



## **Soil Bioremediation Overview**

Bioremediation is comparable with gardening, the crop we are growing is hydrocarbon degrading microorganisms. These organisms are critical in eliminating the target compounds to desired levels. Preparation and use of proper microbes is the key to a successful result. Microbes need proper nutrients, water and air to quickly degrade hydrocarbon so these things must be maintained during the remediation process. The site should be first tilled with hay added to give the soil permeability. Then the proper blend of Microbes and nutrient are applied and watered in. Site should be tilled and watered every 1 to 2 weeks to maintain proper soil conditions. Also checked for pH and nutrient levels before watering so if needed additional amendments can be added during watering. The remediation duration depends on maintaining these factors, as well as ambient temperature and target levels. Typical remediation time for a crude oil spill during warm weather is 90-120 days. Volatile Organic Compounds and Polynuclear Aromatic Hydrocarbons take longer a few months longer. Chlorinated Aliphatic Hydrocarbons take the longest, but can also be Bioremediated.

Soil samples should be taken to identify contaminating compounds and their concentration levels, along with any limiting constituents. Then the proper microbial blends can be selected and a remediation plan designed.

A common procedure for crude oil remediation example is as follows:

Sample soil and Test for TPH to determine beginning levels and volume of soil to be remediated. Example 10,000 sq/ft spill site contaminated 6 inches deep with TPH of 100,000 ppm or 10%. Calculates to following.

- **Soil volume** = 185 cu/yd X 2500 lbs/cubic yard = 462,500 lbs soil
- **Total lbs of Carbon** = 462,500 X 10% TPH = 46,250 X .78 (carbon/ lb of oil)= 36,075 lbs Carbon.
- **Microbe requirement** for a concentration of 1,000,000 cf/gram of soil is 1 liter per yd 185 X 1 liter = 185 liters/3.785 liters/gal = 49 gal AM-101 Microbes
- **Nitrogen Requirement** = 150/1 Carbon to Nitrogen  
36075 lbs carbon/ 150 = 240 lbs Nitrogen
- **P & K Requirement** = 4:1:1 N:P:K ratio (*MicroBoost*<sup>™</sup> is the perfectly balance nutrient package for this process)

240/4 = 60 lbs of both Phosphorus and Potassium

**Hay Requirement** = 1 bale for every 10 cu/yds Soil

#### Procedure:

- **Till site to break up soil, add hay or other organic mulching material and till until blended**
- **If required wash contaminated area with BioWash<sup>™</sup> to improve remediation process**
- **Apply 1/2 of required MicroBoost<sup>™</sup> or other fertilizer**
- **Mix AMS-101<sup>™</sup> Microbes in fresh water and apply evenly**
- **Water in to make sure all soil is treated**
- **Monitor moisture, pH and Nitrogen levels**
- **Re-till and water every 1 to 2 weeks,**
- **Pull samples after 45 days to determine progress, add remaining fertilizer.**
- **Continue until target levels met.**
- **Site may now be revegetated**