

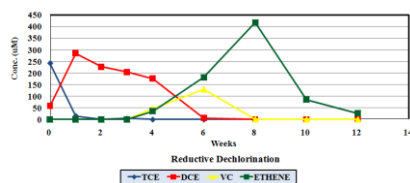
# 60% Sodium Lactate With Nutrients “Injection Ready” QRS™ -SL-Plus with NutriPlus™ a Proprietary Nutrient Package For Aquifer Remediation and Conditioning

## Why use 60% QRS™ -SL-Plus sodium lactate with a nutrient package?

60% QRS™ -SL-Plus sodium lactate is a soluble, food grade and fast acting substrate, which rapidly establishes reducing conditions to support the biodegradation of chlorinated solvents (Ellis et al. 2000). The addition of nutrients and Vitamin B<sub>12</sub> has been statistically demonstrated to support biodegradation of chlorinated solvents with soluble substrates like lactate and emulsified vegetable oil. (He et al 2007 and Harkness et al 2012).

## What is the anaerobic bioremediation process?

The anaerobic bioremediation process uses microorganisms to degrade chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE). An organic substrate is added to the groundwater to generate reducing conditions and provide the necessary carbon and hydrogen to support biodegradation of the chlorinated solvents.



## What are the best applications for 60% QRS™ -SL-Plus sodium lactate?

60% QRS™ -SL-Plus sodium lactate has been successfully deployed at U.S. military installations, industrial sites, chemical plants, and dry cleaners across North America for:

- Aquifer remediation of chlorinated solvents
- Conditioning of the aquifer before an SRS® emulsified vegetable (EVO) injection
- A biobarrier to quickly cutoff plume migration onto adjacent properties
- Certain pesticides/herbicides
- Nitrate
- Perchlorate
- RDX
- Immobilization of metals such as hexavalent chromium.
- Ideal substrate for fast-track projects when demonstrating short-term results are critical.



**What are the benefits of using 60% QRS™ -SL-Plus sodium lactate?**

- It's less expensive per gallon than a long lasting carbon substrate like Terra Systems SRS® family of patented emulsified vegetable oil substrates
- Proprietary *NutriPlus*™ nutrient (Harkness et al 2012) and Vitamin B<sub>12</sub> package (He et al 2007) support enhanced in-situ bioremediation.
- Its low viscosity and high solubility in water allow for rapid transport with groundwater, which enhances distribution in the aquifer and minimizes the number of injection points.
- Delivered to your site “injection ready” in 5-gallon buckets, 55-gallon drums, or 275 gallon IBC totes with a protective metal cage.
- Simply dilute with water and inject into the formation via permanent injection wells or direct push methods.
- Effective for both dissolved phase and DNAPL source area treatment.
- The U.S. Food and Drug Administration have designated 60% QRS™ -SL-Plus sodium lactate as Generally Recognized As Safe (GRAS).

**Table I:** Ingredients of 60% QRS™ -SL-Plus sodium lactate

Ingredient	CAS#	Percent
Sodium Lactate	72-17-3	60
Proprietary Nutrients	Mixture	<5
Water	7732-18-5	35-40

**Technical References for the benefits of using a nutrient package for in-situ Bioremediation?**

Ellis, D. E., E. J. Lutz, J. M. Odom, R. J. Buchanan, Jr., C. L. Bartlett, M. D. Lee, M. R. Harkness, and K. A. DeWeerd. 2000. Bioaugmentation for accelerated *in situ* anaerobic bioremediation. *Environ. Sci. Technol.* 34:2254-2260.

He, J., V. F. Holmes, P. K. H. Lee, and L. Alvarez-Cohen. 2007. Influence of Vitamin B<sub>12</sub> and cocultures on the growth of *Dehalococcoides* isolates in defined medium. *Appl. Environ. Microbiol.* 73(9):2847-2853.

Harkness, M., A. Fisher, M. D. Lee, E. E. Mack, J. A. Payne, S. Dworatzek, J. Roberts, C. Acheson, R. Herrmann, and A. Possolo. 2012. Use of statistical tools to evaluate the reductive dechlorination of high levels of TCE in microcosm studies. *Journal of Contaminant Hydrology* 131(1-4):100-118.