

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

November 13, 2015

Via Electronic Mail
Gary.Birk@TersusEnv.com

Gary Birk, P.E.
Tersus Environmental LLC
1116 Colonial Club Road
Wake Forest, North Carolina 27587

Re: Nutrisulfate™

Dear Mr. Birk:

The Waste Cleanup Program (WCP) hereby accepts Nutrisulfate™ for the enhancement of anaerobic, in-situ, bioremediation of hydrocarbons, chlorinated hydrocarbons, and other suitable contaminants in groundwater. Enclosure 1 shows the chemical composition of Nutrisulfate™, and Enclosure 2 contains regulatory information.

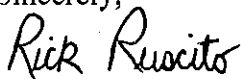
The WCP does not provide endorsement of specific or brand name remediation products or processes, but it does recognize the need to determine their acceptability in the context of environmental regulations, safety and the protection of public health. For that reason, the WCP issues an "acceptance" letter, not an approval. In no way shall an acceptance be construed as a certification of performance. Additionally, vendors, upon receipt of an acceptance, must market their product or process on its own merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace.

Remedial Action Plans that propose the use of an accepted product or process should include a copy of the acceptance letter in the plan's appendix, and reference it in the text of the document. It is not a requirement that a particular remediation product or process have an official acceptance letter in order for it to be proposed in a site-specific Remedial Action Plan. The plan, however, must contain sufficient information about the product or process to show that it meets all applicable rules and regulations.

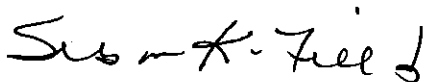
The WCP reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, WCP acceptance of any product or process does not imply it has been deemed applicable for all cleanup situations, or that it is preferred over other treatment or cleanup techniques in any particular case. A site-specific evaluation of applicability and

cost-effectiveness must be considered for any product or process, whether conventional or innovative, and adequate site-specific design details must be provided in a Remedial Action Plan submitted for Department review and approval. If you have any questions, please contact Rick Ruscito at (850) 877-1133, extension 3722 or by e-mail at RRuscito@ene.com.

Sincerely,



Rick Ruscito, P.E.
Ecology & Environment, Inc.
Petroleum Restoration Program Section 6
RRuscito@ene.com



Susan K. Fields
Environmental Administrator
Petroleum Restoration Program
Susan.Fields@dep.state.fl.us

enc: (1) Chemical Composition of Nutrisulfate™
(2) Regulatory Information

c: John Wright, P.E. – FDEP/Tallahassee

ENCLOSURE 1
CHEMICAL COMPOSITION

Nutrisulfate™
November 13, 2015

Nutrisulfate™

<u>Component</u>	<u>CAS No.</u>	<u>Percent by Weight</u>
Yeast Fermentation Product		9 to 10%
Magnesium Sulfate Solution	7487-88-9	Balance

Notes (1) Nutrisulfate™ is shipped as a liquid.
(2) Composition and Information about Ingredients from Tersus Material Safety Data Sheet, revision dated August 8, 2013.

<u>Parameter</u>	<u>Nutrisulfate™</u>
Total Carbon*	1.2%
Total Nitrogen (N)*	0.09%
Carbon/Nitrogen ratio (C/N)*	13.1
Total Kjeldahl Nitrogen (TKN)*	652 milligrams per liter (mg/L)
Chemical Oxygen Demand (COD)*	29,575 mg/L
Total Phosphorus*	218 parts per million (ppm)
Sulfate*	127,250 mg/L
<u>Other Constituents</u>	
Modified Culture Media	Oligosaccharides; Peptides
Yeast Cells	Proteins; Amino Acids; Peptides; Vitamins; Minerals; Proteinates; Nucleic Acids; Beta-Glucans; Lysine; Leucine
Extracellular Metabolites	Peptides; Organic Acids; Oligosaccharides; Nucleotides; Amino Acids; Esters; Alcohols

Notes (1) * approximate value.
(2) Source: Tersus Environmental, LLC Technical Brief, revision dated July 2013.

REGULATORY INFORMATION

- a. Regulations: Chapters of the Florida Administrative Code (F.A.C.) that may be applicable, either in part or in their entirety, include but are not necessarily limited to Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C. for groundwater classes and standards, and groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for Underground Injection Control (UIC), particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapters 62-780, 62-782, and 62-785 F.A.C., for cleanup criteria; and Chapter 62-777, F.A.C., for cleanup target levels.

Users of Nutrisulfate™ shall comply with all applicable regulations. This includes meeting applicable groundwater cleanup target levels for the contaminants of concern, the residual concentrations of reagent ingredients, and any byproducts of concern produced by chemical and biological reactions induced by those ingredients during the timeframe of the cleanup project. For the ingredients of concern that are present in excess of their groundwater standards, the timeframe is that which is permitted for a temporary injection zone of discharge (ZOD) as described below.

- b. UIC and ZOD permits: Per Rule 62-528.630(2)(c), F.A.C., Class V injection-type aquifer remediation wells are exempt from the permitting requirements of Rule 62-528.635, F.A.C., when authorized by a Department-approved Remedial Action Plan or other enforceable mechanism, provided the requirements of the rules governing the remediation project, as well as the construction, operation, and monitoring requirements of Chapter 62-528, F.A.C., are met. Per Rule 62-528.630(2)(c), F.A.C., the issuance of an enforceable, site-specific Remedial Action Plan Approval Order by the Department for injection-type aquifer remediation constitutes the granting of a Class V injection well construction/clearance permit. And per Rule 62-520.310(8)(c), F.A.C., if a temporary ZOD is necessary, and permissible by way of that rule, then the issuance of the site-specific Remedial Action Plan Approval Order also constitutes the granting of permission for the temporary ZOD.
- c. UIC notification: Remedial Action Plans proposing injection-type aquifer remediation shall include information pursuant to Rules 62-528.630(2)(c)1 through 6, F.A.C., for the inventory purposes of the UIC program. Reviewers of those plans, upon issuance of an enforceable Remedial Action Plan Approval Order by the Department, must submit a completed copy of the UIC inventory notification form to the UIC program in Tallahassee.
- d. General information about temporary ZODs: For groundwater remediation, the composition of an injected material must meet the primary and secondary drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapter 62-520, F.A.C., pursuant to UIC Rule 62-528.600(2)(d), F.A.C. Aquifer remediation products that do not meet these requirements must seek relief from water quality criteria by one of two mechanisms. Permission for a temporary ZOD may be obtained via Rule 62-520.310(8)(c), F.A.C. If a ZOD cannot be obtained by rule, it will be necessary to seek a variance from Department rules in accordance with Section 120.542, Florida Statutes.

Rule 62-520.310(8)(c), F.A.C., allows for a temporary ZOD for closed-loop re-injection systems, for the prime constituents of the reagents used to remediate site contaminants, and for groundwater secondary standards. In order to obtain permission for a temporary ZOD by

rule, a site-specific Remedial Action Plan must indicate: (a) the chemical ingredients of concern in the fluid to be injected that will be present in excess of groundwater standards; (b) the size of the ZOD that is needed; (c) the amount of time that the ZOD will be needed; and (d) a plan for monitoring the injected chemical ingredients of concern. The size of the temporary ZOD will usually be the injection well radius of influence when the treatment system is a single injection point. For a multiple point system, the ZOD can usually be expressed and illustrated as the total area of the cluster formed by all the injection points, located side-by-side with overlapping radii of influence.

- e. Specific ZOD information for Nutrisulfate™: Site-specific Remedial Action Plans shall indicate the volume and concentration of aqueous Nutrisulfate™ to be injected, and seek permission for a temporary ZOD by way of Rule 62-520.310(8)(c), F.A.C., as described in paragraph d above for **sulfate**, **ammonia**, and **pH**. If magnesium hydroxide is added to buffer the Nutrisulfate, then pH as a ZOD parameter shall also apply to the magnesium hydroxide.
- f. ZOD monitoring advice for Nutrisulfate™: For sulfate, ammonia, and pH, quarterly monitoring of groundwater should suffice in most cases. The current groundwater standard for sulfate is 250 milligrams per liter (mg/L), and the current standard for ammonia is 2.8 mg/L. The groundwater standard for pH is range 6.5-8.5. Upon expiration of the time period granted for the ZOD, the sulfate, ammonia, and the pH must meet their respective groundwater standards, or their pre-injection, natural-occurring background values at the specific cleanup site, whichever is less stringent.
- g. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the WCP has no objection to the use of some wells for the application of Nutrisulfate™. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply reagents. This will avoid premature conclusions that the entire site meets cleanup goals. By making sure that designated tracking wells are not also used for treatment, there will be more assurance that the treatment process has permeated the entire site and that it did not remain localized to the area immediately surrounding each injection well.
- h. Avoidance of migration: For injection-type, in-situ aquifer remediation projects, pursuant to Rule 62-528.630(3), F.A.C., injection of Nutrisulfate™ shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either the ingredients of concern, site contaminants, or remediation byproducts results.
- i. Abandonment of wells: Upon issuance of a Site Rehabilitation Completion Order, injection wells shall be abandoned pursuant to Section 62-528.645, F.A.C., and the Underground Injection Control Section of the Department shall be notified so that the treatment wells can be removed from the injection well inventory-tracking list.