Sublette™ CONSULTING, INC.

BASIC GUIDELINES FOR BIOREMEDIATION OF A CRUDE OIL SPILL

Hydrocarbon/Crude Oil Spills

Why use bioremediation?

Bioremediation is frequently the most cost-effective way to clean up an oil spill on soil and is endorsed by state and federal regulatory agencies. Cleaning up spills quickly will minimize future liabilities and costs by helping you maintain a good relationship with the landowner and regulatory agencies.

When can I use bioremediation?

If you have any pooled free oil, it is important to vacuum up the free fluids and, if possible, recycle them back to the stock tank or properly dispose of them. Use absorbent material to pick up any fluid that can't be vacuumed and legally dispose of that material. When that's done, you need to ask two questions: (1) Is the contamination deeper than 8 inches? and (2) Is there shallow groundwater under the contamination?

If you answered "no" to both of these questions, then a basic form of bioremediation called landfarming should work well for you.

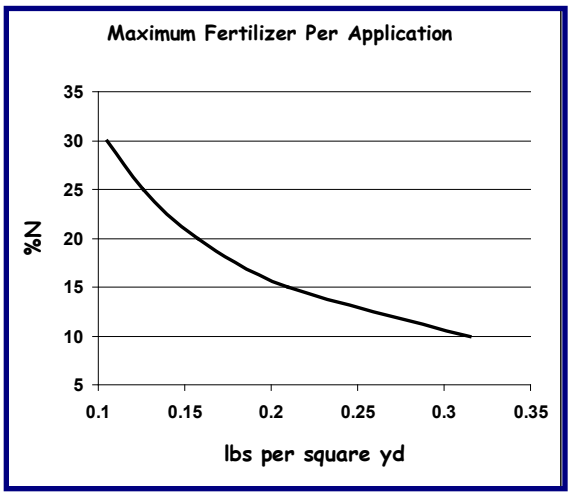
Basic landfarming

When you landfarm a crude oil spill, you are cultivating microorganisms in the soil to eat hydrocarbons. These microorganisms, which are commonly found in soil, need the same things as crops to thrive: fertilizer, moisture, good soil structure, and warm temperatures. Follow the steps below and you will be on your way to cleaning up that spill:

Step 1. Add fertilizer to the contaminated soil. A composite fertilizer like 13-13-13 is a good choice. Add 1/4 lb per square yard of stained soil. Just step off the site to estimate the size. Don't add too much. You can have too much of a good thing. This wastes money and slows the process down. If you don't use 13-13-13, base the amount of fertilizer on the percent nitrogen in the fertilizer (which is indicated by the first digit of the three digit fertilizer rating on the bag) and the chart below.

OR

BioNhance+



Step 2. Add organic matter to the contaminated soil. Organic matter builds soil structure and allows the soil to breathe. Hay or straw works well. Add the equivalent of about 5 small square bales of hay per 1000 square feet.

Step 3. Till the fertilizer and organic matter into the soil to a depth of 6 - 8 inches. Does the soil still glisten with hydrocarbon? If so, you need to blend in some uncontaminated soil from around the edges or below the contamination during tilling. After tilling you should be left with a mixture that crumbles in your hand. Apply a light top dressing of hay. Try to keep heavy equipment and cattle off the site - compacting the soil slows the process down, significantly.

OR

Step 4. Repeat the addition of fertilizer with tilling after 30 days and 60 days. After the last fertilizer addition continue tilling every 30 days during warm weather until the hydrocarbon odor is gone. Once the hydrocarbon odor is gone obtain soil samples and have them analyzed for total petroleum hydrocarbons (TPH) as directed by the appropriate regulatory agency. Revegetate the site to prevent erosion.

2X

Store & Resources: bovairdsupply.com
Need Help: (918) 691-0639 or ksublette@microbe.com
Developed by: Sublette Consulting, Inc.

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What about moisture?

We can speed up the process of bioremediation by keeping the soil moist but most of the time we just depend on rainfall. If you do water the site, don't saturate the soil - that actually slows everything down. If water is scarce use BioNhance+™ to make the most out of whatever water is available. Harness the power of hydrogels to capture and hold water in the soil and aerate the soil. BioNhance+™ contains high quality organic matter and pre-measured fast acting fertilizer as well as hydrogels. If you use BioNhance+™ substitute BioNhance+™ for the composite fertilizer in Step 1.

BioNhance+ Hydrocarbon Remediation

Another moisture issue in some areas is the impact of swelling clays. Certain clays swell in contact with fresh water like rainfall or irrigation water. When clays swell they can effectively seal the soil surface and prevent water infiltration and oxygen penetration, both of which are required for biodegradation of the hydrocarbons. Prevent clay swelling with the surface application of InfiltratioNhance™.

InfiltratioNhance™ Brine or Hydrocarbon Remediation in Clay Soils

What is the best time to start a bioremediation project?

If you have a spill during winter go ahead and till in organic matter to keep the hydrocarbon from moving off site until warm weather returns. If the impacted area is sloped, it may be necessary to construct a low earthen dike at the bottom of the site to prevent runoff. If the spill occurs at any other time of year, go ahead and get started as soon as possible.

How long does it take to bioremediate a site?

That depends on a lot of things, some you have control of and others you don't have any control over. You can speed up the process by sticking to the tilling and fertilizing schedule. But you can't control the rain. Another factor that has an effect on the rate of the process is how old the spill is. You can expect that crude oil that has been in the ground for a while will degrade slower than a recent spill. All things considered, you should see significant results in one or two growing seasons.

What if you couldn't answer "no" to both of those questions?

If the contamination is deeper than 8 inches but there is no shallow groundwater, following these guidelines should result in at least some restoration of the surface although the deeper contamination will remain. Remediation of all of the contaminated soil would require the soil to be excavated, spread out in a layer less than 8 inches deep, and the four steps of basic landfarming applied.

If there is shallow groundwater under the contamination, you should consult a qualified technical expert to show you how to do landfarming without groundwater becoming contaminated.

What about brine?

As you know, crude oil spills often contain brine. In this case you have two contaminants to remediate. Bioremediation will clean up the oil, but the brine must be washed away. Fortunately, the four steps of basic landfarming, which make bioremediation of the oil possible, also make it easier for rainfall to wash brine from the site. When brine is present though, we need to think about drainage of the site—the salt must have a way out. Contact Sublette Consulting, Inc., at ksublette@microbe.com, and request guidelines for remediation of brine-impacted soil.

Need help? Contact Kerry Sublette of Sublette Consulting, Inc. at (918)691-0639 or ksublette@microbe.com.

For more detailed guidance on soil remediation and information on **BioNhance+™** and **InfiltratioNhance™**, as well as other products to support remediation of brine-impacted soils and revegetation, go to **www.bovairdsupply.com.**

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