



**FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

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March 7, 2013

Via Electronic Mail

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Sami Benhamou, CEO, and Orik Dagan
Natural Solutions Group, Corp.
5120 NW 165th Street, Building 103
Miami Gardens, Florida 33014

Re: **VirO2Syl**

Dear Messrs. Benhamou and Dagan:

The Bureau of Petroleum Storage Systems (Bureau) hereby reaffirms its acceptance of VirO2Syl, an aqueous mix of hydrogen peroxide and colloidal silver, as a remediation product for the destruction of petroleum hydrocarbons and other suitable contaminants in soil and groundwater, in situ and ex situ, via chemical oxidation. As indicated, VirO2Syl distinguishes itself from other products of this type in that a proprietary process is used to impart an extended stability and shelf life, and that lower concentrations of it are needed to remediate contaminated sites. The peroxide and the silver are premixed, and the stabilization is such that it allows lower concentrations of the colloidal silver to be used. The decomposition of the peroxide does not accelerate until it makes contact with organic matter, and it does not kill all of the indigenous microorganisms at a cleanup site. Enough of them will survive and recover to do some polishing after the initial treatment.

Regulatory information regarding the use of VirO2Syl is provided as Enclosure 1, and Supplemental Information is provided as Enclosure 2. This letter supersedes the original November 8, 2010 acceptance of VirO2Syl. No major changes have been made, only minor updating of the contact information, the format, and minor changes in the wording for clarity. Underground Injection Control (UIC) notification is still required when VirO2Syl is injected, but a copy of the notification form is no longer provided as an attachment to product acceptance letters. Reviews of Remedial Action Plans proposing in situ, injection-type processes are now instructed to use the latest revision of the UIC notification memorandum published at the Bureau of Petroleum Storage Systems' web site.

The Bureau of Petroleum Storage Systems does not endorse specific or brand name remediation products or processes. It does, however, recognize the need to determine their acceptability in

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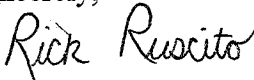
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the context of environmental regulations, safety, and the protection of public health. For that reason, the Bureau issues an "acceptance" letter, not an approval. In no way shall an acceptance be construed as certification of performance, nor shall it be construed as approval for uses that are beyond the jurisdiction of the Bureau. 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 its entirety 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 Bureau reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Bureau 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. Please direct any questions about this acceptance to Rick Ruscito at telephone (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 Section 6



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

Enclosures: (1) Regulatory Information
(2) Supplemental Information

c: Tom Conrardy - FDEP/Tallahassee

History:

ppl #417
inn_175.doc - 11/8/10

ppl #464
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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; Chapter 62-522, F.A.C., for groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapters 62-770, 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 VirO2Syl shall comply with all applicable regulations. This includes meeting applicable groundwater cleanup target levels for the contaminants of concern, the residual concentrations of VirO2Syl ingredients, and any byproducts of concern produced by chemical and biological reactions induced by the ingredients during the timeframe of the cleanup project. For the "ingredients of concern" in VirO2Syl that are present in excess of their groundwater standards, the timeframe is that which is permitted for a temporary injection zone of discharge.

- b. Underground Injection Control permit: 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.
- c. Underground Injection Control notification: Remedial Action Plans proposing in situ, 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 Underground Injection Control 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 Underground Injection Control inventory notification memorandum.
- d. General information about temporary injection zones of discharge: For in situ aquifer remediation, the composition of the fluid to be injected (before it is diluted by the receiving groundwater) must meet the primary and secondary drinking water standards set forth in Chapter 62-550, F.A.C., and the general minimum groundwater criteria of Chapter 62-520, F.A.C., pursuant to underground injection control Rule 62-528.600(2)(d), F.A.C. Additional minimum groundwater criteria for specific chemicals are set forth in Chapter 62-777, F.A.C. Aquifer remediation fluids that do not meet these requirements must seek permission for a temporary injection zone of discharge. Depending on the chemical composition and the physical properties of the fluid, it will be necessary to obtain permission for an injection zone of discharge by either one or both of the following methods: by Rule 62-520.310(8)(c), F.A.C., or by variance from Rule 62-520.310(9), F.A.C.

Rule 62-520.310(8)(c), F.A.C., allows a temporary injection zone of discharge for closed-loop re-injection systems, the prime constituents of the reagents used to remediate site contaminants, and the secondary standards for groundwater, provided a Department-approved remedial action plan addresses the duration and size of the zone of discharge, and groundwater monitoring of the injected chemical species of concern.

In order to obtain permission for a temporary zone of discharge by way of Rule 62-520.310(8)(c), F.A.C., a site-specific Remedial Action Plan must indicate: (a) the chemical species of concern in the fluid to be injected that will be present in excess of their allowable concentrations; (b) the size of the zone that is needed; (c) the amount of time that the zone will be needed; and (d) a groundwater monitoring plan for the injected chemical species of concern. In most cases, monitoring on a quarterly basis should be sufficient. The size of the temporary injection zone of discharge in paragraph (b) above will usually be the injection radius of influence when the treatment system is a single injection point. For a multiple point system, the zone of discharge 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 zone of discharge (ZOD) information for VirO2Syl: The Bureau of Petroleum Storage Systems, using information provided by the Natural Solutions Group Corporation, has identified pH and silver as parameters in need of permission for a temporary injection zone of discharge by way of Rule 62-520.310(8)(c), F.A.C., for which the groundwater must be monitored during the course of a cleanup. In order for temporary injection ZOD permission to be granted by way of Rule 62-520.310(8)(c), F.A.C., for pH and silver when VirO2Syl is injected, a site-specific Remedial Action Plan must: (a) identify pH and silver as parameters of the fluid to be injected that do not meet their injection standards; (b) specify the size of the ZOD needed for pH and silver; (c) specify the period of time for which a temporary ZOD is needed; and (d) provide for the monitoring of pH and silver in the groundwater during the course of the cleanup. In most cases, monitoring on a quarterly basis should suffice.
- f. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the Bureau has no objection to the use of some wells for the injection of remediation products. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to inject remediation products. This will avoid premature conclusions that the entire site meets cleanup goals. By making sure that designated tracking wells are not also used as treatment points, there will be more assurance that the remediation product has permeated the entire site and that it did not remain localized to the area immediately surrounding each injection well.
- g. Avoidance of migration: For injection-type, in situ aquifer remediation projects, pursuant to Rule 62-528.630(3), F.A.C., the injection of VirO2Syl shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either the VirO2Syl or the contaminants of concern in the aquifer results.
- h. 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.

- i. Open-pit applications: While open-pit application of VirO2Syl is not an injection-type application, and notification of the Underground Injection Control Section therefore not required, the user must still be mindful of groundwater quality. For open-pit applications, the Bureau of Petroleum Storage Systems suggests that groundwater in the application area be sampled for the same parameters that would have been monitored had the application been an injection. Those parameters are pH and silver.
- j. "Soil-only" cleanups: For sites where VirO2Syl will be used in situ for the cleanup of only soil that is located above the water table, consideration should be given to the potential for its ingredients of concern to percolate to the underlying groundwater. The potential will have to be evaluated on a site-specific basis, and may at least have to take into account the depth to which the VirO2Syl will be applied in comparison to the depth of the groundwater, the amount of VirO2Syl applied, and the permeability of the soil. If it is determined that VirO2Syl has the potential to reach the water table, then the underlying groundwater should be monitored for pH and silver during the course of the cleanup, as if the VirO2Syl had been directly introduced below the water table.
- k. Soil and groundwater criteria for VirO2Syl ingredients of regulatory interest: The secondary groundwater standards for pH and silver, as indicated in the current issue of Chapter 62-550, F.A.C., are range 6.5-8.5 and 0.1 milligrams per liter (mg/L) respectively. These standards or their natural-occurring background values at the cleanup site, whichever is less stringent, must be met by the time that the temporary injection zone of discharge expires. For soil, the criteria for silver is the 17- milligram per kilogram (mg/Kg) maximum allowable leachability-based soil cleanup target level and the 410-mg/Kg direct residential exposure limit established in the current issue of Chapter 62-777, F.A.C. The lower value of the two (17-mg/Kg) has to be met in order for the site to qualify for an unconditional declaration of No Further Action. For additional information about alternate methods by which to demonstrate that soil meets unconditional cleanup target levels for leachability, see Rule 62-770.680(1)(c)2 in the current December 27, 2007 issue of Chapter 62-770, F.A.C.

SUPPLEMENTAL INFORMATION

- a. Chemical composition: Premixed VirO2Syl, as-shipped, contains 27% hydrogen peroxide and 0.03% colloidal silver. Since information provided to the Bureau of Petroleum Storage Systems by Natural Solutions Group Corporation discusses the use of VirO2Syl at this as-shipped concentration, the Bureau has offered its advice on how to comply with injection zone of discharge requirements for this composition. Whether it is advisable to dilute the as-shipped product with additional water prior to application at a specific site for an in situ cleanup is a matter that should be discussed between the user and Natural Solutions Group Corporation before a site-specific Remedial Action Plan is prepared and submitted for review and approval. In regard to the silver, the Bureau indicates that it will be necessary to obtain permission for a temporary injection zone of discharge, for the fluid to be injected, for any dilution that involves the addition of less than 3,000 volumes water to 1 volume of as-shipped VirO2Syl prior to injection. Whether permission for a temporary injection zone of discharge will be necessary for pH for various dilutions of VirO2Syl prior to injection will depend on the resulting pH of the mixture, which will be influenced in part by the pH of the local dilution water.
- b. Pilot study: For petroleum cleanup, per Rule 62-770.700(2), F.A.C., it is required that a pilot study proposal be submitted for review, and that a pilot test be performed prior to the design of a full-scale treatment system. If conditions at a site do not warrant a pilot study, then a proposal explaining the rationale to forego it must be submitted for review.
- c. Dosage: The amount of VirO2Syl to be used for the remediation of groundwater and soil at a contaminated site depends on site-specific conditions. The Bureau of Petroleum Storage Systems therefore advises users of VirO2Syl to consult Natural Solutions Group Corporation to determine an appropriate dosage. For in situ applications, the Bureau also advises that no more than the necessary amount be introduced to the subsurface, in order to avoid a situation in which a lengthy period of time is needed for residual concentrations of the ingredients of concern to decrease to their soil and groundwater standards, or their natural-occurring background levels at the cleanup site, whichever is less stringent.