



FLORIDA DEPARTMENT OF Environmental Protection

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

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

January 20, 2020

Via Electronic Mail to John Freim at JFreim@Regenesis.com

Mr. John O. Freim, Ph.D.
Director of Materials Science
REGENESIS Corporate Headquarters
1011 Calle Sombra
San Clemente, CA 92673

Re: **S-MicroZVI™**
The FDEP Innovative Technology Application Number: 1880

Dear Mr. Freim:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts S-MicroZVI™ for remediation and enhancing anaerobic bioremediation of suitable contaminants in groundwater and soil. S-MicroZVI™ is a proprietary formulation based on a colloidal suspension of 40% zero-valent iron (ZVI) by weight in glycerol.

Enclosure 1 is a voucher for a confidential disclosure of the proprietary ingredients submitted by REGENESIS. Enclosure 2 contains regulatory information.

While the Florida Department of Environmental Protection (FDEP) does not provide endorsement of specific or brand name remediation products or processes, it does recognize the need to determine their acceptability from an environmental standpoint with respect to applicable rules and regulations, and the interests of public health safety. Vendors, upon receipt of an acceptance, must market their product or process on its merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace. This acceptance letter shall not be construed as either an approval of the product or a certification of its performance.

Additionally, Department acceptance of any product or process does not imply it has been deemed applicable for any particular cleanup situation, or that it is preferred over other treatment or cleanup techniques. A site-specific evaluation of applicability should 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.

It is not a requirement that a remediation product or process obtain an acceptance from the Department in order to be proposed for use in a site-specific Remedial Action Plan, but the plan must contain information to show that it meets all applicable and appropriate rules and regulations. For S-

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MicroZVI™, a copy of this acceptance letter containing regulatory compliance advice should be included in the appendix of each site-specific Remedial Action Plan that proposes its use.

The Department reserves the right to revoke its acceptance of a product or process if any component has been falsely represented.

If you have any questions, contact Elena Compton at (850) 245-8911, through Mail Station 4535 at the letterhead address, or by e-mail at Elena.Compton@FloridaDEP.gov.

Sincerely,



Elena Compton, M.S., P.E.
Professional Engineer III
DBSP, FDEP
850-245-8911

Enclosures: (1) Voucher; (2) Regulatory Information

ENCLOSURE 1
VOUCHER

S-MicroZVI™



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Director of Materials Science
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1011 Calle Sombra
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Re: **Proprietary Ingredients: S-MicroZVI™**

Dear Mr. Freim:

The Division of Waste Management hereby acknowledges the submittal of confidential disclosures by REGENESIS, dated October 30, 2019 (received on November 1, 2019). The disclosure provided the proprietary ingredients and their concentrations in S-MicroZVI™.

Without this voucher for the disclosures and the advice provided by the Division in Enclosure 2 based on its review of all the ingredients, users of S-MicroZVI™ would not know how to comply with the requirements of Rule 62-520.310(8)(c), Florida Administrative Code (F.A.C.) for a temporary Zone of Discharge.

For underground injection control purposes, aquifer remediation plans proposing the use of S-MicroZVI™ must indicate the volume and complete chemical composition of the fluid to be injected. Since the identities of some ingredients are proprietary, it will suffice to indicate just specify the overall volume and concentration of S-MicroZVI™ to be injected, and then provide a footnote indicating that the confidential disclosure dated October 30, 2019, is already on file with the Division. Please direct questions regarding this voucher to Elena Compton at 850-245-8911.

Sincerely,

A handwritten signature in blue ink that reads "Elena C. Compton".

Elena Compton, M.S., P.E.
Professional Engineer III
DBSP, FDEP
850-245-8911

ENCLOSURE 2
REGULATORY INFORMATION

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1. Groundwater cleanup standards: The onus shall be on users of S-MicroZVI™ to ensure that all applicable groundwater standards will be met at the time of project completion for the contaminants of concern being remediated, and any by-products produced as a result of chemical or biochemical reactions induced or assisted by S-MicroZVI™. The following chapters of the Florida Administrative Code (F.A.C.) are cited: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C., for groundwater classes, for groundwater permitting, and for monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapters 62-780 F.A.C., for cleanup criteria, allowance of alternative cleanup target levels and conditional closure requirements; and Chapter 62-777, F.A.C., for cleanup target levels.
2. Injection well permit: 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.
3. Underground Injection Control (UIC): Remedial Action Plans proposing injection-type aquifer remediation shall include the information required by Rules 62-528.630(2)(c)1 through 6, F.A.C., for the purposes of the UIC program. Reviewers of those plans, upon issuance of a Department-enforceable Remedial Action Plan Approval Order, must transmit this information to the UIC program in Tallahassee by submitting a completed copy of the "UIC Notification". The notification is in the form of a memorandum currently located on the Internet at <https://floridadep.gov/waste/petroleum-restoration/forms/uic-notification-remediation-hazardous-waste>.
4. General information about temporary Zones of Discharge (ZOD): For groundwater remediation, the composition of a fluid to be injected 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. [and Chapter 62-777], 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 as follows. Permission for a temporary ZOD may be obtained via Rule 62-520.310(8)(c), F.A.C. If permission for a ZOD cannot be obtained by rule, then 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 covered by all the injection points, located side-by-side with overlapping radii of influence.

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5. Upon expiration of the time-period granted for the ZOD by way of Rule 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their natural-occurring background values at the specific cleanup site, whichever is less stringent.

Conditional closure is also allowable provided the closure criteria of Rule 62-780.680, F.A.C., are met and there are no exceedances of a primary standard due to impurities in the product. Note that such conditional closure may require a modification of the size or duration of the ZOD. This modification must be approved in an enforceable order of the department, such as a conditional Site Rehabilitation Completion Order.

6. Site-specific Remedial Action Plans shall describe the volume and concentration of S-MicroZVI™ that will be injected.
7. Specific ZOD information for S-MicroZVI™:
- a. A ZOD evaluation was based on the maximum concentration of 5% (by wt.) S-MicroZVI™ prior to injection into the subsurface.
 - b. For the ZOD parameters: sodium, zinc, foaming agents (consisting of anionic and nonionic surfactants), sulfate, diethylene glycol, ethylene glycol, TRPH (Total Recoverable Petroleum Hydrocarbons), and TDS (Total Dissolved Solids) shall be monitored. Reviewers of Remedial Action Plans should check the box as shown below when filling out the UIC Notification memorandum:
“☐ ZOD permission by rule 62-520.310(8)(c), F.A.C., for reagent chemical species and/or parameter(s) in the fluid to be injected (or re-injected) that exceed secondary groundwater standards. ...”.
8. If other materials are injected along with the S-MicroZVI™, a ZOD evaluation would be required as a part of the remedial action plan review.
9. Required UIC ZOD compliance monitoring for S-MicroZVI™ to comply with Rule 62-520.310(8)(c), F.A.C.: The receiving groundwater must be monitored for sodium, zinc, foaming agents (consisting of anionic and nonionic surfactants), sulfate, diethylene glycol, ethylene glycol, TRPH, and TDS.
10. Quarterly monitoring should suffice in most cases. Upon expiration of the time period granted for the ZOD by way of Rule 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their natural-occurring background values at the specific cleanup site, whichever is less stringent, or appropriate controls are put in place to allow conditional closure under rule 62-780.680, F.A.C.
- a. Sodium is a primary drinking water contaminant with current standard of 160,000 ug/L (microgram per liter).

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- b. Zinc, foaming agents (consisting of anionic and nonionic surfactants), sulfate, and TDS are secondary drinking water pollutants with the following standards: zinc = 5,000 ug/L, foaming agents = 500 ug/L, sulfate = 250,000 ug/L, and TDS = 500,000 ug/L.
 - c. Diethylene glycol, ethylene glycol, and TRPH (identified in Chapter 62-777, F.A.C., as minimum criteria systemic toxicants) have the following Groundwater Cleanup Target Levels (GCTLs): diethylene glycol = 14,000 ug/L, ethylene glycol = 14,000 ug/L, and TRPH = 5,000 ug/L.
11. Analytical method for surfactants: Per Chapter 62-550, F.A.C., Standard Method 5540 (SM 5540) can be used to determine the concentrations of surfactants in water samples. Method SM 5540 C is for the measurement of anionic surfactant concentrations, and method SM 5540 D is for the measurement of nonionic surfactant concentrations. S-MicroZVI™ includes anionic and nonionic surfactants in its formulation.
12. Utilization of wells: If a remediation site has sufficient monitoring wells, then the Division of Waste Management has no objection to the use of some existing monitoring wells for the injection of S-MicroZVI™ if the wells are suitable for the purpose. However, no “designated” monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply S-MicroZVI™. Nor shall wells used for the injection of S-MicroZVI™ be used as dedicated wells for tracking remediation progress. This will avoid a premature conclusion that the site meets cleanup goals. By making sure that designated tracking wells are not 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.
13. Three categories of groundwater monitoring:
- a. Active remediation monitoring for a cleanup site’s contaminants of concern: During the period of active remediation, groundwater shall be monitored in accordance with the requirements of the approved RAP as set forth in Section 62-780.700, F.A.C.
 - b. Post Active Remediation Monitoring for a cleanup site’s contaminants of concern: At least one (1) year of quarterly post remediation groundwater monitoring for the contaminants of concern shall be conducted at a minimum of two (2) wells: one located in the area of highest contamination, the other at the downgradient edge of the contamination plume, pursuant to Section 62-780.750, F.A.C.
 - c. Monitoring of the UIC zone of discharge: in order to comply with Rule 62-520.310(8)(c), F.A.C., the ZOD shall be monitored for sodium, zinc, foaming agents (consisting of anionic and nonionic surfactants), sulfate, diethylene glycol, ethylene glycol, TRPH, and TDS, as discussed in paragraph 7b above.
11. Underground Injection Control operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to Rule 62-528.640(1)(b) and (c), F.A.C., since no movement of the contamination plume is expected to accompany the treatment process, the Department requests that the information items listed in Rule 62-528.640(1)(b), F.A.C., be considered and included in Remedial Action Plan proposals as a matter of good and thorough design practice. Briefly

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summarized, they are: quality of water in the aquifer, quality of the injected fluid, existing and potential uses of the affected aquifer, and well construction details.

12. Abandonment of wells: Upon issuance of a Site Rehabilitation Completion Order or a declaration of “No Further Action”, injection wells shall be abandoned pursuant to Rule 62-528.645, F.A.C. The Underground Injection Control Section of the Department shall be notified so that the injection wells can be removed from the inventory-tracking list.
13. Open-pit application: There is no objection to the introduction of S-MicroZVI™ to an open excavation pit in which the groundwater has been exposed. Open-pit application is not injection, and it is not necessary to notify the Underground Injection Control Section, but this should not be construed as carte blanche to introduce to the pit any substance at any concentration with no regard to potential toxicological effects. The Division of Waste Management therefore recommends that the groundwater in the area of the pit be monitored for the same zone of discharge parameters that would have been monitored (if any) had the application actually been an injection.