GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name	***NATIONAL ZINC***	***ProjectID:*** 06-02
Last Updated:	09/26/02	

City:	Bartlesville
County:	Washington and Osage
State:	OK
Country:	USA
Bodies of Water:	Eliza Creek; Sand Creek; Caney River
US EPA Region:	VI
Status (Active, Complete, or Monitoring Only):	Complete
Date On NPL:	N/A
ROD/ESD Date:	OK State ROD (OU-2), 1996
Operable Unit:	OU-2 (State)
Areas of Concern (length or acres):	5,300 feet of the North Tributary (unnamed) of Eliza Creek.
Other Characteristics of Water Body:	As described in Reference A-160: The Upper Reach consists of drainage swales that usually contain water during storm events and have little or no flow at other times. Only certain segments of these drainage channels accumulate sediments. The Lower Reach has been a sediment accumulation zone since a farmer's dam was constructed on Eliza Creek (approximately 600 ft downstream of the confluence) in the 1940s. The construction of the dam allowed water from Eliza Creek to back into the Lower Reach, reducing flow velocities and allowing fine sediments to settle out. Prior to dam construction, the Lower Reach was likely an intermittent channel that had bank-full flow only during major storm events. The Lower Reach is thus a depositional environment with one to three feet of soft sediments overlying native material (referred to as the clay layer). The overlying sediments were targeted for removal down to the underlying clay layer in the Lower Reach. The key assumption for this removal approach is that the underlying clay layer is "clean" (i.e., concentrations of cadmium, lead, selenium, and zinc are less than the remediation levels for OU2 sediments). The width of the Lower Reach varies from approximately 5 feet in the upper section to approximately 60 feet in the lower section, which opens into a wider delta-like area just above the confluence with Eliza Creek.
Contaminants of Concern:	heavy metals (Cd, Pb, Se, Zn)
Source of Contamination:	Emissions of airborne and solid waste from historical zinc smelting operations at the National Zinc site.
Contaminated Area Physical Characteristics:	Sediments in two main areas of the North Tributary had metals concentrations that exceeded preliminary remediation goals (PRGs): the two upper reaches, 2,000 feet in length, located near the National Zinc site, which are erosional areas not considered to be important habitat areas, and the mainstream of the North Tributary, running 1,200 feet to the confluence with Eliza Creek (the "lower reach"), which is a depositional area with generally favorable habitat. The middle section of the North Tributary, 2,100 feet, from the junction of the upper reaches down to the lower reach, is not a depositional area and metals concentrations in this section do not exceed PRGs. Elevated metals concentrations in surface water were observed coincident with elevated metals levels in sediment.

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For samples collected during remedial design, sediment sample results (1995-1997) in the upper reach ranged from 6.1 - 507 ppm for cadmium; from 10.9 - 1,700 ppm for lead; and from 57.3 - 17,600 ppm for zinc; sediment sample results (1997) in the lower reach ranged from ND - 1,950 ppm for cadmium; from 3.9 - 1,950 ppm for lead; and from 108 - 10,600 ppm for zinc.

Type of Regulatory Action: Memo of understanding between EPA and OK DEQ to conduct a "national pilot project" and complete a CERCLA-quality investigation and remediation under state authority, in lieu of an NPL listing.

Overall Status Summary: Based on a 1996 Oklahoma State ROD, 3,000 cy of metals-contaminated sediments were targeted for dry excavation from about 3,600 linear feet of tributaries upstream of Eliza Creek, followed by stabilization and onsite burial; to be followed by replacement with clean fill. Destruction of stream habitat vs. pros/cons of removal and natural recovery were evaluated during the remedial design phase. Ecological-based cleanup levels were set for cadmium, lead, selenium, and zinc.

Removal was accomplished by dry excavation in December 1997, and January and February 1998. The great majority of the removed sediments failed TCLP testing for cadmium which altered plans for onsite disposal. Subsequently, it was determined that the 208 cy removed from the upper tributary (upper reach) did not require stabilization; 9,800 cy removed from the lower reach did. Stabilization was accomplished by addition of dolomitic quicklime and sodium sulfide. All sediments were disposed at an in-state commercial landfill.

The ROD requirement for backfilling after sediment removal was waived.

Remedial Action Planned:	☑
Risk Assessment:	☐
Remedial Action Implemented:	☑
Status of Dredging	☐
PRPs:	☑
Contacts:	☑
References:	☑
Modeling:	☐
Fishing Advisory:	☐

Key Conditions: commercial landfill, fish spawning limitations, more-harm-than-good, natural recovery, property access issues, solidification/stabilization

REMEDIAL ACTION PLANNED

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Target Sediment Cleanup Standards (TSCS):	Ecological-based cleanup levels of 100 ppm for Cd, 692 ppm for Pb, 29.2 ppm for Se, and 12,000 ppm for Zn.
How TSCS Established:	ecological risk assessment
Target Bank and Floodplain Cleanup Levels (if applicable):	
Other Target:	Soils in agricultural areas, with ecological-based cleanup levels of 305 ppm for Cd, 5,000 ppm for Pb, and 200 ppm for As.
Environmental Sample Data References:	
• ***Sediment:***	
• ***Water:***	
• ***Fish:***	
Estimated Target Volume:	3,000 cy (1996 ROD); 208 cy from upper reach and 3,600 cy from lower reach (1997 and 1998 Remediation Plans)
Planned Disposal Method:	Commercial non-hazardous waste disposal facility, after stabilization to pass TCLP. (In a subsequent discussion with the OK DEQ, it was indicated that onsite burial and capping was the preferred option, on the assumption that the removed material would pass TCLP testing without stabilization.)
Estimated Calendar Time to Implement Remedy:	
Estimated Time to Implement Remedy:	
Estimated Cost to Implement Remedy:	$2.8 million (1996 ROD), which included $2.1 million for a passive water treatment contingency
Stated Remedial Action Objectives (and Source):	1996 ROD: Maximize removal of contaminated sediments and minimize damage to the ecosystem. No other RAOs stated.
Measures of Success to be Used:	Not defined in ROD. Refer to "Planned Monitoring and Restoration"
Planned Monitoring and Restoration:	"Because the proposed remediation plan for both the Upper Reach and Lower Reach of the unnamed tributary will result in complete removal of affected sediments from the creek, long-term operations and monitoring of the unnamed tributary will not be required" (Reference A-160).
Agency Position on Sediment Removal (and Source):	Source 1996 ROD: "Prior to sediment removal, the stream flow would be diverted as required and the sediments would then be excavated. It may be necessary to further evaluate potential stream dewatering and flow diversion options during remedial design. The sediment would be removed using a Bobcat loader, backhoe, or mechanical dredge. The backhoe or mechanical dredge would also be able to remove debris, as necessary, in order to gain access to the sediments. Sediment resuspension would be controlled by diverting the stream flow (if any) around the area being excavated. In addition, silt curtains may be used further downstream to reduce the transport of residual suspended solids, if any."

". . .removal would occur throughout the entire tributary segments targeted for remediation (i.e., the upper reaches and the lower reach of the North Tributary). Clean fill would be imported to replace the excavated material in the lower reach of the North Tributary. The imported fill would be similar to the excavated sediment. For the purposes of the FFS, it is assumed that 20 percent of the fill would be topsoil to reconstruct the floodplain areas. The remaining portion of the fill would be sand. After placement of the fill, the stream restoration activities would be conducted in the lower reaches of the tributaries. This alternative would allow the excavated sediment (treated as needed) to be transported to an approved offsite disposal facility. Additionally, the natural recovery option will be used for Eliza Creek. During the remedial design, additional information will be gathered to designate the actual areas to be removed. If the destruction of the stream habitat will be too great in some areas, the DEQ may choose to limit removal in sensitive portions of the lower reach of the North Tributary."

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Physical Target:	Heavy metals (Cd, Pb, Se, Zn) in 3,550 linear feet of tributary (upper and lower reaches) to Eliza Creek.
Goals:	Sediment removal to achieve ecological-based cleanup levels for heavy metals.
Primary Contractor:	Midwest Environmental Services (division of Sherwood Construction)
Other Contractors:	PTI Environmental Services; Environmental Management Consultants Corporation (EMC2) (formerly Titan Environmental Corporation)
Generic Remediation Method:	Dry excavation
Equipment:	As described in the Completion Report, Reference A-890: "Track excavators and/or backhoes with smooth edged buckets were used to excavate the sediments depending on the required removal depth/extent and access limitations. Using smooth edged buckets minimized the disturbance to the underlying tributary bed while operator care was taken to minimize disturbance to streambanks and existing trees (including roots) during the removal. Sediments were also cleaned out of the tributary culverts that run under 14th Street using a motor grade blade welded to a steel box that was attached to a cable. The cable/blade assembly was then attached to a wheeled backhoe or track excavator and pulled back and forth along the bottom of the concrete box culverts."
Material Handling:	As described in the Completion Report, Reference A-890: "Dewatering of the Upper Reach prior to sediment excavation was not required because removal activities were conducted when water was not flowing. Dewatering of the Lower Reach prior to excavation entailed trenching a bypass around a farmer's irrigation dam located in Eliza Creek approximately 600 feet downstream of the Lower Reach-Eliza Creek confluence. The bypass was constructed on December 9, 1997 and quickly resulted in the complete draining of the Lower Reach such that no backwater from Eliza Creek entered the Lower Reach confluence area . . . The dewatering effect provided by the bypass allowed access to the excavation areas and minimized the risk of downstream transport of suspended sediments during excavation. The bypass trench was backfilled on February 27, 1998 after completion of the Lower Reach sediment excavation work to return the upstream water level in Eliza Creek and the Lower Reach confluence area to pre-construction conditions." "The excavated sediments were loaded directly into watertight, tarped dump trucks for the haul to the Osage Landfill staging area. The exact volume of sediments removed was difficult to estimate based on truck count because the trucks were only partially filled to control any possibility of spillage during transport . . . At the Osage Landfill, the removed sediments were placed in a HDPE lined/contained stockpile area."
Volume Removed:	10,000 cy
Calendar Time:	December 12, 1997 through January 31, 1998 for the upper reach and January 27 through February 24, 1998 for the lower reach
Time To Implement:	2½ months
Total Cost:	$640,000
Dredging Cost:	N/A
Disposal of Sediment:	Sediment was stockpiled onsite for about one year pending a decision on disposal. Sediment failed TCLP for Cd, which altered plans for onsite disposition. Ultimately, the plan was to stabilize the material prior to disposal at an offsite commercial landfill. According to Reference B-137:

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	"Stabilization of the materials will be achieved by incorporating reagents consisting of 5% wet process lime and a 0.01% sodium sulfide relative to the materials maximum dry weight into the material. The material to be stabilized will be placed in six-inch lifts and the reagents will be thoroughly tilled/mixed into the material prior to sampling for subsequent TCLP analysis for Cd." Only a single TCLP sample was required to characterize the small volume (208 cy) of sediment removed from the upper reach. The results showed that the 208 cy could be disposed offsite without stabilization. Disposal occurred in December 1998. Of the seven composite samples used to test the 9,800 cy of sediment removed from the lower reach, the results for five samples exceeded the TCLP Cd criterion. As a result, the 9,800 cy of sediment were first stabilized by incorporating upwards of 5% dolomitic quicklime and 0.01% sodium sulfide by weight, prior to offsite disposal. The sediment was stabilized in 18 batches, each made up of between 250 and 750 cy. One-third of the batches required several treatment and TCLP testing cycles. Disposal of all sediment was to the BFI Landfill in Broken Arrow, OK. Disposal was completed by August 13, 1999.
Volume of Water:	N/A
Method of Water Treatment:	
Water Discharge Limit:	
Air Monitoring During Remediation:	None
Water Monitoring During Remediation:	
Outcome:	A total of 208 cy of sediments was removed to pre-determined depths of 3 - 12 inches from 1,900 linear feet of the upper reach tributary and 9,800 cy of sediments were removed to depths of 1 - 5 feet from 1,650 linear feet of the lower reach tributary to Eliza Creek. As described in the Completion Report, Reference A-890: "Confirmation sampling was not required for the Upper Reach because previous depth interval sampling data had shown that the contamination was limited to the organic-rich, soft, surficial sediments in the ditch and did not extend to depth. Therefore, excavating to the pre-determined depths identified in the Upper Reach Remediation Plan, combined with visual observation of the complete removal of the organic-rich, soft, sediments, provided sufficient assurance of adequate removal . . . Confirmation sampling was performed in the Lower Reach . . . to confirm that overlying sediments had been adequately removed. Confirmation sampling stations were centered at the approximate locations where remedial design samples were taken . . . The samples were each a composite of five subsamples collected at 10-foot intervals from the upper six-inches of residual material along a 50-foot length of channel bottom." ". . . confirmation sample results from all but two of the Lower Reach stations were below the ecological RA remediation levels after completion of the sediment excavation to the depths specified." An additional 6-12 inches of sediment were removed from the two locations in order to achieve cleanup levels.
Restoration and Post-Monitoring:	As described in the Completion Report, Reference A-890: "Local experience has demonstrated that natural revegetation typically provides effective cover for erosion protection and wildlife habitat within one year's time. Therefore, ODEQ agreed to allow the disturbed areas to naturally revegetate before considering the need for manual seeding. . . . vegetation was . . . relatively well established on the disturbed areas within six to seven months of completing the work. Therefore, no active revegetation work was necessary."

"Consideration had been given during preparation of the remedial design to the potential need to replace the removed sediments with clean backfill as was specified in the ROD. However, with the exception of (one) Upper Reach sampling location, where some gravel backfill was placed as a precautionary measure in the excavated area to maintain grade and prevent upstream headcutting, backfill was not required for the following reasons:

1. It was unnecessary as a barrier layer above impacted materials because, as noted previously, all impacted sediment was removed and the material underlying the removed sediments has been analyzed and shown to be well below remediation levels.
2. It was unnecessary to restore ecological function because . . .benthic invertebrates that live in the bottom substrate are not an important part of the aquatic community in these silted in streams (terrestrial insects are the primary food source for the invertebrate-feeding fish in these streams).
3. It was unnecessary to maintain the overall geomorphic stability of the stream banks and channel because of the tributary's relatively low flows and gentle grade."

" In any event, natural conditions will result in deposition of additional sediment over time, thereby approximately restoring the pre-removal bottom substrate and grade conditions."

"Therefore, the ODEQ-approved OU2 remediation plans identified that backfilling would not be required for the reasons stated above, but might be considered along the toe of slope of sensitive banks, if needed for erosional control. No areas requiring bank toe backfilling were identified during the RA."

"Other restoration work completed at the site included:

- grading to remove irregular topography created by construction activities to prevent erosion until approximate pre-construction topography;

- consolidating cleared brush into piles to provide wildlife habitat;

- placing erosion control fabric on the excavated channel bottom in (one) area to prevent erosion until vegetation was established;

- placing rock riprap along (one) section of the Upper Reach; and

- removal/restoration of temporary access roads."

As further stated in Reference A-890: "no formal monitoring of . . . sediments, surface water, biota, or channel stability is required."

Site-Specific Difficulties:

- Plans for onsite disposal of removed sediments were revised when the great majority of the sediment failed TCLP testing for cadmium. This resulted in about a one-year delay in disposal of 9,800 cy of sediment. This was resolved by development, testing, and application of a stabilization process using dolomitic lime and sodium sulfide, followed by offsite disposal at a commercial landfill.

- As described in Reference A-890: "Total remedy construction costs were higher than projected due to greater volumes of sediment removed than was predicted in the ROD. However, per unit removal construction costs were considerably lower than projected, due to a reduction in stream dewatering costs (which was largely accomplished through an inexpensive bypass of the Eliza Creek irrigation dam) and ODEQ-approved waiver of the ROD's backfill equipment. These per unit cost reductions were partially offset by the extra costs associated with stabilizing a greater portion

of the removed sediment prior to disposal."

- As described in Reference A-890: "The actual volume of sediment removed from the Lower Reach was approximately 172% greater than the 3,600 cubic yard amount estimated in the Lower Reach Remediation Plan and approximately 227% more than the 3,000 cubic yards estimated in the OU2 ROD. The differences can be explained by the need to remove Lower Reach sediments to greater depths/aerial extents during the RA (as required by confirmation sampling results) than was predicted in the Lower Reach Remediation Plan (based on remedial design sampling results) or in the ROD (based on FFS and RI sampling results)."

Monitoring Data References:

- ***Sediment***
- ***Water:***
- ***Fish:***

POTENTIALLY RESPONSIBLE PARTIES

Project Name ***NATIONAL ZINC*** ***ProjectID:*** 06-02

PRP Name: **PRP INFORMATION NOT RELEASED** ***PRPID:***

Street Address:

City:

State:

KEY CONTACTS

Project Name ***NATIONAL ZINC*** ***ProjectID:*** 06-02

Last Name: **KEY CONTACT INFORMATION NOT RELEASED** ***Contact ID:***

First Name:

Title:

Company:

Address:

City:

State:

Postal Code:

Work Phone # : ***Other Phone #:***

Fax # :

Email Address:

Project Name ***NATIONAL ZINC*** ***ProjectID:*** 06-02

Reference Type: A ***ReferenceID:*** 7

Title: ***Record of Decision: National Zinc Site - Operable Unit Two***

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: Oklahoma Department of Environmental Quality

Preparer/Author Address:

Prepared For: General Public

Date Published: September 27, 1996

Key Words and Phrases:

Reference Type: A ***ReferenceID:*** 160

Title: ***Lower Reach Sediment Remediation Plan: National Zinc Site - Operable Unit 2***

Location: AEM

Category: Remedial Action Plan/Work Plan

Prepared by/Author: (1) PTI Environmental Services and (2) Titan Environmental Corporation

Preparer/Author Address: (1) 15375 SE 30th Place, Suite 250
Bellevue, WA 98007
(2) 7220 North 16th Street, Suite E
Phoenix, AZ 85020

Prepared For: Oklahoma DEQ

Date Published: January 1998

Key Words and Phrases:

Reference Type: A ***ReferenceID:*** 890

Title: ***Final Remediation Action Completion Report: National Zinc Site - Operable Unit 2: Bartlesville, Oklahoma***

Location: AEM

Category: Contaminated Sediments: Remediation Final Report

Prepared by/Author: EMC2

Preparer/Author Address: 7220 North 16th Street, Suite E
Phoenix, AR 85020

Prepared For: Phelps Dodge Corporation and Oklahoma Department of Environmental Quality

Date Published: January 4, 2002

Key Words and Phrases:

Project Name ***NATIONAL ZINC*** ***ProjectID:*** 06-02

ReferenceID: 116

Reference Type:	B
Title:	***National Zinc Company Oklahoma EPA ID# OKD000829440 Updated by Reference B-319***
Location:	AEM
Category:	Site Update
Prepared by/Author:	US EPA Region VI
Preparer/Author Address:	Website
Prepared For:	General Public
Date Published:	March 26, 1997
Key Words and Phrases:	

ReferenceID: 137

Reference Type:	B
Title:	***Transmittal: Stabilized Commercial/Industrial Soil and Sediment Stockpiles: Sampling and Analysis Plan: National Zinc Site - Bartlesville, Oklahoma***
Location:	AEM
Category:	Contaminated Sediments: Disposal Methods
Prepared by/Author:	Environmental Management Consultants Corporation
Preparer/Author Address:	7220 North 16th Street, Suite E Phoenix, AZ 85020
Prepared For:	Oklahoma DEQ
Date Published:	March 24, 1999
Key Words and Phrases:	

ReferenceID: 319

Reference Type:	B
Title:	***National Zinc Company, Oklahoma***
Location:	AEM
Category:	Site Update
Prepared by/Author:	US EPA Region VI
Preparer/Author Address:	Website
Prepared For:	General Public
Date Published:	July 31, 1998
Key Words and Phrases:	

Project Name ***NATIONAL ZINC*** ***ProjectID:*** 06-02

Reference Type: C ***ReferenceID:*** 37

Title: ***National Zinc sediment removal eyed***

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author Address:

Prepared For: Superfund Week

Date Published: January 12, 1996

Key Words and Phrases:

Reference Type: C ***ReferenceID:*** 209

Title: ***National Zinc design nearing completion***

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author Address:

Prepared For: Superfund Week

Date Published: February 7, 1997

Key Words and Phrases:

Reference Type: L ***ReferenceID:*** 88

Title: ***Memo re: Precedent for Extended Sediment Remediation in Rivers and Streams***

Location: AEM

Category: Contaminated Sediments: Overview of Issues

Prepared by/Author: AEM, Inc.

Preparer/Author Address: Malvern, PA 19355

Prepared For: Distribution

Date Published: August 15, 2000

Key Words and Phrases:
