IN SITU INJECTIONS IN REMOTE LOCATIONS

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BACKGROUND

Environmental calamities such as tanker truck crashes and pipeline leaks do not always occur in well-populated areas. Trucks can crash on remote mountain passes or lonely stretches of highway. Pipeline leaks can occur in distant areas of open range or other isolated locations.

Treatment of these spills requires the ability to clean up the contamination with very few standard resources. Often these spills do not have access to electricity or cellular service and just getting to the location of the spill can require long amounts of travel. These restrictions can often limit treatment options to those that can be completed quickly and without needing long-term access to the site.

Several of the factors mentioned above guide these sites toward in situ remediation technologies. The remoteness of the sites can eliminate 'mechanical' systems due to the lack of power and cellular service. Sensitive populations or waterways near the release often dictate the remediation happen quickly and that the chosen technology not adversely impact the area. Contamination can affect areas that are difficult to access with conventional excavation equipment.

SITE 1 - UTAH TRUCK ROLL OVER

A tanker truck rolled down an embankment and onto an active set of railroad tracks. Several thousand gallons of fuel were spilled impacting an area approximately 7,000 square feet in size. Lithology was sand and gravel with bedrock starting between 12 & 18 feet below ground surface (bgs.) Groundwater benzene concentrations were as high as 14 mg/L and free-product was observed in some areas.

Challenges
- Equipment would need to cross railroad tracks and work would occur in railroad right of way.
  - Excavation would not be possible.
  - Injection equipment was disassembled and reassembled on other side of tracks.
  - Impacts were on both sides of railroad tracks. Work had to be halted and equipment moved for oncoming trains.
  - All non-essential equipment had to be parked on shoulder of road.
- Spill occurred within 60 feet of creek.
  - Needed immediate results and remedy could not impact water quality.
- Site accessed down a sloping shoulder.
  - Large equipment could not access spill area.













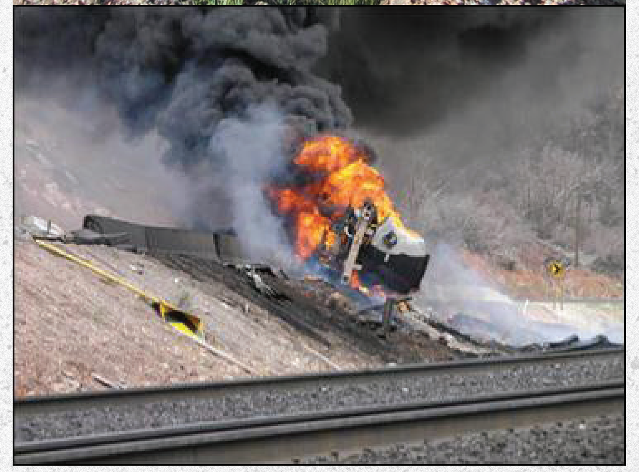

SITE 2 – AGAIN

Two years later, a second truck rolled over 200 yards past the original site. Based on the success of the original site, the same procedure was used for a second successful site.

An NFA was also issued for this site.

SITE 3 – COLORADO MOUNTAIN PASS

A similar technique was used for a tanker truck rollover accident on a mountain pass in Colorado. BOS 200® was injected in a 1,000 square foot area of the plume that could not be accessed by excavation equipment. Groundwater benzene concentrations in the treatment area were recorded at 4 mg/L before injections. Site lithology was made up of clay.

Challenges:
- Snow and extreme cold exist at the site from October through May, limiting access.
- An old French drain was found at the site during the excavation. The French drain had ultimately transported contamination approximately 200 feet from the excavated area.
  - The French drain led to area down an embankment that was inaccessible to large equipment.

Solution:
BOS 200® was installed the summer following the spill. Some surfacing occurred during the injections and a second smaller installation was performed the following summer. Groundwater concentrations after the second installation were non-detect, and the site was closed shortly afterwards.

SITE 4 – IDAHO RESERVOIR

A truck rolled over and spilled 6,500 gallons of fuel on a portion of raised highway that travels across a reservoir in Idaho. The spill was immediately excavated but contamination migrated down from the highway when surface water levels dropped over the winter. Groundwater benzene concentrations had been recorded at 12 mg/L and there were concerns of impacts to the reservoir.
Challenges:
- Portion of highway where spill occurred was surrounded by water on both sides.
- Rip rap had been placed on the slopes below the raised highway to the water level.
- Spill was directly impacting the reservoir water.
  - Wells installed in the spill area were set to depths within the reservoir.

Solution:
An installation of BOS 200® was performed the summer after the spill occurred. The injection area was limited to the right of way of the highway. Enough BOS 200® was installed to reduce groundwater benzene to below treatment levels and a planned second installation was not necessary for closure.