



# RESIDENTIAL SOIL REMEDIATION

Removal of arsenic and lead contaminated soil from residential areas and protection of residents and the public, site workers, and the environment



## Remediation Process

1. Obtain access agreement from property owner and sample property
2. Prepare design for properties (or portions of properties) with arsenic and/or lead above acceptable limits
3. Meet with property owner to discuss remediation and complete restoration agreement
  - a) Restoration agreement specifies areas and depths to be excavated, vegetation to be removed or left in place, and restoration (i.e. sod, mulch, gravel, etc.)
  - b) Owner responsibilities (i.e. move cars, personal items) and Contractor responsibilities and contact information are detailed



## Remediation Process (Continued)

4. Document pre-existing conditions
5. Add property to remediation schedule and have utilities located
6. Excavate property in accordance with design and agreement
  - a) Air Monitoring is performed during excavation
  - b) Excavation completion is documented

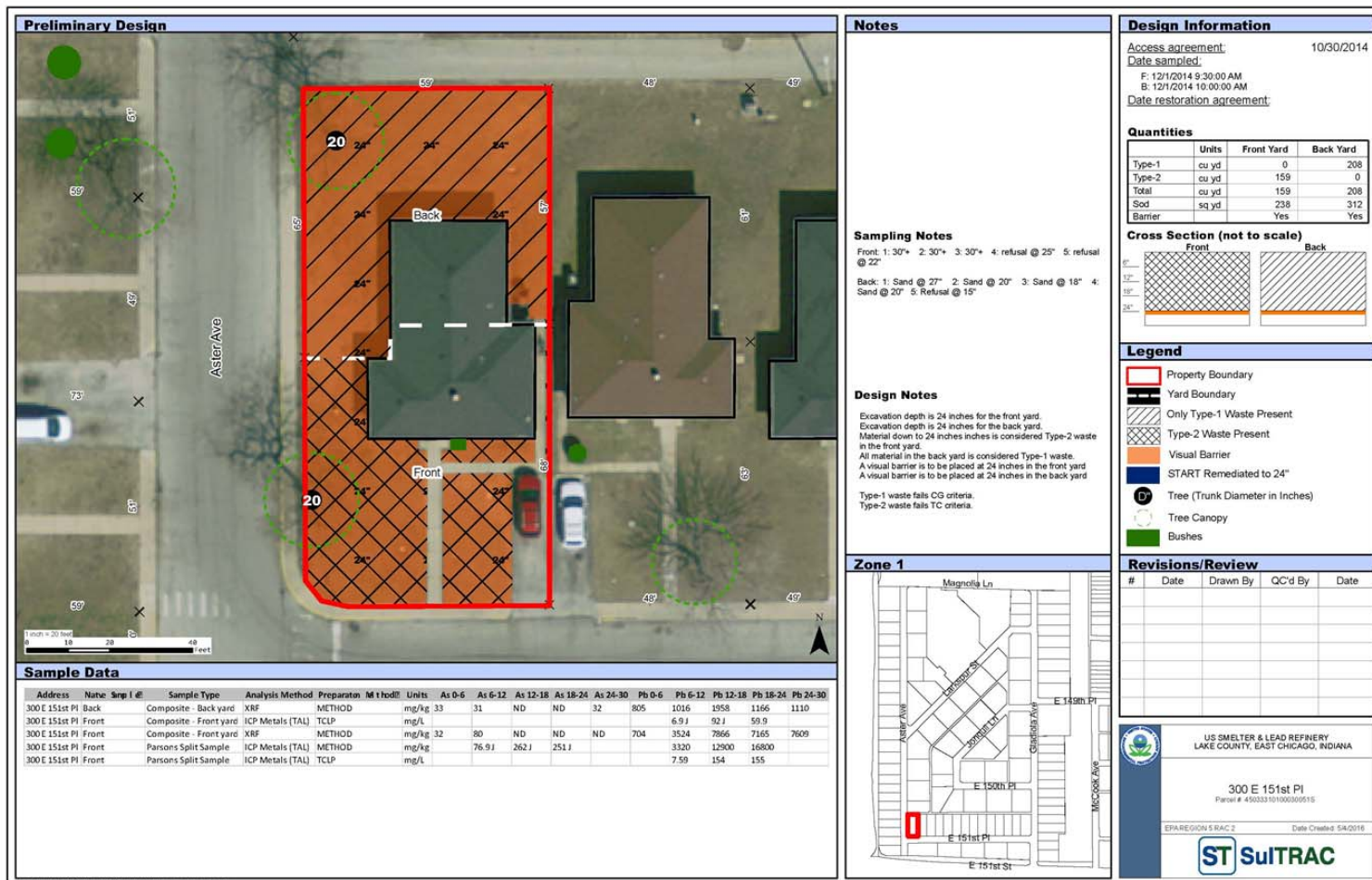


## Remediation Process (Continued)

7. Restore property with backfill, topsoil, sod, etc.
  - a) Damaged or temporarily relocated items are repaired/reinstalled (i.e. reinstall fence removed for access)
  - b) Completion of restoration is documented
8. Contractor will water sod for establishment period
9. Meet with property owner to verify satisfactory completion and sign completion agreement
  - a) Documentation that remediation completed is provided to owner



# USS Lead Property Design Example





# Effective Communication Key to Resident Satisfaction

- Explanation of work to be performed, items to be removed, and timeframes
- Notify owner and/or tenants when work is scheduled
- Provide contact information in case of issues during remediation
- Performance and documentation of quality work by Contractor, oversight by EPA & IDEM
- Follow-up completion meeting







# Excavation

- Utilities marked by Indiana811/East Chicago prior to arrival at property
- Contractor will excavate in vicinity of utility markings by hand to depth of excavation to verify line is not present
- If line is present in excavation area, expose with hand tools to prevent damage





## Excavation (Continued)

- Small equipment (mini-excavator, skid steer, single-axle dump trucks, etc.) are often used during residential remediation due to access constraints
- General Laborers perform manual excavation around foundations, utilities, trees and/or shrubs, small areas, and act as spotters



Mini-excavator and dump truck (Excavation)



Skid-steer (Backfill placement)





## Excavation (Continued)



Soil will be left to support foundations and permanent structures such as AC Unit (excavate by hand at 45 degree angle)



Soil at 45 degree angle along sidewalk. Laborer excavates by hand along permanent structures



## Excavation (Continued)

- Small/ non-mature trees may be removed and new tree replanted. Extra caution exercised around tree roots of large trees to remain in place. Minimum of 1-2 inches surficial soil removed, up to full excavation depth.



Large tree with roots close to surface



Surficial soil removed under tree canopy





## Excavation (Continued)

Preventing the spread of contamination to off-site areas

- Plastic sheeting placed on non-contaminated areas which excavator arm will swing across to catch any spilled soil
- Plastic may be placed on remediation property or adjacent properties (with access)
- Geofabric may alternately be used (plastic may be slipping hazard to workers when wet)





## Excavation (Continued)



Property boundary marked with paint, plastic on adjacent property, and mats to prevent ruts



Plastic in alley, personnel decontamination is set up at excavation boundary





## Excavation (Continued)



Personnel decontaminate boots every time they leave excavation area



Boot cleaning at excavation boundary. Hand decontamination (hand-wash, Lead D-wipes, etc.) and first aid will also be present.



## Excavation (Continued)



Equipment (bucket, tracks, etc.) is also dry-decontaminated (brush, scraping) at completion of excavation prior to transport



Truck will be cleaned of loose soil and tarp lowered prior to transport





## Excavation (Continued)

Entrance/exit access will be maintained for residents during remediation

- Equipment will be stopped and sidewalk cleaned as needed if resident needs to enter/exit residence while work is on-going
- Special provisions will be made as needed such as installing walkway immediately after completing excavation to maintain access routes to residence





## Excavation (Continued)

Sidewalks and/or roadways cleaned as needed at completion of excavation at property and the end of each work day with shovels, brushes, and/or water truck as needed or permissible







## Air Monitoring

Air monitoring conducted at residential entrance nearest the excavation area as well as the downwind perimeter. Monitoring is conducted while excavation is occurring.

Two types of monitoring:

- Particulate (dust) monitoring (field measurement)
- Arsenic and lead specific monitoring (laboratory analysis)





## Air Monitoring (Continued)

### Particulate Monitors

- Particulate results can be directly read from the monitor in the field. Results are later downloaded daily to computer
- Highest particulate results are used to select arsenic and lead samples to submit for laboratory analysis
- A particulate monitor may be set up at a background location where no work is ongoing such as the project office



Particulate monitors pDR-1500 (left) and personal sized pDR-1000 (right)



## Air Monitoring (Continued)

### Arsenic and Lead Sampling (Gilian type pump)

- Air is drawn through a sample filter and tubing attached to the Gilian pump
- Airborne lead and arsenic are captured on the filter
- Sample cassettes are submitted to the laboratory for analysis
- Pump flow rate is calibrated at start and end of day



Filter cassette (left) and Gilian pump (right)



Flow rate calibration unit



## Air Monitoring (Continued)

- Air monitoring is also conducted at the perimeter of vacant lots.
- Duplicate filter cassette samples are periodically collected and analyzed for quality control purposes

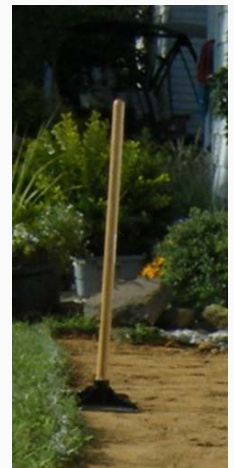






## Backfill (Continued)

- In open areas, backfill may be compacted by the weight of equipment such as a skid steer.
- In smaller areas, a vibratory plate compactor or hand tamper may be used.
- Backfill will be installed and compacted in lifts of 6" thickness to a min. 90% of laboratory max. density





## Backfill (Continued)

- Satisfactory compaction will be tested by a trained geotechnical professional using an in-place field soil density gauge (Troxler or similar)
- Minimum two tests per lift (18-24", 12-18", 6-12") per area (front yard, back yard)





# Restoration

- Sod or seed will be placed (based on restoration agreement) after backfill and topsoil.
- Sod / seed will be watered by the Contractor using a water truck during the establishment period
- Satisfactory sod/seed establishment will be verified prior to signing the completion agreement with the property owner

