



Florida Department of Environmental Protection

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Tallahassee, Florida 32399-2400

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Secretary

October 1, 2012

Via Electronic Mail
BOOSUSA@yahoo.com

Otto Sova, Ph.D.
c/o Marian Kupchik
BOOS USA, LLC
1217 Cape Coral Parkway East, #369
Cape Coral, Florida 33904

Re: Enzymatic Decontamination

Dear Dr. Sova:

The Division of Waste Management (Division) hereby accepts Enzymatic Decontamination for the degradation of petroleum and other suitable contaminants in groundwater and soil, in situ and ex situ. As indicated by BOOS USA, LLC, the natural-occurring, non-bacterial enzyme isolated from the species *Eisenia foetida* is a natural pollutant degrader. When petroleum hydrocarbons are degraded by this enzyme, the end products are carbon dioxide and water. Please see Enclosure 1 for the Division's regulatory advice regarding the use of this enzyme for the cleanup of contaminated sites in Florida.

The Division 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 Division 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 Division reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Division 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 and Environment, Inc.
Bureau of Petroleum Storage Systems
Petroleum Cleanup Program Section 6



Rebecca S. Lockenbach
FDEP Section Leader
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 6

enc: (1) Regulatory Information

c: Tom Conrardy, P.E. - FDEP/Tallahassee

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 62-770, 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 Enzymatic Decontamination 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 Enzymatic Decontamination: Site-specific Remedial Action Plans shall indicate the volume of the remediation fluid to be injected, and the concentration of enzyme in it. For a typical cleanup in which the fluid to be injected contains 1,000 parts by volume water to 1 part by volume of enzyme concentrate, it is not necessary to seek permission for a temporary ZOD. But if the fluid to be injected contains less than 52.57 parts by volume water to one (1) part by volume of enzyme concentrate, then 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 ammoniacal nitrogen. Reason: The concentrated enzyme, as shipped by BOOS USA, contains 150 milligrams (0.15 grams) per liter of ammoniacal nitrogen (*i.e.*, nitrogen associated with the amino acids found in proteins), and at dilution ratios less than 52.57 to 1, the concentration of the ammoniacal nitrogen in the fluid to be injected will be in excess of its 2.8-milligram per liter groundwater standard.
- f. ZOD monitoring advice for Enzymatic Decontamination: If a ZOD is required for ammoniacal nitrogen, because the volumetric ratio of water to enzyme concentrate in the fluid to be injected is less than 52.57 to 1, then quarterly monitoring of the receiving groundwater should suffice in most cases. The current groundwater standard for ammonia nitrogen per Chapter 62-777, F.A.C., is 2.8 milligrams per liter (mg/L). Upon expiration of the time period granted for the ZOD, the concentration of the ammonia nitrogen must meet its 2.8-mg/L groundwater standard, or its natural-occurring background value 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 Division has no objection to the use of some wells for the

application of enzyme. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply enzyme. 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 enzyme shall be performed in such a way, and at such a rate and volume, that no undesirable migration of any ingredients of concern, site contaminants, or remediation byproducts that may be of concern 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.
- j. Open-pit application: Applications of the enzyme to an open pit in which the groundwater has been exposed is not an injection, and notification of the UIC Section is not required. However, the groundwater in the pit should be monitored if the concentration of ammoniacal nitrogen in the enzyme fluid introduced to it is greater than 2.8 milligrams per liter. If the pit is backfilled after the introduction of enzyme fluid containing more than 2.8 milligrams per liter of ammoniacal nitrogen, then install groundwater monitoring wells in the backfill that are representative of the former pit area. Sample them for ammonia nitrogen as if the application of the enzyme had actually been an injection that required ZOD permission via rule 62-520.310(8)(c), F.A.C.