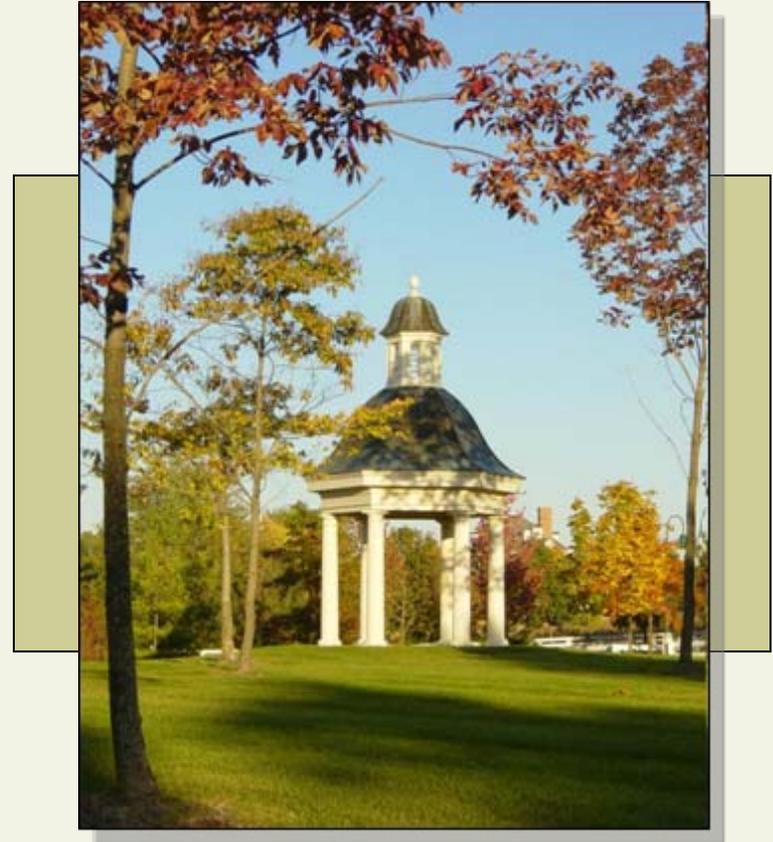


Remediation of a Skeet Shooting Range

Craig A. Cox, CPG, CP

Background

- *Good News!* - Developer purchases a large tract of land in for a high-end golf course community.
- *Bad News!* - Developer is unaware that the center of the site contains an 8-acre skeet-shooting range.
- *Really Bad News!* – Development is well underway and some lots within the footprint of the range have been sold!



Skeet Shooting Primer

- Ranges consists of one or more trap houses and shooting stations.
- Round of skeet produces a about a pound of lead.
- During a year, a range could easily produce 2000 pounds of lead.
- Over 40 years that could come close to 40 tons of lead.



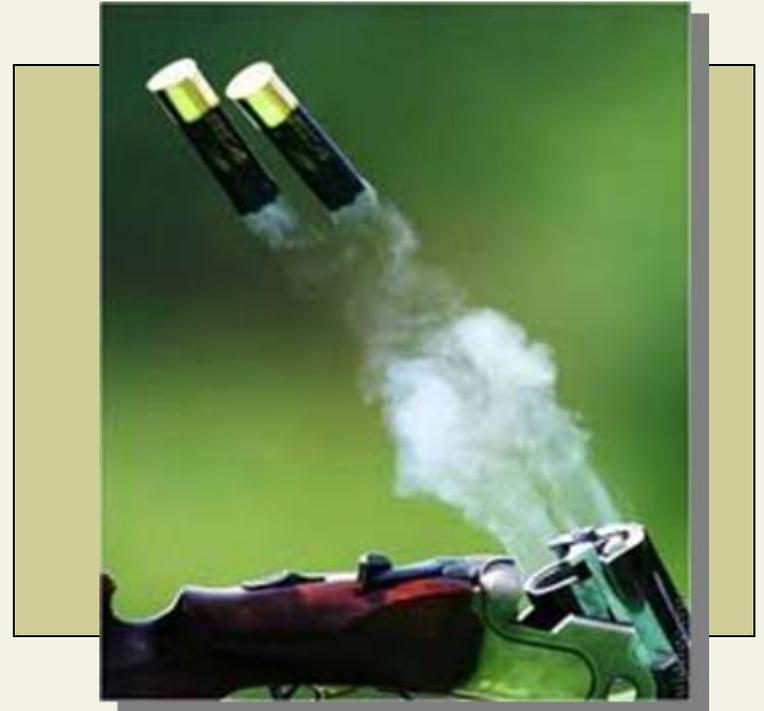
Skeet Shooting Primer

- Lead shot travels downrange approximately 200 meters or less.
- Ranges are typically located near wet areas.
- *Bonus!* – Clay targets aren't made of clay. They are made of petroleum pitch and limestone dust and are high in PAHs.



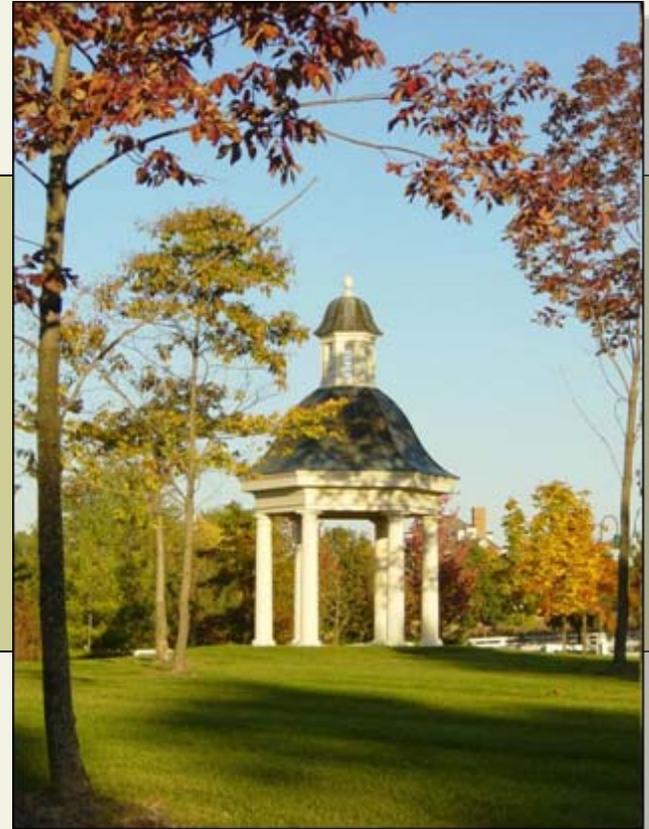
Regulatory Framework

- What about all the lead?
 - Release of hazardous waste?
 - Reportable quantity under CERCLA?
- What about the environmental media?



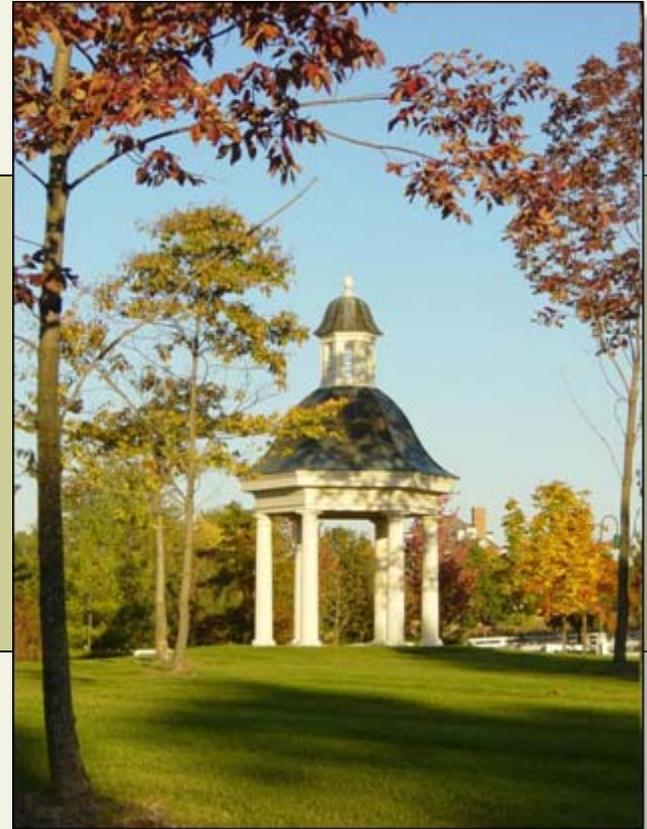
Project Goals

- Remediate the site to meet residential standards.
- Maintain the esthetic qualities of the stream.
- Maintain as many of the trees as possible.
- Maintain an aggressive assessment and remediation schedule.



Approach

- Assess the extent of contamination.
- Meet with Ohio EPA's Division of Emergency and Remedial Response, and Division of Surface Water.
- Meet with local stakeholders to discuss their concerns.
- Develop a remedial approach for soil, sediment, and surface water.



Assessment Tools

- Portable XRF for lead screening along a grid.
- Standard sampling methods and laboratory analyses.
- In-place TCLP used to determine waste disposal and remedial options.
- Temporary monitor wells to assess groundwater.



Assessment Results

- Site is generally flat lying and is drained by a small permanent stream.
- The soil profile consists of 2 to 4 feet of topsoil overlying 6 to 8 feet of glacial till.
- Bedrock consists of black shale.



Assessment Results

- Range appeared to be used for shot guns only.
- The range had two trap houses and associates firing stations.
- The range also had a fence used for targets.
- Clay targets and spent shell casings were abundant, but lead shot only seen in the stream.



Assessment Results

- Approximately 2-acres of the site was hazardous for lead.
- PAHs only in surface soils.
- Groundwater not affected.
- A 350-foot stretch of the stream contained lead shot as much as a foot thick.
- Surface water not affected, but vulnerable to effects of remediation of the sediment.



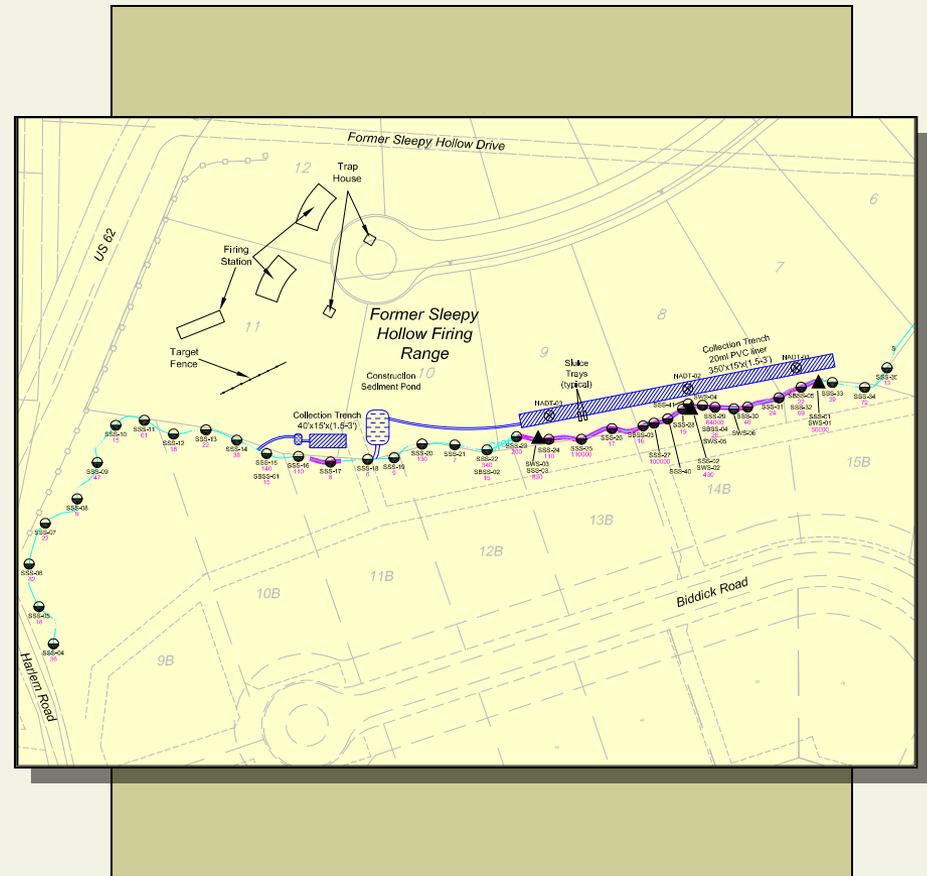
Remedial Approach - Soil

- Stabilize soil in place to remove hazardous characteristic, then excavate and dispose as solid waste.
- XRF used to direct stabilization and excavation efforts.
- 100 Confirmatory samples sent to lab for analysis.
- Area was backfilled by developer to meet their site specifications using soil stockpiled from other areas of the development.



Remedial Approach - Stream

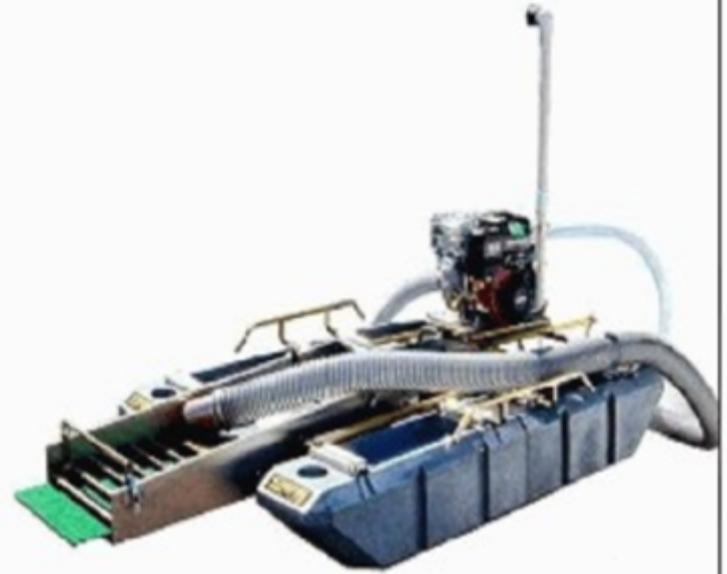
- Use portable dredge to remove lead shot from stream.
- Sluice boxes used to capture shot for recycling.
- A lined swale used to direct water and sediment into catch basins.
- Clean sediment and water was returned to the stream.



Remedy



Remedy



Remedy



Remedy

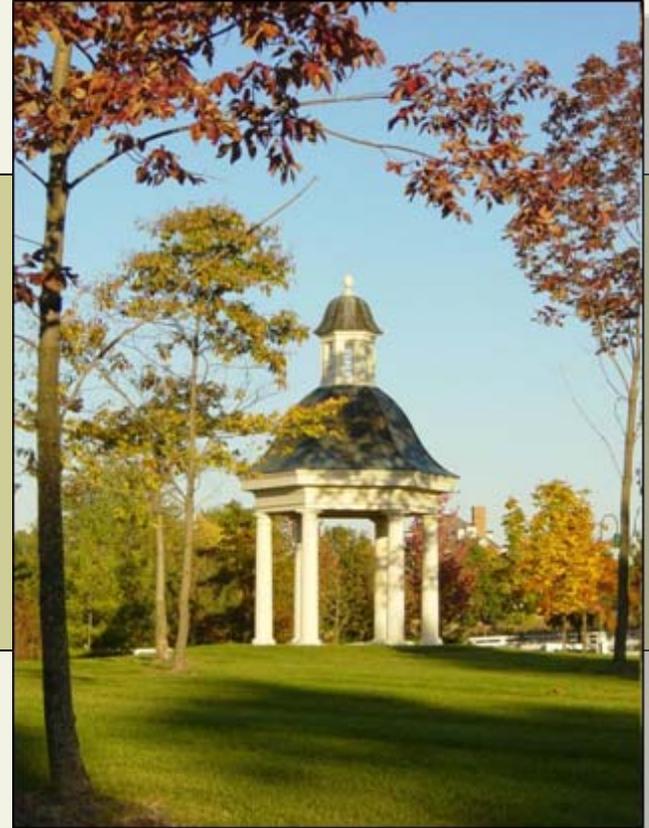


Remedy



Outcome

- Stabilized and removed 9,200 tons of soil to solid waste landfill.
- Recycled 3,760 pounds of lead shot (more than 10 pounds of lead per foot).
- Met residential standards and maintained esthetic quality of the stream.



Outcome

- Met the expectations of Ohio EPA, the developer, and the local stakeholders.
- Recycling helped to offset the remediation costs.
- Remediation did not generate any hazardous waste.
- Development was able to proceed as planned.

