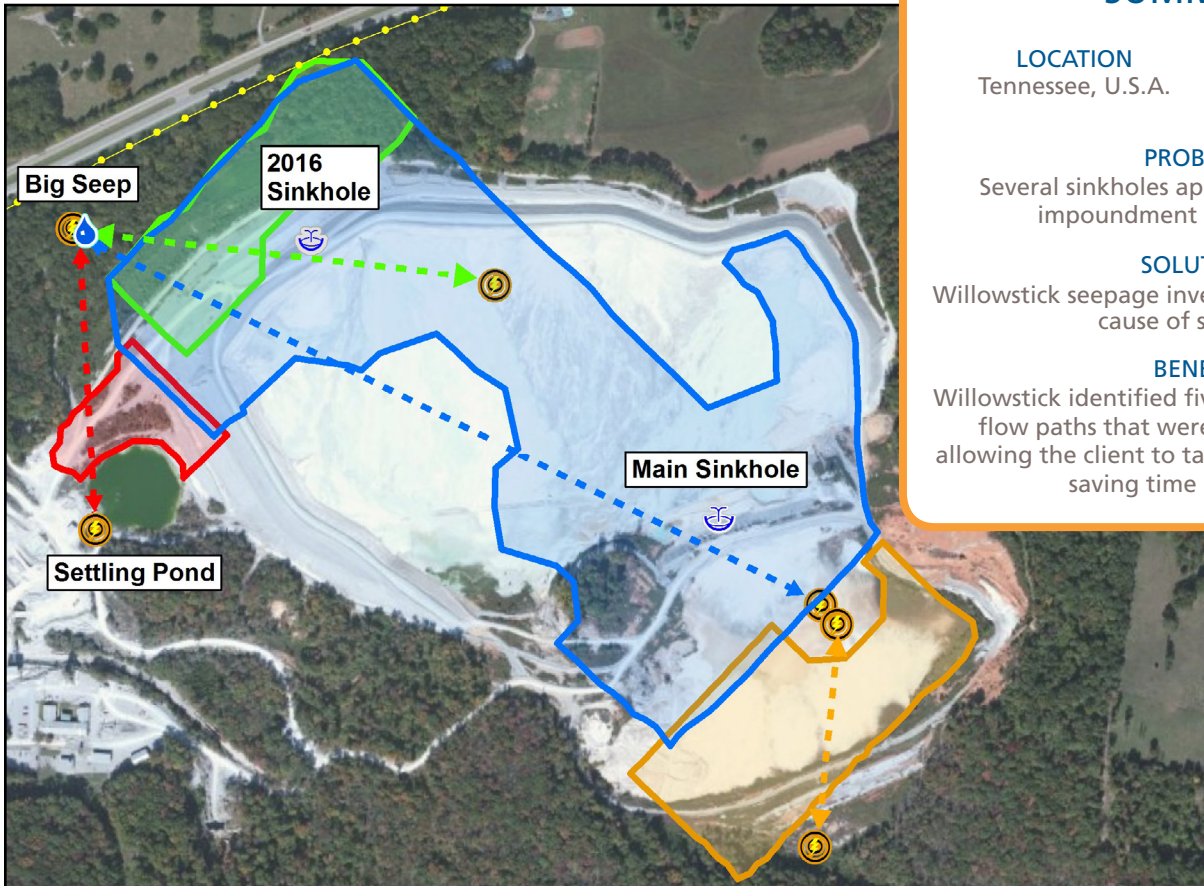


WILLOWSTICK IDENTIFIED PREFERENTIAL SEEPAGE FLOW PATHS IN A TAILINGS IMPOUNDMENT



SUMMARY

LOCATION
Tennessee, U.S.A.

DATE
August 2016

PROBLEM
Several sinkholes appeared in a tailings impoundment at a zinc mine

SOLUTION
Willowstick seepage investigation to determine cause of sinkholes

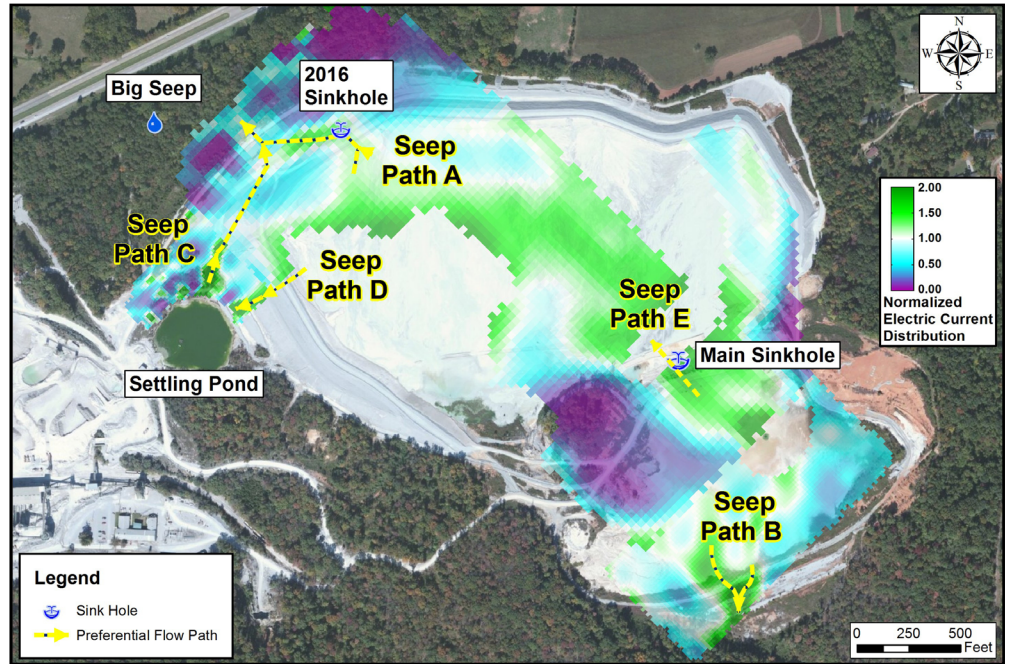
BENEFIT
Willowstick identified five preferential seepage flow paths that were causing sinkholes, allowing the client to target their remediation, saving time and money

THE PROBLEM: SINKHOLES

Two sinkholes appeared in the interior of a zinc mine's tailings impoundment, causing the mining company to receive a citation. Additionally, water down-gradient of the tailings impoundment drains to a centralized area called the "Big Seep" as shown in the above figure. A dye test confirmed that water from a nearby settling pond was connected to the Big Seep, but the client didn't know how it was connected. The client was interested in knowing if the sinkholes posed a risk to the integrity of the impoundment. The client also wanted to know the source of water to the Big Seep.

THE SOLUTION: A WILLOWSTICK INVESTIGATION

Using its patented technology Willowstick identified five major preferential seepage flow paths in and around the impoundment. In the figure to the right, the green shading shows areas of greater magnetic field intensity and the yellow lines indicate the preferential seepage flow paths Willowstick identified. The sinkholes were observed above the preferential seepage flow paths. The Willowstick technology also identified several flow paths that were converging at the Big Seep.



Willowstick identified these preferential flow paths by injecting a signature electric current (380 Hz) into the subsurface. We then use our sensitive instruments to measure changes in the intensity of the magnetic field as the current follows the subsurface flow paths. After Willowstick collects the data it is processed and modeled to identify the preferential seepage flow paths.

THE BENEFIT: CONFIDENCE IN THE INFORMATION

Due to the successful application of the Willowstick Technology, the client now understands what caused the sinkholes and the source of the Big Seep, and can target their remediation efforts accordingly. Thus saving time and money.

