

Site Investigation, Sustainable Remediation & Ecological Restoration of a Century Old Former Zinc Smelter Site



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Overview

- Goal: In the context of a case study, emphasize the benefit of integrating remediation plans with long-term land use plans
- The approaches represented in this project highlight:
 - The use of site-specific risk assessment as a tool in preparation of redevelopment plans
 - The use of environmental restoration as a central element in site remediation



Former Zinc Smelter Site

- Two zinc smelters in one town - East and West Plants
- Plants began operating in 1898
- Produced over 33 million tons of slag – placed in a pile over 2.5 miles long



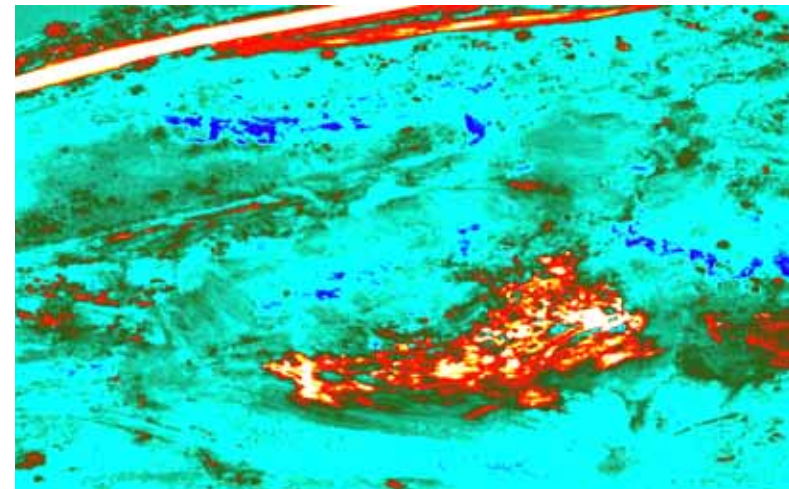
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- Air emissions resulted in deforestation (~2,000 acres)
- High levels of arsenic, cadmium, copper, lead, and zinc found in surrounding area
 - Soil impacts over several thousand acres
 - Indoor dust
 - River sediments



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- Produced over 33 million tons of slag into a pile over 2.5 miles long
- Air emissions resulted in deforestation (~2000 acres)
- High levels of lead, cadmium and zinc found in surrounding soils and indoor dust
- The West Plant operations shut down in 1980
- East Plant operations converted to zinc recovery



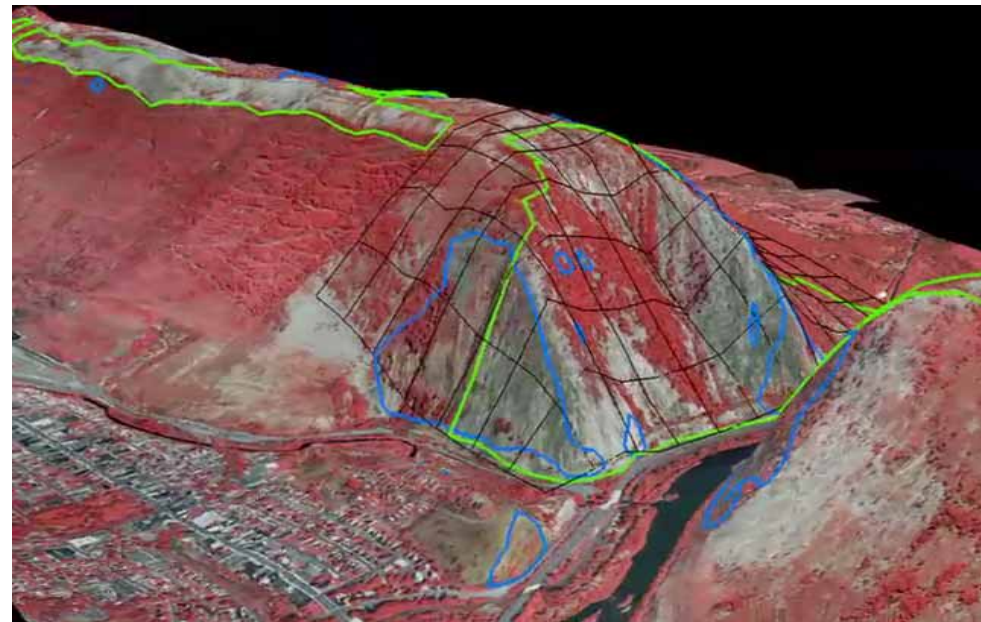
Regional Restoration

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 - spreading soil amendments
 - seeding with grasses and tree seedlings



Regional Restoration

- In 1987, remedy for addressing the denuded mountain was proposed
 - spreading soil amendments
 - seeding with grasses and tree seedlings.
- Efforts to revegetate remaining areas are ongoing
 - Stabilize remaining areas where vegetation has not yet been restored
 - Tree planting



West Plant – Plan for Reuse



- Plant was shut-down in 1980s and subsequently abandoned
- 120 acre parcel zoned for industrial use
- Active rail siding and access to regional highway
- Stakeholders agree that future land use should be commercial/industrial



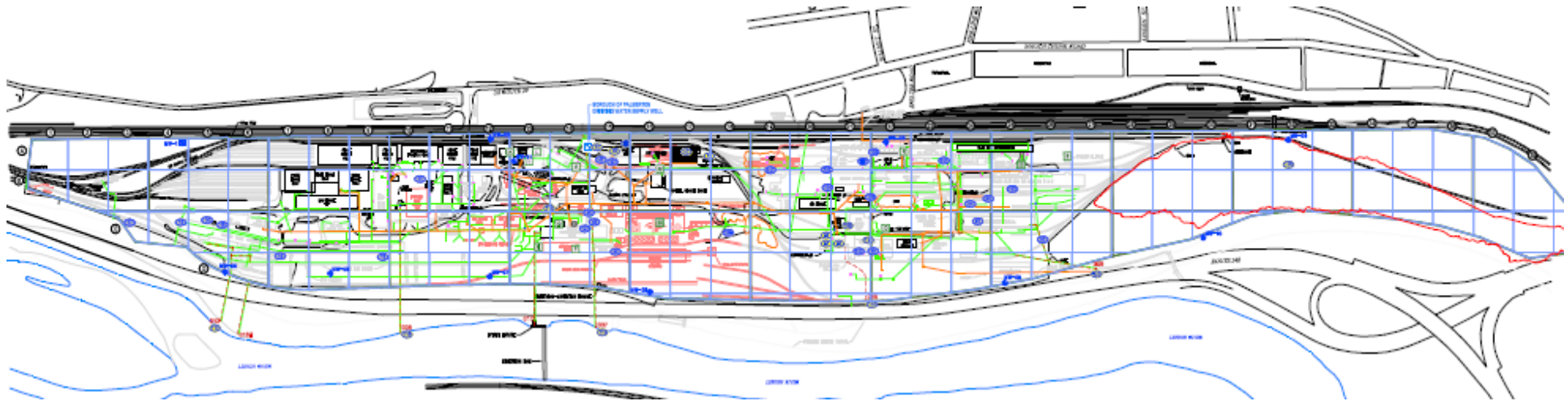
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- 120 acre parcel zoned for industrial use
- Active rail siding and access to regional highway
- Stakeholders agree that future land use should be commercial/industrial
- Characterized by abandoned process buildings, cinder/slag fill, buried utilities and plant infrastructure



West Plant – Characterization



- Map site conditions including several generations of process operations
- Field screen methods (e.g. XRF) to rapidly characterize site-wide fill and suspected source area
- Focused soil and groundwater sampling based on field screening
- Perimeter air sampling



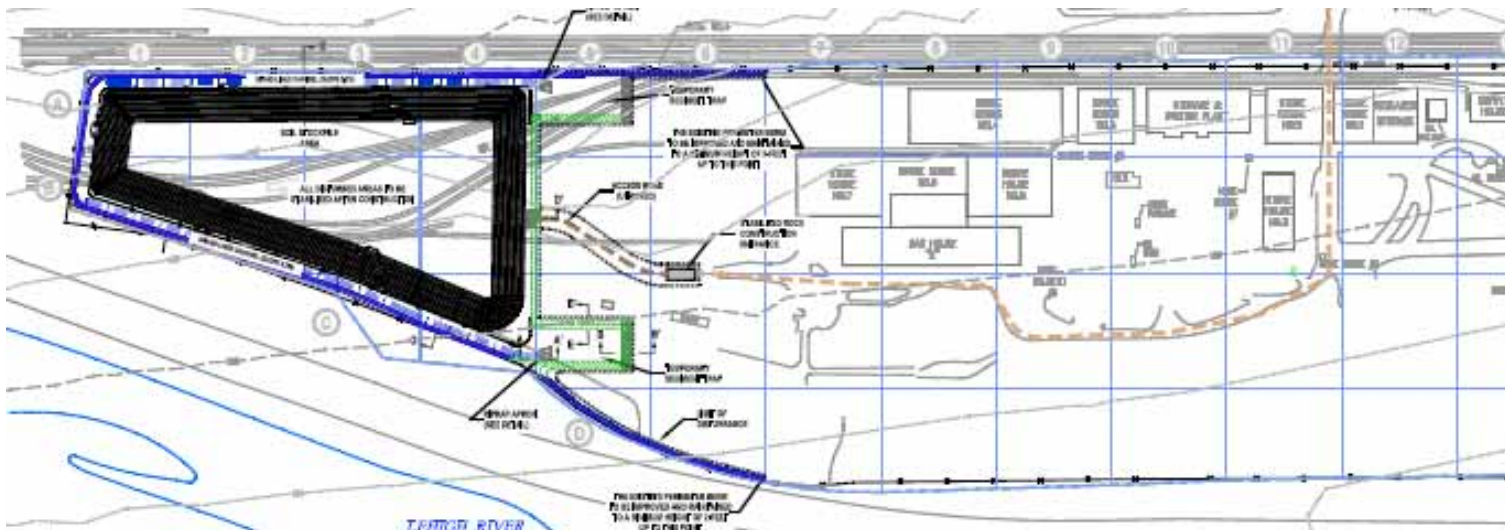
West Plant – Characterization

- Site-specific risk assessment – current and future use
 - Residents and trespassers
 - Routine workers
 - Maintenance workers
 - Aquatic ecological receptors (in the adjacent river)
- Elevated metals detected in soil and groundwater
 - Pose a potential risk to on-site receptors (direct contact)
 - Potential to discharge to nearby river at levels of concern for aquatic uses
- Nonaqueous phase liquids and solvent related organics detected in soil and/or groundwater
 - Pose a potential risk for vapor migration to indoor air
 - Pose a potential risk to workers during excavation activities



West Plant – Remediation

- Utilize risk assessment and redevelopment plan as basis for site remedy
 - Direct Contact: Buildings, pavement and construction fill serve to prevent contact with contaminated soils
 - Vapor Intrusion: Building layout and design to mitigate potential vapor intrusion exposures
 - Off-site Migration: Stormwater management devices installed for remediation will be maintained for site redevelopment
- Provide for groundwater monitoring & institutional controls

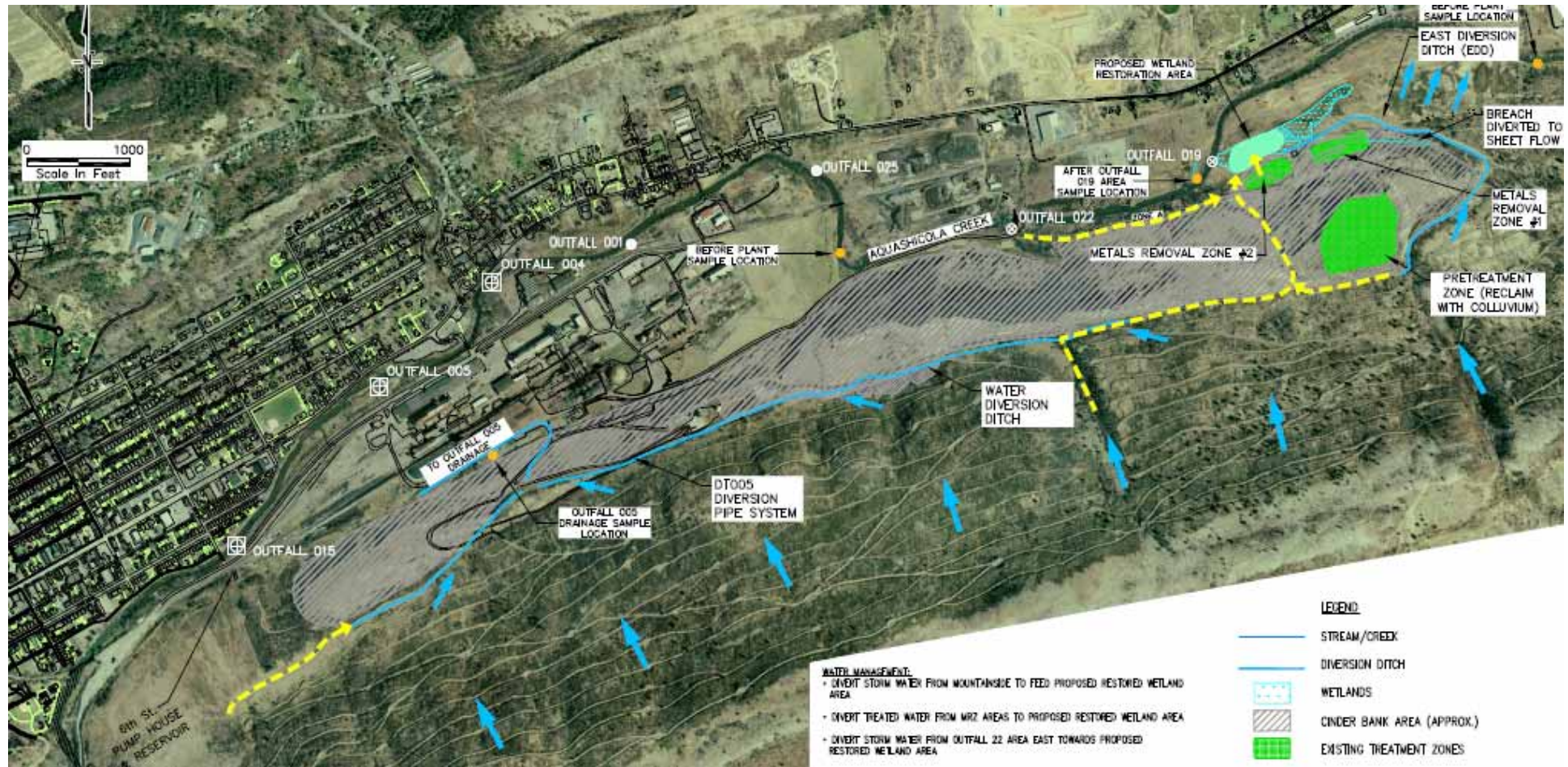


East Plant – Cinder Bank Management

- Metals are continuing to leach from the cinder bank
 - Rainfall infiltration
 - Surface water run-on & infiltration
- Continued loading to adjacent river from groundwater



East Plant – Cinder Bank Runoff

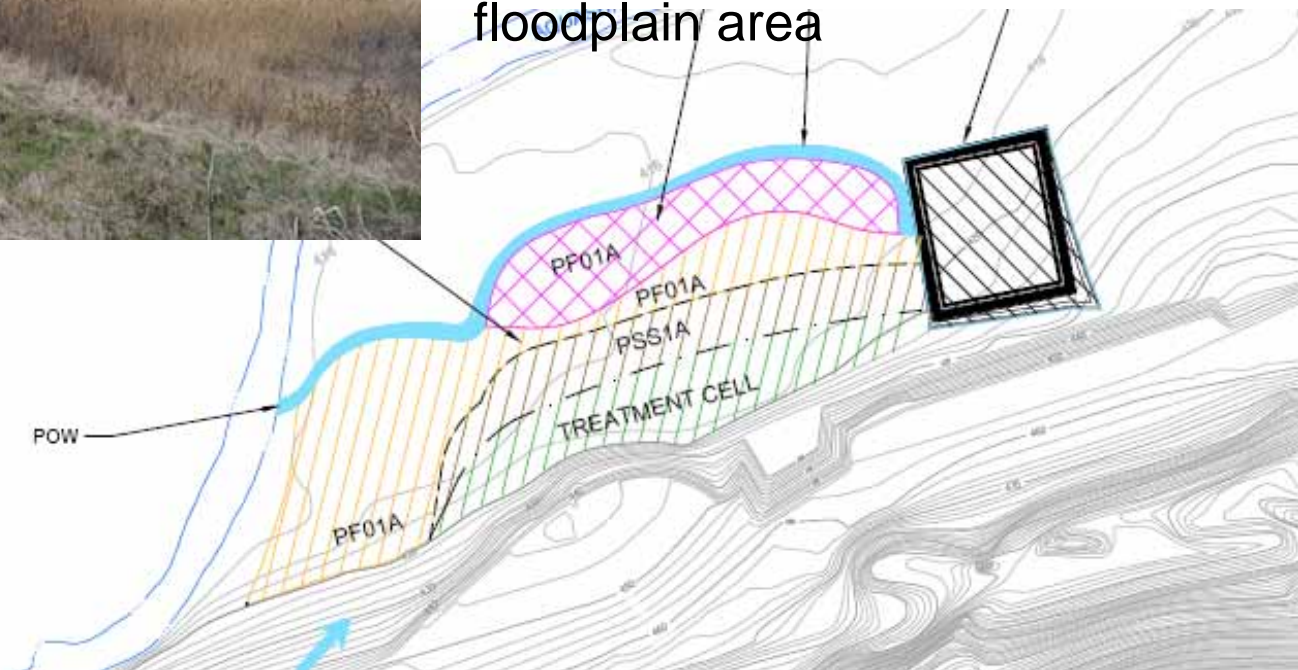


East Plant – Stormwater Treatment



Objectives:

- Provide a treatment wetland area for storm water runoff and water discharging from groundwater remediation areas
- Improve the ecological value of the floodplain area



Summary – Integrated Solutions

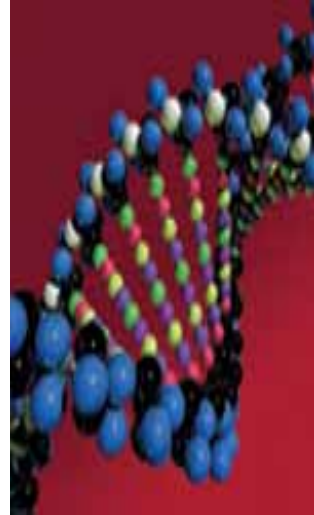


- Integrating restoration and reuse plans
 - Reduced requirements for intrusive and stand-alone remedies
 - Avoided additional natural resource damages from more traditional remedial alternatives
 - Meet stakeholder goals for site reuse and resource restoration
- Cost avoidance
 - West Plant: US\$ 5 to 10 million
 - East Plant: US\$ 2 to 5 million



Thank you

Obrigado!



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