ISCR

Project Summary

ISCR Treatment Program: Metals Treatment Utilizing Calcium Polysulfide (CAPS)

ISOTEC

Case Study 107

Location: **Vincent, Alabama**

History: **Former Plating Facility**

Contaminants: **Metals: aluminum, cadmium, cobalt, nickel, lead, thallium, zinc, & cyanide**

Treatment Area: **360,000 sq ft**

Treatment Interval: **18-25 ft bgs**

Lithology: **Surficial sandy silts and clays, clay and gravel, laminated sandy and silty clay, clayey chert gravel, and karsted carbonate bedrock**

Remedy Approach:

- **ISCR Treatment Program of Heavy Metals Using Calcium Polysulfide (CAPS)**

Remediation Results:

INTRODUCTION

ISOTEC was retained to implement a calcium polysulfide (CAPS) treatment program at the Former Alabama Plating site in Vincent, Alabama to address heavy metals impacted soil and groundwater.

SITE BACKGROUND

Hot-dip galvanizing and electroplating were previously conducted on the site and resulted in metal impacts of the soil and groundwater. Present contaminants of concern (COCs) include: aluminum, cadmium, cobalt, nickel, lead, thallium, zinc and cyanide. All previous buildings and structures were demolished prior to remediation. Site geology consists of surficial sandy silts and clays, clay and gravel, laminated sandy and silty clay, clayey chert gravel, and karsted carbonate bedrock. The depth to groundwater varied from 3- to 34-feet (ft) below ground surface (bgs); historical records show fluctuation by as much as 18-ft.

PROJECT CHALLENGES

Designing, planning, and implementing a successful treatment program requires careful consideration in regard to the unique circumstances of a site. This site had a variety of challenges for ISOTEC personnel to overcome in their daily injection and monitoring activities. The area of environmental concern was located in a In order to mitigate any risk factors, the following safety measures were conducted:

- Most heavy metals precipitate as insoluble metal sulfides and the chemical reactions is often instantaneous upon contact therefore hydrogen sulfide air monitoring was performed daily to protect both field personnel as well as local pedestrians within the vicinity of the target work area. No significant readings were detected.
- All liquid solutions were stored in secondary containment pads surrounded by temporary fencing.
- No known utilities were assumed to exist beneath the proposed treatment areas and the readings from the GPR survey confirmed that no utilities existed in the proposed treatment areas.
- Transfer hoses and water lines were run from the staging and equipment area underneath the highway inside a culvert located on the southeast portion of the North Area and corresponding northeast corner of the South Area in order to facilitate work in the South Area. Utilizing the culvert eased concerns related to traffic safety and potential vehicular damage to equipment crossing the roadway.
- Final restoration of the site included grading, seeding and placement of hay/straw. Due to increased rainwater flow noticed across the site that caused ponding of water in the southeastern corner of the site, installation of additional grading measures was completed in the North Area during site restoration work.

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ISCR TREATMENT PROGRAM

Total treatment area was approximately 360,000 square feet (ft^2) in size and divided into North and South Areas, separated by a highway (Figure 1). The site was concurrently divided into three separate injection areas based on known metals concentrations and referred to as Zone 1, Zone 2 and Zone 3; Zone 1 being the most impacted area of the site and Zone 3 being the least impacted.

The original treatment design included injection point (IP) locations within the highway and adjacent right of ways (extending 40-ft each way from the center road line), but were omitted from the final treatment program as access to the active roadway was not approved by the Alabama Department of Transportation. Alternatively, transfer hoses and water lines were run from the staging and equipment area underneath the highway inside a culvert located on the southeast portion of the North Area and corresponding northeast corner of the South Area in order to facilitate work in the South Area. Utilizing the culvert eased concerns related to traffic safety and potential vehicular damage to equipment crossing the roadway.

Injections began in the North Area and adhered to the proposed injection sequence of Zone 1 first, followed by Zone 2 and finally Zone 3 (to the extent possible). Following completion of the North Area injections, mobilization of equipment was transitioned to the South Area followed by injections into the Zone 1 and Zone 3 locations.

The ISCR treatment program was implemented over 34 injection days during winter. To mitigate concerns of potential freezing of the liquid CAPS solution, the reagent holding tanks were agitated with a recirculation pump to prevent crystallization. A total of 172,723 gallons of CAPS reagent was injected through a network of 274 temporary direct push point technology (DPT) injection points. The North Area received 94,091 gallons of CAPs into 152 locations over 19 injection days. The South Area received 78,632 gallons of- CAPS into 122 locations over 15 injection days.

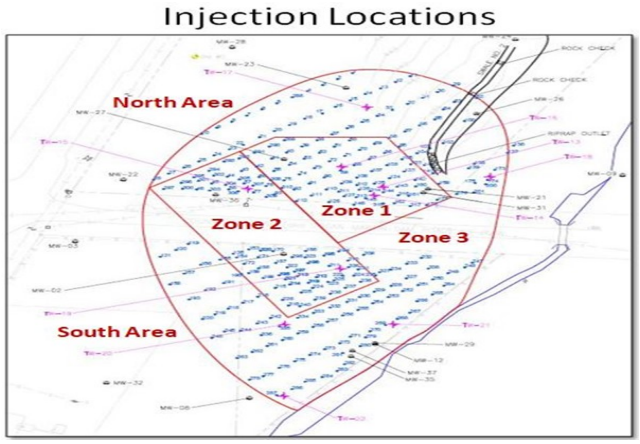
Injection procedures consisted of a bottom-up approach and utilized custom ISOTEC injection screens. The targeted vertical treatment intervals ranged from 6-44 ft bgs across the site. Within each IP location, 1-4 discrete target intervals were completed until the entire target treatment interval was completed. Each interval consisted of a 6-ft length screen. All temporary DPT injection points were abandoned the same day injection activities were completed at a given location using compacted hydrated bentonite.

All ISCR injection points were offset at least five feet from any existing monitoring wells to reduce potential for injected amendment short circuiting through the wells. Overhead utilities were not present within the target areas, but some trees existed in certain areas. Caution was utilized while installing locations in the remaining wooded areas so that the drill rig did not encounter overhead branches.

Ten (10) temporary monitoring wells were installed at varying depths (due to refusal issues) within the injection zones using DPT methods. The temporary wells were constructed using 1-inch threaded schedule 40 polyvinylchloride (PVC) with a 10 ft, 0.0010-inch slotted screen at terminal depths ranging from approximately 11 to 35 ft bgs.

The injection event was completed safely with minimal disruption to neighboring properties. Results of the treatment program are to be monitored by the site engineer for an extended period of time following the injection event to gauge treatment program effectiveness.

Figure 1: Approximate Layout of Staging Areas



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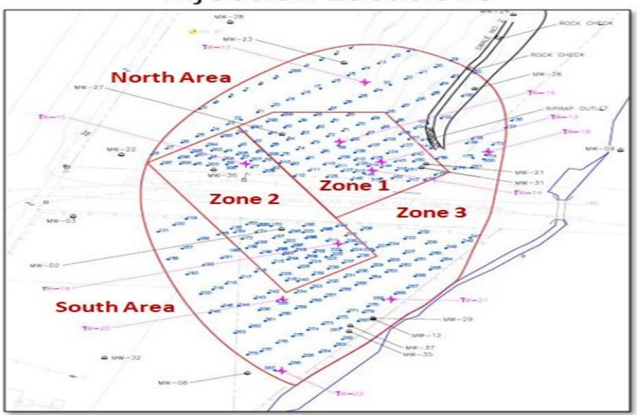
Injection Locations



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