CASCADE CASE STUDY

Mobile Groundwater Contamination Remediated with In Situ Stabilization

Cascade Manages Multiple Challenges, Including Unexpected Soil Conditions and Utility Issues at Active Shipping Facility

PROJECT: Shipping Facility on Former Paint Manufacturing Site

LOCATION: Keasbey, NJ

SERVICE: In Situ Solidification and Stabilization (ISS) and Utility Relocation

CONTAMINANTS: Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Dibenzo[a,h]anthracene, Tert-butanol (TBA)

CHALLENGE

Seasonal Flow of Contaminated Groundwater Continues Despite Previous Remediation

The former paint manufacturing Site, bound by a PMC Specialties Site-related Deed Notice and groundwater contamination of a Classification Exception Area (CEA), included contaminants of concern such as Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Dibenzo[a,h]anthracene, and Site-specific contamination in groundwater, Tert-butanol or tert-Butyl alcohol (TBA). The Site is currently an active facility.

The TBA in groundwater at the Site was delineated to a roughly 150-by 175-foot source area under the parking lot and along a route of underground utility lines at the edge of the property. The TBA was reportedly flushing from the area with seasonal groundwater flow from a former underground tank farm, within the footprint of historic chemical and paint manufacturing structures. The TBA followed the CEA plume to downgradient wells which showed high levels of TBA.

Other sections of the Site and surrounding properties had been remediated utilizing multiple forms of remediation technology. In the early 2000s, the footprint that held the former tank area had been partially excavated and backfilled during remediation but still continued to release TBA in groundwater in a predictable and seasonal fashion. The property owner, working with a third-party consultant and Cascade's direct client, contracted with multiple engineering companies to design a remedial approach to stop the release of TBA and target the source materials. The objective of the remedial plan was to isolate the flow of groundwater from the area and solidify and stabilize the contaminated soil using in-situ solidification and stabilization (ISS).

SOLUTION

In Situ Solidification and Stabilization and Utility Relocation

The Site engineer asked Cascade to perform ISS of the approximately 15,000 cubic yard area of TBA-impacted soils. To avoid impacting active 24/7 operations, the project was limited to the area of disturbance including a 100-foot by 100-foot area adjacent to the ISS footprint. Cascade was to install an initial five-foot wide, 20-33-foot deep barrier slurry wall around the impacted area before conducting the full-scale ISS operations. The barrier wall was to cut off the groundwater flow to and from the suspected TBA source, prior to treating the more impacted soils towards the center of the footprint with ISS.

In addition, Cascade was to remove concrete, asphalt, light poles, curbs, and fencing within the area as well as identify and relocate an unspecified number of underground utilities, including but not limited to electric, communication, sewer, fire protection water, and storm sewer lines. The drawings specified the existence of two electric and/or telecommunication lines, a set of storm sewer inlets, and the active high pressure water protection line connected to the truck maintenance building which was adjacent to the ISS footprint. Groundwater was suspected to be encountered between seven and 13-feet below grade surface (bgs).

Cascade was to complete the ISS and utility relocation between June and September to avoid occupying needed space within the parking area ahead of the busy shipping season (October through December).

PROJECT EXECUTION

Handling On-Site Surprises Including Bluestone Soil and 85% More Utility Conduits

Cascade quickly identified why the TBA had become so mobile, and why the former remedial work was not entirely effective. The area had been backfilled almost exclusively with bluestone, also known as #57 stone. Remedial investigations and site characterization prior to Cascade's mobilization had not fully captured the extent of the bluestone and lack of fines at the site.

The stone fill had undermined the soil and clay formations, creating voids where groundwater was settling and contacting source material, and subsequently flushing into and contaminating seasonal groundwater flow. The bluestone at the site also created an excavation issue because the stone did not set, stabilize, solidify, or hold appropriately. Slumping occurred when managing material.

As the initial barrier wall was completed, the TBA-impacted groundwater was trapped within the ISS footprint, as designed. But the unanticipated bluestone had created a void space of 20-30% in the area. When the Cascade team began to add slurry to the footprint, groundwater trapped in the void space began to rise with nowhere to go. The liquid slurry pushed groundwater away but was effectively trapped by the secure barrier wall. As more of the ISS area was mixed, groundwater rose from 13 feet below grade surface to approximately zero. The team siphoned out and filtered the groundwater, adding it to the slurry mixture being pumped back into the ground in order to eliminate the increase in volume. The team was able to quickly respond to the situation and update the feasibility of the ISS mix design, the ISS approach, and material management.

Another challenge was that the two conduits for electric and telecom identified prior to the onset of the project proved to be over 14 conduits of unknown contents ranging from data to electric to fiberoptic. A sanitary sewer line was also identified along the utility route with the fire protection and storm sewer lines. Conduits had also been placed underground below groundwater, and replacing or rerouting conduits in the same area would not be safe or to code, so Cascade had to proactively plan a new route with new manhole covers above the finished ISS grade but safely below the eventual asphalt and parking lot cap.

To provide stable ground for heavy equipment and mitigate the potential for undermining bluestone, Cascade was selective with uncovering concrete and asphalt at the site. Cascade also test-pitted areas to identify the extent of bluestone to anticipate the need for more slurry and to delineate and document the area for the engineer and client. Cascade produced a change order to deliver higher production with larger excavators to meet the active site owners request that the project must be completed by mid-October.

To address the new utility conduits that were discovered, Cascade managed the utility identification and rerouting issues with weekly calls and meetings. As Cascade identified more utilities, the team worked closely with the active site owner and a contracted electrician to identify their functions and to relocate the utilities safely and legally. Cascade was able to reduce the downtime of temporary power to multiple vital buildings to only a few hours. Cascade efficiently relocated the utilities and provided temporary support for the many lines within a week. Cascade also supported the active site owner by providing insight into their own infrastructure, which had been lost to time.

As these challenges arose, Cascade addressed them by working diligently with the property owner, tenant, engineers, and client to provide and identify solutions. The need to collaborate with multiple parties and complete in situ remediation work in conjunction with utility relocation, temporary power, and space management made for a challenging and dynamic experience featuring many moving parts and surprises. Communication between the field and office and between Cascade and the project team was critical to success.

CONCLUSION

Creative Problem-Solving, Dedication, and Communication Key to Staying on Schedule and Budget

Cascade completed all ISS remediation work; utility relocation; installation of temporary and new permanent power, sewer, fire protection, and telecommunication; monitored effectiveness, strength, and permeability of the ISS; and restored the area to existing or better conditions.

Working diligently and thoughtfully, Cascade helped the engineer and client so that both maintained their initial budgets, while creatively securing funding for change orders through line-item budgets that would not have been otherwise used. A client representative said, "I was at the site this morning with DEP [New Jersey Department of Environmental Protection] and [Engineer] for a cap inspection and wanted to let you all know the site looks great! There are trucks parked all over the area and you wouldn't know we had done what we have completed if you weren't there."

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The client, property owner, consultant, engineer, and current tenant, were happy with Cascade's innovative and resourceful project execution. The project was finished six days ahead of schedule despite major data gaps in site characterization, drawing specifications, and field conditions. Cascade maintained the schedule through the multiple setbacks and major changes in scope including change orders and unknown conditions in the field. The Cascade team faced multiple problems that they solved with reasonable pricing and planning.