The map above shows where each soil sample was collected. A brief description and results for each sample are below.

	Sample	Description	Results
●	Growing Area Mixture	A mixture of 6 scoops of soil collected where plants are grown	Chromium exceeded the New York Soil Cleanup Objective. All other metals were below the New York Soil Cleanup Objective.
●	NGA Soil 1	A single scoop of soil collected from the pathway between beds*	Arsenic and chromium exceeded the New York Soil Cleanup Objective. All other metals were below the New York Soil Cleanup Objective.
▲	NGA Soil 2	A single scoop of soil collected from undisturbed area*	All metals were below the New York Soil Cleanup Objective.

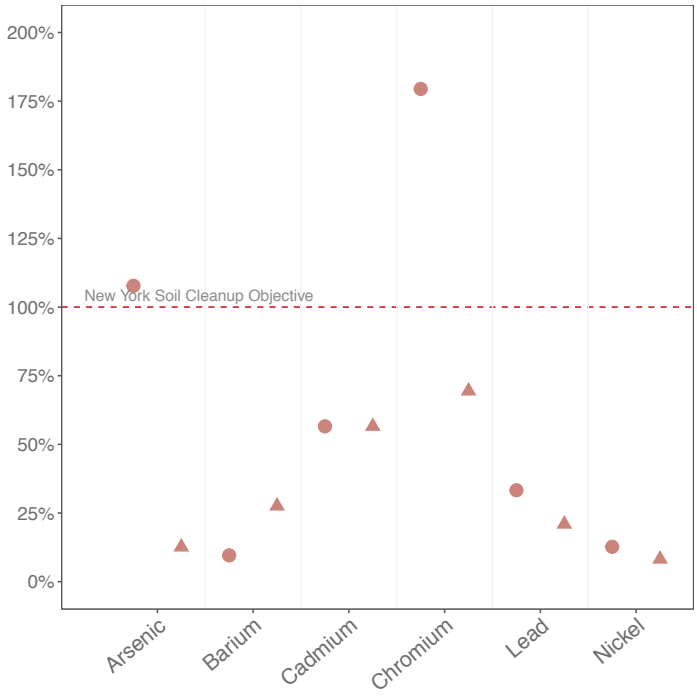
*Plants are not grown in this soil.

The following plot(s) show(s) the levels of metals in soils collected at Name Redacted compared to New York State's Soil Cleanup Objectives.

Mixture of soils collected from growing area



Soils collected from non-growing area



A value of 50% means the level of that metal in the soil was half of the New York Soil Cleanup Objective for that metal.

A value of 100% means the level of that metal in the soil was the same as the New York Soil Cleanup Objective for that metal.

A value of 200% means the level of that metal in the soil was two times greater than the New York Soil Cleanup Objective for that metal.

IRRIGATION WATER RESULTS

We tested all water samples for six metals harmful to human health and four other metals. For information about how water samples were collected and analyzed, please read "Methods: How samples were collected and analyzed."

In all water samples, we measured the levels of six metals that are harmful to human health:

- arsenic
- barium
- cadmium
- chromium
- lead
- nickel

There are no state or federal guidelines for metals in water used to irrigate food crops. To help interpret your results, we compared the levels of metals in each water sample to the Environmental Protection Agency (EPA)'s drinking water standards. These regulations are set to protect public health assuming the tested water is a primary source of drinking, bathing, and cooking water for an entire lifetime. Since most irrigation water sources are not used for these purposes, this is likely an overly protective standard.

The lower the level of metal is below this public health recommendation, the better. If the amount of a metal is higher than the drinking water standard, it is wise not to drink the water. Note that the methods we used we did not measure bacteria, viruses and parasites in the water on site. It is always a good idea to follow "General recommendations for reducing contact with metals in urban soils" provided in this report.

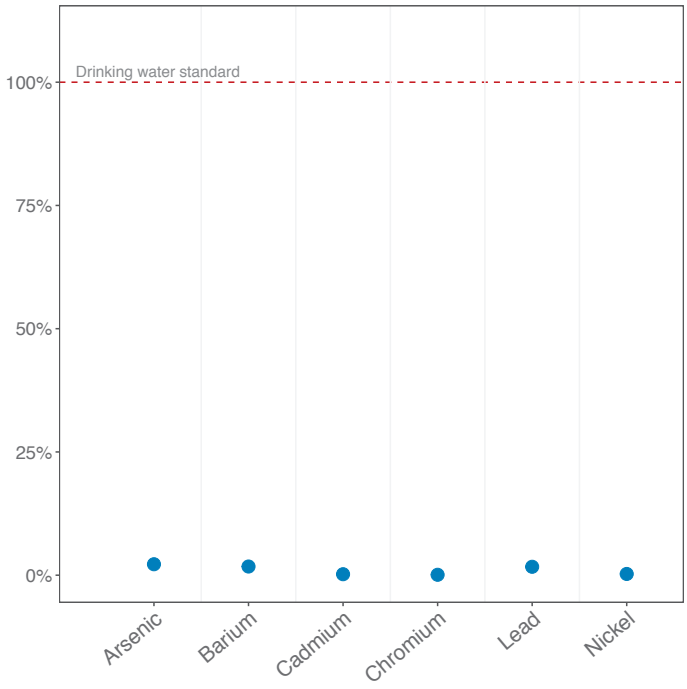
For the exact levels of all metals measured in water at your site, see the Appendix.

IRRIGATION WATER RESULTS FOR NAME REDACTED

The map above shows where each water sample was collected. A brief description and results for each sample are below.

	Sample	Description	Results
●	Water	Municipal water collected via hose	All metals were below the drinking water standard.

The following plot shows the level of harmful metals in irrigation water collected at Name Redacted compared to the US EPA Drinking Water Standards.



GENERAL RECOMMENDATIONS FOR REDUCING CONTACT WITH METALS IN URBAN SOILS

If you are concerned about exposure to metal contaminants in urban agriculture, here are some simple—and mostly free—steps you can take to reduce your exposure.

Change your behavior	What can you do, specifically?
Do not drink water out of rain barrels. While city water is safe, hoses can become contaminated so it's best not to drink from them either.	Bring a full water bottle with you when going to work on site.
	If a large group typically gardens together, consider bringing a large insulated beverage (e.g., "Igloo") cooler filled with water to the garden.
	If drinking municipal water from spigot, let it run at least ten minutes once before using at beginning of season, and at least 1-2 minutes before use each time after that.
Reduce skin contact with soil.	Wear gloves, closed-toed shoes, long pants, and long sleeves, especially when interacting with contaminated soil. Brush off/dump out soil that accumulates in gloves, shoes, and pockets before going indoors.
	Dust off any soil from your hands before leaving the site and wash your hands as soon as possible after gardening.
Do not allow children to eat soil or crawl on ground in garden.	Establish designated play areas that reduce soil contact. Choose grassy areas over soil, if possible.
Avoid bringing soil into your home.	Take shoes and dirty clothes off before entering your home.
	Keep tools on site or clean them before transporting home.
	When transporting plants (including harvested produce), remove as much soil as possible before putting them in bags, baskets, or vehicles.
	Avoid bringing pets on site.
Reduce exposure to contaminants on the surface of urban-grown fruits and vegetables.	Minimize consumption of produce on-site.
	Wash and peel urban-grown produce, especially root vegetables, in clean sink before consuming.
	Remove outer leaves of green leafy and cruciferous vegetables (e.g., broccoli, cauliflower) before eating.
Reduce exposure to contaminants in urban-grown fruits and vegetables.	Vary where you get your produce. For example, source some of your fruits and vegetables from other sources such as farmers markets, grocery stores, or other sites.

Make your farm or garden safer	What can you do, specifically?
Avoid build-up of harmful metals in the water.	Let municipal water run for ten minutes once at the beginning of season, and then for 1-2 minutes before use each time after that.
Avoid parts of the site known to be contaminated.	Don't grow edible plants in contaminated areas.
	Don't put compost piles on top of contaminated areas.
Avoid growing near known sources of pollution.	Avoid growing near busy roads, demolished buildings, industrial sites, and other known sources of pollution.
	If possible, grow in a place with less potential for water to drain onto site. For example, avoid growing downhill from a road, building, or downspout.
Grow exclusively in raised beds using imported soil.	Don't use treated wood, railroad ties, or vehicle tires to build raised beds.
	Try to buy compost, fertilizer or topsoil from vendors that test their materials for contaminants.
	Use landscaping fabric and/or build raised beds high enough to make sure plant roots do not reach contaminated soil.
Reduce the potential for dust	Use mulch on non-growing area soils (e.g., walkways) to prevent the "kicking up" of dust. Avoid mulches made from treated wood, if possible.

Some other thoughts:

- Children, infants, and pregnant women are more vulnerable to some of these pollutants. Following some of these recommendations may be even more important for them.
- The amount of exposure to harmful metals on site increases as you spend more time there. If you are concerned with exposure, take steps to maximize your time efficiency at the farm or garden.

THE ORIGIN OF AND CONCERNS WITH METALS IN URBAN SOIL

Metals are a group of substances/elements that exist naturally in all rural and urban soils on the earth. Metals can also be released into the environment by human activities, often causing higher levels of metals in urban soils than rural soils.

- Some metals (e.g., arsenic, barium, cadmium, chromium, lead, and nickel) are harmful and can make people sick. Other metals (e.g., calcium, copper, iron, magnesium, manganese, phosphorus, potassium, and zinc) are considered essential for human and/or plant health and can be beneficial in certain amounts.
- Most soils, water, and produce have some small amounts of harmful metals. There is no clear line of what is considered "safe." In most cases, there is no immediate health concern, but there may be increased risks with high amounts of exposure over long periods of time. If the amount of a metal is higher than a guidance value, it wise to reduce contact with that soil, water, or produce item whenever possible. It is always a good idea to follow "General recommendations for reducing contact with metals in urban soils" provided in this report.

The following picture shows some of the sources of metals. It also shows some ways that you might come into contact with them while working in the garden or eating urban-grown fruits and vegetables.

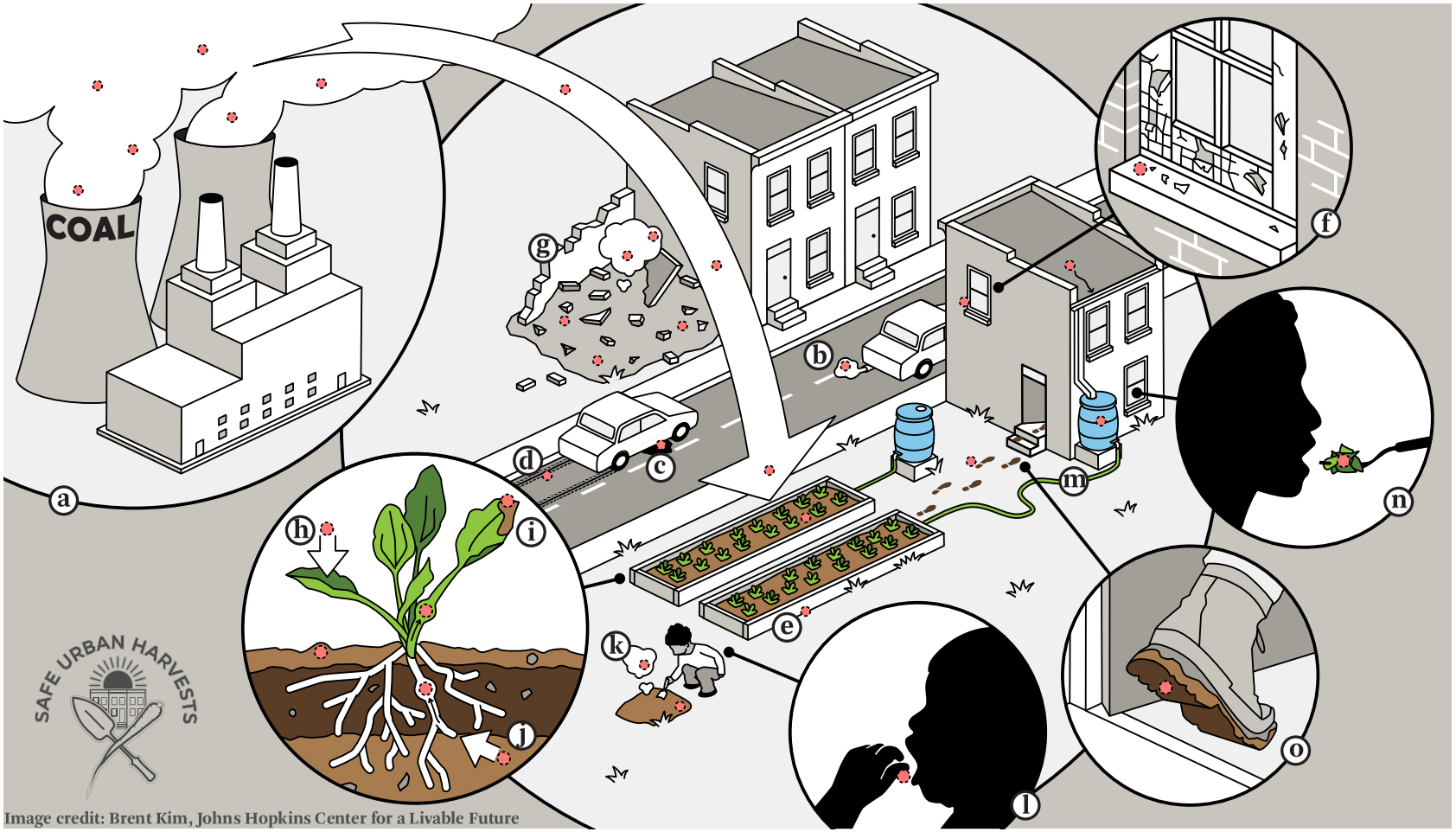


Image credit: Brent Kim, Johns Hopkins Center for a Livable Future

Where do harmful metals come from?

- Industrial sources, such as coal power plants (a)
- Vehicle exhaust (b), automotive fluids (c), and tire wear (d)
- Treated lumber (e), such as for raised beds
- Chipping lead paint (f)
- Demolition of old houses (g)
- Historic uses of leaded gasoline and certain pesticides

How can metals contaminate urban-grown fruits and vegetables?

- Airborne dust containing metals can settle on or stick to the outside of fruits and vegetables (h)
- Soil can stick to the outside of fruits and vegetables (i)
- Metals in contaminated soil can be taken up inside fruits and vegetables (j)

How can I come into contact with metals?

- Breathing or swallowing airborne dust (k)
- Unintentionally swallowing contaminated soil while working or playing in it (l)
- Drinking water from a contaminated irrigation source (m)
- Eating contaminated fruits or vegetables (n)
- Tracking soil into your home (o)
- Direct skin contact with contaminated soil

ADDITIONAL RESOURCES

The following documents are available on the Safe Urban Harvests study website. They contain additional information about the study and resources for urban agriculture in Baltimore.

Methods: How samples were collected, analyzed, and interpreted

Meet our Safe Urban Harvests study team

Grant and assistance opportunities for Baltimore community gardens and urban farms

MORE INFORMATION ABOUT METALS

If you would like more information about the six metals harmful to human health, please refer to the Agency for Toxic Substances and Disease Registry's Frequently Asked Questions factsheets ("ToxFAQs") for these metals. These factsheets describe the most common sources of exposure and the most severe health effects that may result from frequent contact with high levels of these metals. *Please note that not all of the information in these factsheets is relevant to the urban agriculture context. Some information may only apply to high level exposures typical in industrial workplaces.* The factsheets are available at:

Arsenic: https://www.atsdr.cdc.gov/toxfaqs/tfacts2.pdf

Barium: https://www.atsdr.cdc.gov/toxfaqs/tfacts24.pdf

Cadmium: https://www.atsdr.cdc.gov/toxfaqs/tfacts5.pdf

Chromium: https://www.atsdr.cdc.gov/toxfaqs/tfacts7.pdf

Lead: https://www.atsdr.cdc.gov/toxfaqs/tfacts13.pdf

Nickel: https://www.atsdr.cdc.gov/toxfaqs/tfacts15.pdf

SAFE URBAN HARVESTS STUDY TEAM AND PARTNERS

For more information, please contact the Safe Urban Harvests partners who have additional experience and knowledge to support your efforts:

SAFE URBAN HARVESTS STUDY TEAM

For questions about the study purpose, methods, and results interpretation

Johns Hopkins Center for a Livable Future
111 Market Place, Suite 840, Baltimore, MD 21202
Keeve Nachman, Principal Investigator
knachman@jhu.edu
410-223-1707
https://www.jhsph.edu/clf/suh

SAFE URBAN HARVEST PARTNERS

Baltimore City Office of Sustainability
For questions about zoning for urban agriculture and growing food on public land

Abby Cocke, Environmental Planner
417 E. Fayette Street, 8th Floor, Baltimore, MD 21201
abby.cocke@baltimorecity.gov
410-396-1670
http://www.baltimoresustainability.org/projects/baltimore-food-policy-initiative/homegrown-baltimore/urban-agriculture-2/

Farm Alliance of Baltimore
For farms that are producing farm products for sale and donation to the public.

Mariya Strauss, Executive Director
2701 Saint Lo Drive, Baltimore, MD 21213
mariya@farmalliancebaltimore.org
410-736-8079
www.farmalliancebaltimore.org

Parks & People Foundation
For community greening grants and educational community gardening events

Valerie Rupp, Community Grants Program Director
2100 Liberty Heights Ave,
Baltimore, MD 21217
valerie.rupp@parksandpeople.org
(410) 448-5663
http://parksandpeople.org/

University of Maryland Extension — Baltimore City
For questions about growing practices, fertility, and soil science

Neith Grace Little, Extension Educator--Urban Agriculture
6615 Reisterstown Road, Suite 201,
Baltimore, MD 21215
nglittle@umd.edu
410-856-1850 ext. 123
http://extension.umd.edu/baltimore-city/urban-agriculture

APPENDIX

SOIL

Table 1. Harmful metals measured in soils at Name Redacted

In parts per million (ppm)	Report Label	Arsenic	Barium	Cadmium	Chromium	Lead	Nickel
	New York Soil Cleanup Objective	**16.0**	**350.0**	**2.5**	**36.0**	**400.0**	**140.0**
●	Growing Area Mixture	3.9	< 25.0	< 2.0	40.2	70.8	17.7
●	NGA Soil 1	17.2	33.5	< 2.0	64.6	133.1	17.8
▲	NGA Soil 2	2.0	96.4	< 2.0	25.0	83.8	11.5

Notes:
Highlighted values are higher than the NY Soil Cleanup Objective.
Chromium exists in two forms, one that is more harmful than the other. We expect that most of the chromium at your site is the less harmful trivalent (III) form, as opposed to the more toxic hexavalent (VI) form. We are conducting further analysis to better answer this question for Baltimore and will provide these findings as soon as possible.

Table 2. Other metals measured in soils at Name Redacted

In parts per million (ppm)	Report Label	Calcium	Copper	Iron	Manganese	Potassium	Zinc
●	Growing Area Mixture	22732.0	57.2	19826.0	421.5	1282.0	148.7
●	NGA Soil 1	18490.0	89.6	19525.0	471.0	1620.0	210.8
▲	NGA Soil 2	17012.0	22.1	13219.0	279.0	3406.0	75.1

Table 3. pH and electrical conductivity measured in soils at Name Redacted

	Report Label	pH	EC
●	Growing Area Mixture	6.9	0.4
●	NGA Soil 1	6.7	0.4
▲	NGA Soil 2	7.3	0.3

Note: A normal pH for most plants ranges from 5.5-7.5.

IRRIGATION WATER

Table 4. Harmful metals measured in irrigation water at Name Redacted

In parts per billion (ppb)	Report Label	Arsenic	Barium	Cadmium	Chromium	Lead	Nickel
	EPA Drinking Water Standard	**10.0**	**2000.0**	**5.0**	**100.0**	**15.0**	**100.0**
●	Water	< 0.2	35.2	< 0.007	0.08	0.3	0.3

Table 5. Other metals measured in irrigation water at Name Redacted

In parts per billion (ppb)	Report Label	Calcium	Copper	Iron	Manganese	Potassium	Selenium	Zinc
●	Water	1002.0	11.2	67.2	2.7	2578.2	0.5	5.1

Note: Some of these metals can be harmful at very high levels. None of the metals were present in your sample at these levels.

For more resources on urban soil safety, visit: www.jhsph.edu/clf/urbansoilsafety.

SAFE URBAN HARVESTS

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