

# SR

## Soil Bioremediation Fluid

## Instructions

### ABOUT THE PRODUCTS

**Nature's Way SR.** SR is a powerful water based contact emulsifier formula with live, aerobic microbes. SR is used in conjunction with Biocatalyst to create an unequalled bioremediation system. Microbes remain active in open, or closed, containers for at least 1 year.

**Nature's Way Biocatalyst.** Biocatalyst is a clear thin liquid containing a stable oxygen supply for the microbes (supplied by the SR). Biocatalyst transports vital oxygen deeply into the soil so that required oxygen is readily available to the microbes engaged in the Bioremediation process. Nature's Way Biocatalyst (when mixed with nutrients) also provides microbes with the necessary nutritional source to convert food into protein for rapid growth and reproduction. Biocatalyst is particularly important for use in subsequent (follow-up) applications due to the rapid rate of reproduction of microbes established during application of SR.

**IMPORTANT:** These instructions are intended for bioremediation of non-chlorinated hydrocarbon contaminants (see section 1.0 ) and less than 200,000 ppm (20%), Total Petroleum Hydrocarbon (TPH). Soils with higher contamination levels must be diluted with peat, sand, mulch, etc. (lowering TPH to below 200,000 ppm). The actual amount of time necessary to complete the bioremediation process depends on moisture content of the soil, permeability of the soil, type and amount of contaminants in the soil, atmospheric temperature, soil pH and any toxins present. Although cold weather or freezing conditions will not kill the microbes it will slow their progress. For each 10 degrees centigrade decrease in temperature, the remediation efficiency of the microbes drops by 50%. **BIOREMEDIATION IS A NATURAL PROCESS GOVERNED BY THE LAWS OF NATURE – AND WILL ONLY WORK TO THE EXTENT THESE LAWS ARE TAKEN INTO CONSIDERATION AND FOLLOWED BY THE APPLICATOR.** Read and understand all sections of these instructions before beginning.

### COMMON CONTAMINANTS COVERED UNDER THESE INSTRUCTIONS

- 1) Diesel, Jet fuels (without antibacterial agent), gasoline, kerosene, white mineral oil
- 2) Crude oil both fresh and aged, crude oil sludge, crude oil tank bottoms
- 3) Refined oils such as automobile motor oil, bearing grease, lubricants
- 4) Propylene glycol, hydraulic oil
- 5) Animal fat, vegetable oils

### COMMON CONTAMINANTS REQUIRING SPECIAL PROTOCOL

All chlorinated hydrocarbon compounds, such as:  
Polychlorinated biphenyl  
Pentachlorophenols and degradation by-products  
Trichloroethylene  
Perchloroethylene  
Trichloroethane (1,1,1; 1,1,2; etc)  
Ethylene Glycol

**NOTE:** If uncertain about the effect of targeted petroleum hydrocarbon contaminants on the microbes contained in the Nature's Way products and the soil, we recommend that a small (spoonful) representative sample of the contaminated soil to be remediated be submitted to Integra Environmental, Ltd. to determine if the select microbes that are furnished with Nature's Way solution will live, multiply and flourish in the contaminated soil. This test determines only if microbes can live in the soil - not the type or amount of contamination. Tests to determine the type and/or amount of contamination must be done by an independent laboratory.

It is necessary to determine the amount of contamination and the types of contaminants present in the soil to be treated before treatment begins. To obtain certified (or dependable) test figures on the total petroleum hydrocarbon (TPH) content of the soil, a one quart (liter) representative sample must be obtained prior to application of Nature's Way Products and submitted to an local environmental laboratory of your choice for testing. Further samples and tests should be done every 14 days after initial application to determine progress. The soil sample to be used as the pre-treatment TPH test standard should be taken after soil is tilled and from the most contaminated area. Follow-up samples should be taken from the same location and must be representative of site being bioremediated.

Ambient temperature range for optimum microbial performance is 85 to 100 degrees F.(29 to 38 degrees C.), however, microbial activity (although slow) will occur so long as soil temperature is above freezing, regardless of air temperature. Although temperatures below 32 degrees F. will not kill microbes, they become dormant and are not

useful until temperatures rise. Expect that bioremediation projects in cold weather will require more time to complete, depending on severity of the cold. For each drop of 10 degrees C., microbial efficiency drops by 50%.

## **DETERMINING THE AMOUNT OF PRODUCT TO USE**

The amount of SR and Biocatalyst to be used must be pre-determined and on site before beginning. The exact amount to use will vary depending on site analysis. Typically, a total of 1/2 to 1 gallon of SR and 1 gallon of Biocatalyst per cubic yard or cubic meter is required for soil with contamination levels below 100,000 ppm. SR and Biocatalyst are normally applied full strength for topical application (less than 18") and then watered in with well or tap water until both products reach the depth of the contamination. When necessary, the products may be diluted with up to 3 parts tap or well water to insure that an adequate volume of liquid is available for proper application (complete coverage). Contact Integra for details. Contamination deeper than 18" will require specialized techniques and/or adjusted application procedures and amounts. Contact Integra Environmental for a site-specific protocol.

All equipment used to contain or dispense Nature's Way products must be either NEW or thoroughly washed and rinsed prior to use. Equipment (pumps, sprayers, hoses, tanks, etc.) or containers previously used with toxic chemicals, insecticides, herbicides, or bactericides/sanitizers must not be used. There is no need to stir or shake product before use. SR and Biocatalyst **can be** applied through same equipment without rinsing (i.e. pump suction hoses can be transferred back and forth between containers).

## **PREPARING THE SOIL TO RECEIVE PRODUCTS**

Carefully check soil analytical information and determine the level (amount) of hydrocarbon contamination and the type of other contaminants that must be treated.

Carefully check the moisture content of the soil. In order to obtain maximum results it is necessary that the Nature's Way products be applied when soil conditions are dry or near-dry soil (0 to 15% moisture).

Till, disc, or plow the entire area to the depth to be remedied (up to 18 inches, 46cm). Highly cultivated, permeable soil conditions are recommended. Humus such as peat moss, sand, mulch, clean soil, etc. should be added IF: TPH is near or at 20% and/or to add permeability to tight or clay soils. Although not required, faster results can be obtained by tilling the soil occasionally before each watering.

NOTE: Tilling means the loosening of the soil including the breaking up of large lumps of soil so that the contaminant will be exposed to the Nature's Way fluids (including water and atmospheric oxygen) and the accompanying selected microbes. This is done by the use of a tractor-pulled disking machine, a motorized rotary tilling machine or other mechanical means that causes the soil to be loosened to the required depth (no more than 18 inches, 46cm). Humus (hay, peat moss, clean soil, finely shredded tree bark etc.) may be tilled into the soil, as described above, to the full depth of the contaminant so that the soil has sufficient permeability to allow transfer of the necessary treatment materials into intimate contact with the contaminating hydrocarbons.

## **INITIAL PRODUCT APPLICATION**

**The object of application is to establish contact between products and contaminants. This is accomplished by applying products to near dry soil and then thoroughly watering to insure that the products have been fully transferred to the width and depth of the contaminants. Follow-up is just as important. Routine watering approximately each 7 days (depending on rainfall) is necessary, allowing the soil to go through wet/dry cycles, from near dry to near wet. Bioremediation will not occur if soil conditions are allowed to remain dry, or wet, for extended periods of time. If necessary, drainage water can be captured and re-applied (during routine watering).**

1. All the SR designated for the project is applied during the initial application while only 50% of the Biocatalyst. Example: 50 gallons of SR/ 50 gallons Biocatalyst, reserving the remaining 50 gallons of Biocatalyst for use in the next application.
2. Beginning when soil is dry or near-dry, spray (do not pour) SR over the area so that product comes in contact with all surface soil. Apply more liberally in areas of known high contamination (plumes, higher ground, "hot spots").

3. Add supplied nutrient powder (5 grams per gallon) to the amount of Biocatalyst scheduled for **initial** application only. Keep the remaining nutrient powder dry and in reserve for next application of the remaining Biocatalyst.
4. Spray over the entire area to be treated, covering all exposed soil.
5. Water the entire area with tap or well water (no saltwater) to the point of rejection, avoiding flooding or run-off. Dividing areas into sections or quadrants and watering in a rotating order is recommended to avoid over saturation. Use of a shovel or auger is recommended to insure that water has penetrated to the depth of contamination.

**Note: After mixing nutrients with Biocatalyst, it must be applied immediately (same day). Water must then be applied immediately afterward to prevent Biocatalyst from drying out before reaching all the contaminants.**

### **2<sup>nd</sup> APPLICATION – 7 to 14 days after initial application**

**The following steps must be implemented on the SAME DAY. Soil must be dry to near-dry.**

1. Add the appropriate amount of nutrient powder to the Biocatalyst with supplied inorganic nutrients (approx. 5 grams per gallon). Mix until dissolved.
2. After tilling spray evenly over entire area to be treated, covering all exposed soil.
3. Water the entire area with tap or well (fresh) water to the point of rejection, avoiding flooding or run-off.

### **3<sup>rd</sup> APPLICATION (if required/desired) – 21 to 28 days after initial application.**

Three or more applications and/or re-tilling are usually necessary only when treating highly contaminated soil over 18" deep (over 100,000 ppm) or if chlorinated hydrocarbons are present. Multiple applications and re-tilling may also be conducted, if desired, to achieve faster results. Soil should be, as always, near dry upon each application and/or tilling. Contact Integra if not sure or for site-specific recommendations. The type of contaminant will greatly change the rate of bioremediation.

1. Add the appropriate amount of nutrient powder to the Biocatalyst with supplied inorganic nutrients (approx. 5 grams per gallon). Mix until dissolved.
2. After tilling spray evenly over entire area to be treated, covering all exposed soil.
3. Water the entire area with tap or well (fresh) water to the point of rejection, avoiding flooding or run-off.

## **CONCLUSION**

When Nature's Way products are used as directed, and moist soil conditions have been consistently maintained, visual and sensory improvements are usually evident within 3 to 10 days and environmentally acceptable results can be expected. For official results, testing of the remediated soil by an environmental laboratory must be conducted to assure the contaminant levels in the soil are below local regulatory limits. Some type hydrocarbons contain carbon or dyes that will not change color after contaminant is eliminated by the microbes. Success or failure of a soil project should be based on lab analysis, NOT visual discernment. If you have any questions or comments concerning Nature's Way products or distributors, please contact us directly between 7 am and 4 PM Monday through Friday, central time (713) 680-1234. Thank You.

**WARRANTY:** Nature's Way products are manufactured in accordance with strict quality standards, however, due to the many variable and site specific conditions and requirements involved with the Bioremediation process, and the inability of Integra Environmental, Ltd. to control these specific conditions. All implied warranties, including, but not limited to, implied warranties or merchantability and fitness for a particular purpose are hereby disclaimed.

**Nature's Way Line of Products is covered by U.S. Patent number 5,561,059  
ALL INGREDIENTS ARE COMPLETELY BIODEGRADABLE**

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