

# Examining Urban Soil Quality and Contamination Along the Wasatch Front

Eli Oliver  
Utah State University

Melanie Stock, Paul Grossl  
Utah State University

## Introduction

The objective was to establish a soil survey along the Wasatch Front to examine the concentrations of common contaminants and soil quality in urban farms and community gardens during 2020-21:

1. Heavy metals: lead, arsenic
2. Hydrocarbons: petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic carbons
3. Salinity, pH, and elevated macronutrient levels

**Table 1.** EPA regional screening level (RSL), determined local threshold, and national background concentrations in mg/kg compared to the average measured concentration of lead and arsenic for urban soils along the Wasatch Front.

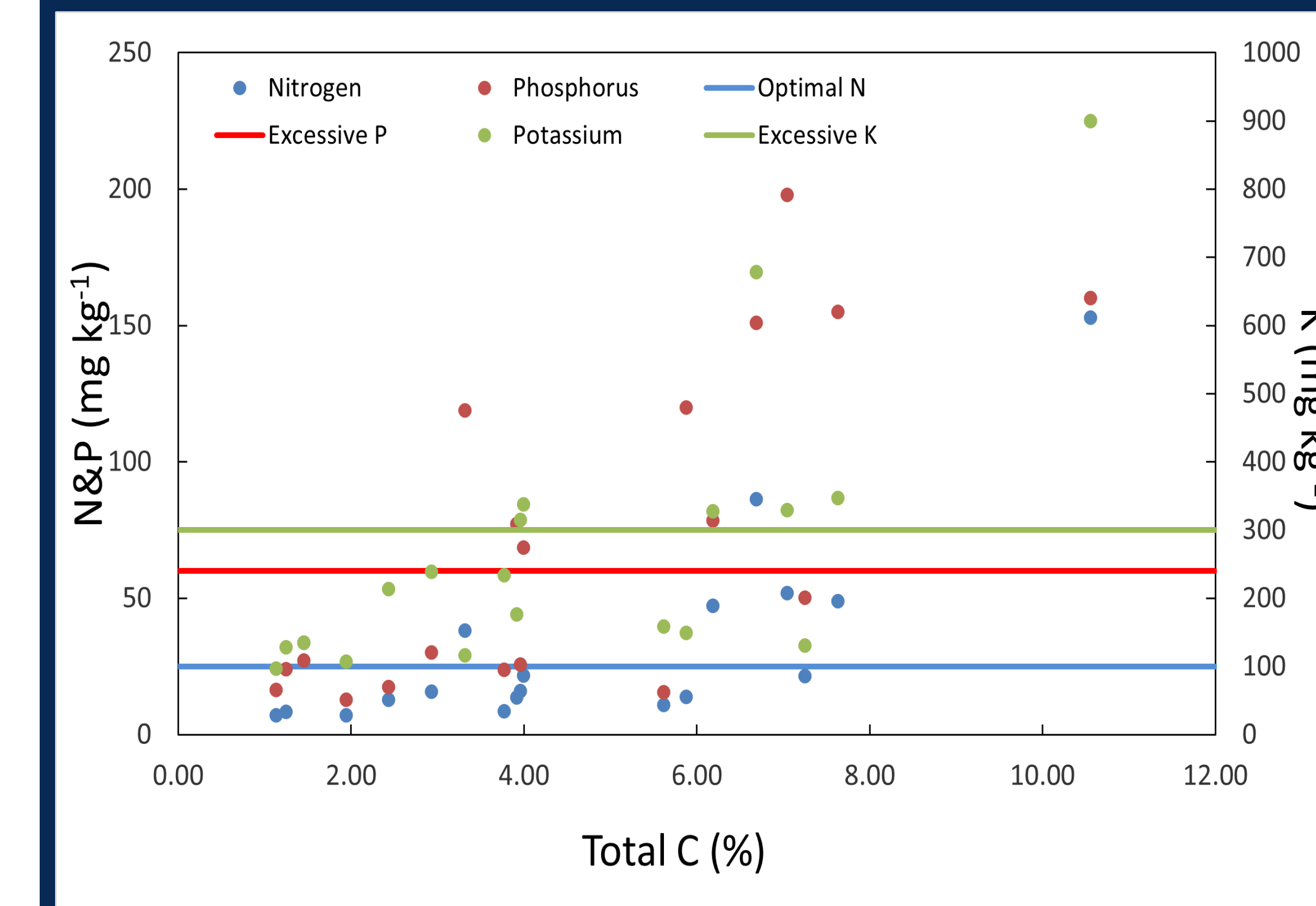
| Element | EPA RSL <sup>1</sup>           | Determined Local Threshold | National Background Concentrations <sup>2</sup> | Avg. Sample Concentration |
|---------|--------------------------------|----------------------------|---|---------------------------|
|         | -----mg kg <sup>-1</sup> ----- |                            |   |                           |
| Lead    | 400                            | 400                        | 16  | 96.29                     |
| Arsenic | 0.68                           | 20                         | 5.2   | 10.12                     |

## Methods

- Study was conducted from Fall 2020-2021
- 13 of 20 sites sampled as of April 2021
- Composite samples taken at each site
- Multiple composite samples taken based on soil types and land use
- Samples taken at targeted depth of 0-12 in
- Tests conducted: EPA 3050, Olsen P&K, Nitrate-N 2N KCl extract, Total Carbon, pH+EC+SAR, EPA Method 8260D, EPA Method 8270 SIM

## Results

- Average lead concentration was 96.29 mg kg<sup>-1</sup> with a range of 14.8-516 (Fig. 1 a)
- Average arsenic concentration was 10.12 mg kg<sup>-1</sup> with a range of 2.83-39.1 (Fig. 1 b)
- 7 samples were above the optimal concentration for N
- 9 samples had excessive concentrations of P
- 7 samples had excessive concentrations of K



**Figure 2:** Measured NPK concentrations and the point at which each becomes excessive. N&P are graphed on the primary axis, while K is on the secondary axis.

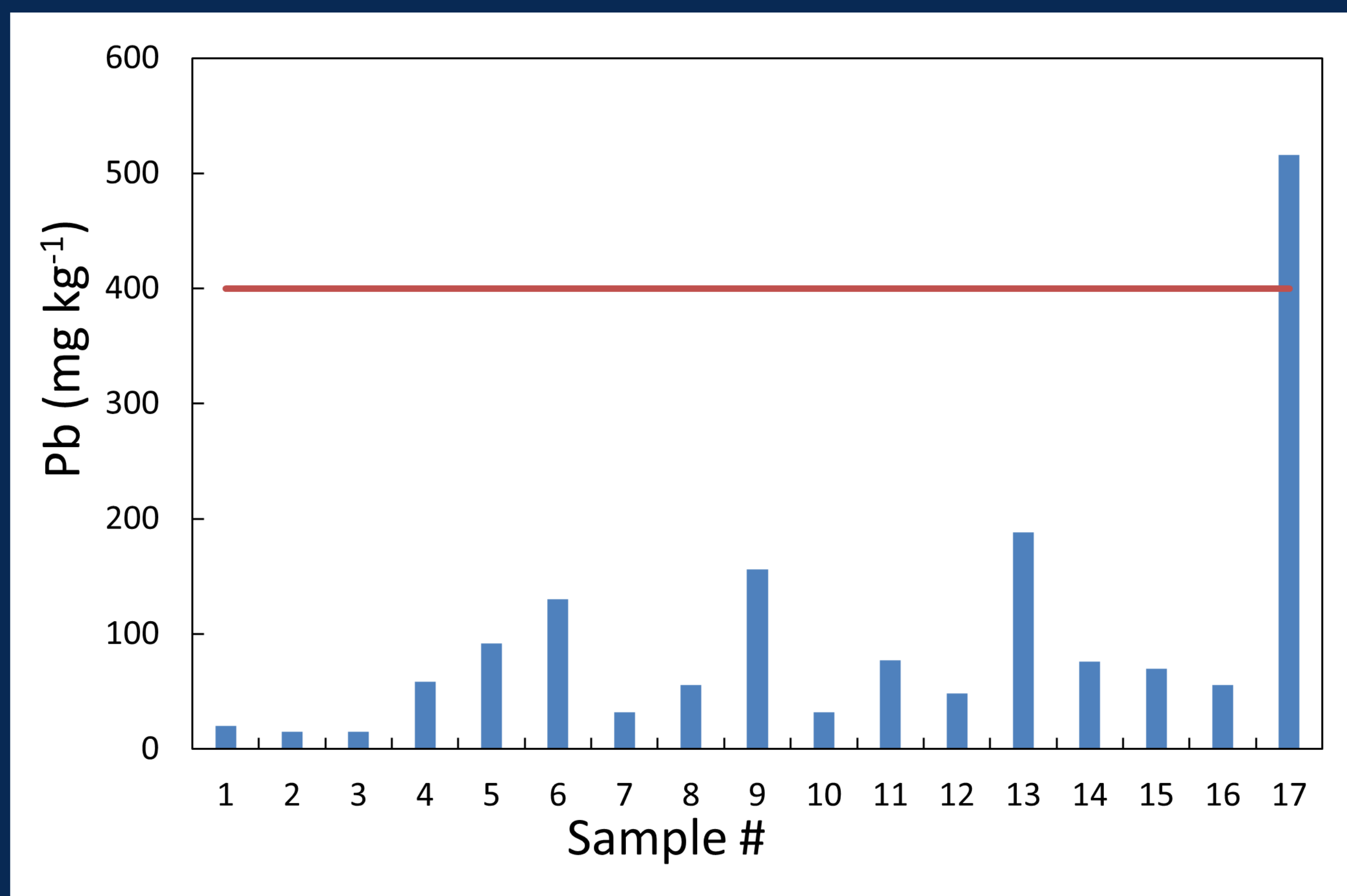


Fig. 1 a

**Figure 1.** a) Measured lead (Pb) concentrations in mg kg (blue bars) compared to EPA screening level of 400 mg kg<sup>-1</sup> (red line).  
b) Measured arsenic (As) concentrations (blue bars) compared to a screening level of 20 mg kg<sup>-1</sup> (red line).

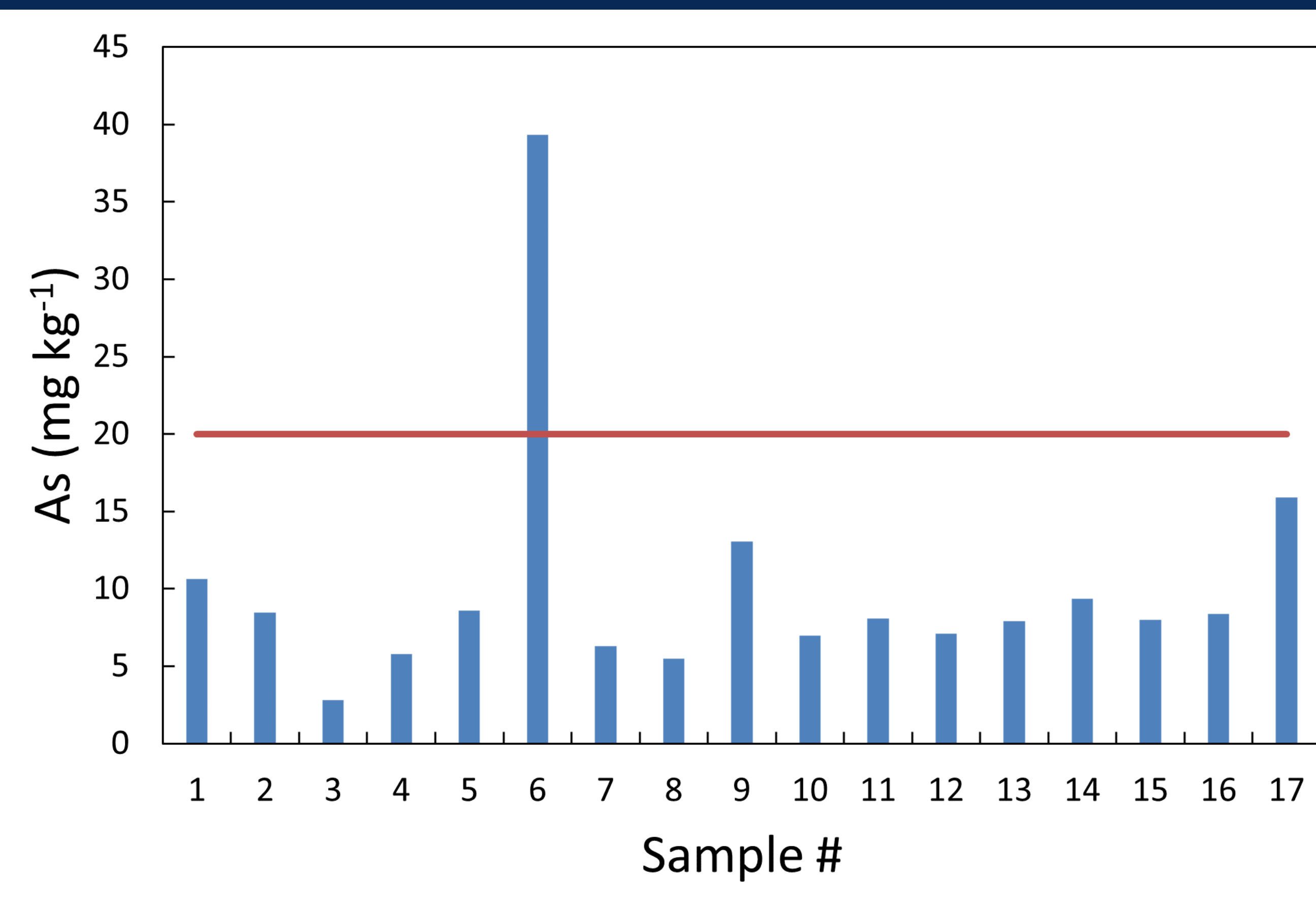


Fig. 1 b

## Conclusions

All arsenic concentrations exceeded the EPA screening level of 0.68 mg kg<sup>-1</sup>. Most background arsenic levels are naturally above this value, which demonstrates the need for a more localized screening limit based on measured concentrations. Overall lead concentrations were lower risk: to date one sample was over the limit of 400 mg kg<sup>-1</sup>, and this sample was also from a depth of 12-24 in. Common site risk factors present at sites with higher metal concentrations were proximity to roads and old homes. The average phosphorus concentration was high, and there were gardens where all macronutrient levels are considered high. This shows the need to address sites on an individual basis, as sites with high macronutrient levels do not need further amendments applied.