Report on

Bioremediation Of Highway Spills On Sites With Shallow Underground Utility Lines

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Problem:

A tractor/trailer was involved in a highway accident in WV releasing approximately 75 gallons of diesel fuel from a ruptured saddle tank. Free petroleum product flowed into the gravel alongside road shoulder and adjacent embankment. The site is a single lane, north/south highway of typical asphalt paved construction (Figure 1). Road shoulders are intermittent gravel, grass and embankments. Potential receptors are human, wildlife and groundwater. Multiple major underground communication utilities lines were present in the accident area making it difficult to excavate.

Figure 1. Accident site showing the asphalted road affected by spill.

Diesel fuel had released on the pavement edge and gravel shoulder causing surface staining. Debris on the pavement was pushed to the gravel to allow normal traffic patterns for evening hours. Petroleum absorbent booms were placed along the down-gradient edges of the spill area to prevent further migration during anticipated storm events. Anti-slip absorbent media was applied to the impacted pavement and scrubbed to remove residual phase petroleum. As this material was spent, it was removed and the process repeated until practical recovery was achieved. An additional application was then made as a slip preventative measure for traffic.

Soil excavation/disposal would be conducted in the petroleum stained areas under the supervision of the state environment protection agency. The West Virginia Department of Environmental Protection (DEP) supervised the cleanup. Several ground communication pedestals were present both north and south of the incident site, indicating buried utilities in the area and the cleanup had to be coordinated with the concerned utility agencies. A soil sample was collected from the center of the surface staining to provide waste characterization and analysis of the petroleum concentrations showed TPH at 47,000 parts per million (ppm).

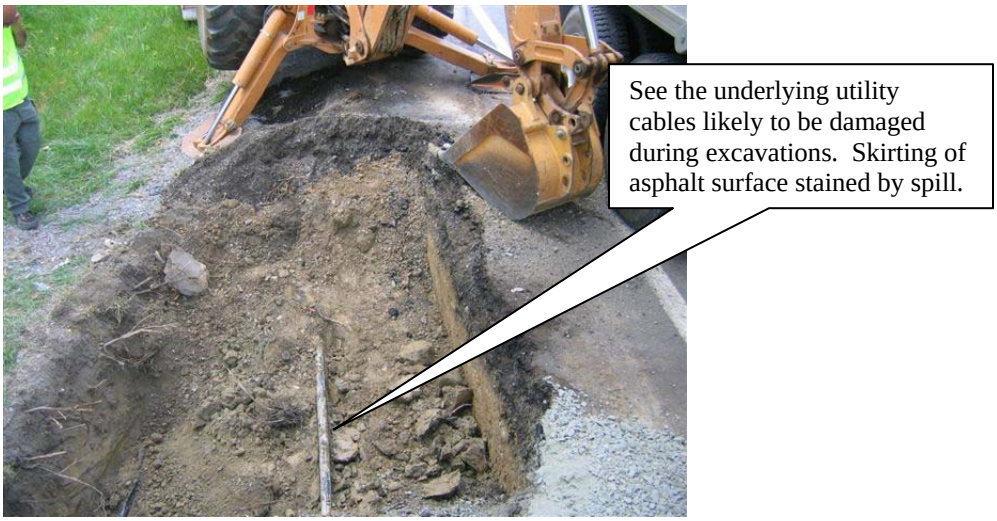

Figure 2. Showing underlying cables and stained skirting of pavement.

As the excavation continued along the embankment towards the open side ditch, depth was increased once equipment progressed beyond the exposed cable (Figure 2). At the east side of the excavation, a depth of 48" was achieved when a third unknown communication cable was damaged by the backhoe. Awaiting repair technicians, it was agreed that further soil removal is not practical or even possible by conventional means due to the position of buried cables.

Solution:

Underlying cables thus significantly reduced the area of excavation, accessibility and time constraints of two-way traffic closure, decision to apply AgroRemed was made by WV DEP.

I*n situ* bioremediation using AgroRemed was considered a less disruptive and safe method for cleanup. Repair technicians had not arrived at this time and AgroRemed was readily available on site. Four locations were identified to record changes in TPH in soil and samples of soil from these locations were monitored several times to record any decrease of petroleum concentrations during bioremediation. Two pine trees located along the east bank of the right-of-way were identified as bench marks for future sampling events. Soil samples were collected from these two west locations at the pit bottom showed 2,500 ppm and 4,000 ppm respectively after 20 days of treatment.

Individual tests of the soil samples did not indicate vapor levels above background readings for Photo Ionization Detector (PID). Laboratory results for four soil samples collected on July 26th showed the results as follows; Sample 1 showed values below laboratory detection limits of 50 ppm, Sample 2 showed 570 ppm, Sample 3 showed 830 ppm, and Sample 4 showed 290 ppm. These results indicated an aggressive degradation of petroleum hydrocarbons within seven days of the previous application. Use of bioremediation product under such situation was thus justified. As seen from the results,

total remediation of diesel fuel was completed in 35 days and DEP agreed no further action (NFA) was needed and the project was closed.

CONCLUSIONS:

The average amount of fuel spilled in a saddle tank release is 104 gallons while the average cost to clean it up is $9,200 nationwide due mainly to transportation and disposal of contaminated soils. Reuse of the same soil after treatment with AgroRemed also reduces costs of transportation and causing minimum disturbance to the local ecosystems. Overall benefits of AgroRemed for highway spill are listed below.

- Reduces toxicity of diesel and promotes healthy vegetation
- Cost of AgroRemed for on-site cleanup was less than $ 2,000.00
- AgroRemed cleans up spill in non-invasive manner
- Recommended in sites where excavations are more damaging
- Treatment with AgroRemed reduces damage to underground utility lines
- TPH in soil is reduced to accepted levels in just over a month
- There were no residual diesel odors
- Prevention of premature failure of asphalt due to diesel spills

It has been seen that the immediate effect of AgroRemed is to detoxify the toxic nature of the hydrocarbon and then consume the contaminant in a shortest period of time provided all the conditions favoring the growth of bacteria are available. Accidents on the highways are often away from city and so it is difficult to monitor the situation. Excavation of soil though is considered a preferred method for cleanup, it is not always convenient or feasible.

AgroRemed delivers a clean and efficient cleanup solution. Application of AgroRemed to the accident site immediately after a spill will reduce the damage to the asphalt surface and also reduce the damage to the roadside vegetation. It is a safe, easy to use and a non-invasive solution and should form an important part of spill cleanup kit for the emergency response operations.

Acknowledgements:

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