



Florida Department of Environmental Protection

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

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

January 8, 2008

John W. Saltsman
Natural Remediation, LLC
194 14th Avenue South
Naples, Florida 34102

Re: **STI Technology**

Dear Mr. Saltsman:

The Bureau of Waste Cleanup (Bureau) hereby accepts STI Technology (STI) as a product for both in-situ and ex-situ bioremediation of petroleum hydrocarbons, chlorinated organic hydrocarbons, and other suitable compounds in soil and groundwater at contaminated sites in Florida. The STI Technology product was previously accepted by the Bureau of Petroleum Storage Systems (BPSS) for Partners for a Better Environment, Inc. This current acceptance by the Bureau of Waste Cleanup includes a name change from Partners for a Better Environment, Inc., to Natural Remediation, LLC. Since the product itself remains the same as was accepted by the BPSS, all aspects of the previous acceptance letter also apply for this acceptance, as described in this letter and in Enclosures 1, 2 and 3.

The product is a proprietary calcium oxide-based powder that is mixed with water by the user prior to application. A voucher for the confidential disclosure of a proprietary chemical analysis is provided as Enclosure 1.

The Bureau recognizes STI Technology as a method for remediation of contaminated sites in Florida. The Bureau has no objections to its use provided a site-specific Remedial Action Plan (RAP) is approved by the Department. Regulatory and supplemental information are provided in Enclosures 2 and 3 respectively.

The Bureau does not provide endorsement of specific or brand name remediation products or processes; however, it does recognize the need to determine their acceptability in the context of environmental regulations and protection of public health and safety. In no way shall this regulatory acceptance letter be construed as Bureau certification of performance. Additionally, the Bureau emphasizes a distinction between its regulatory "acceptance" letter and

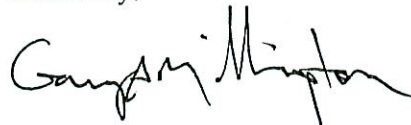
Mr. John W. Saltsman
January 8, 2008
Page 2

an approval. Products and processes are accepted but they are not approved. Vendors and consultants must market the products and processes on their own merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace.

Remedial Action Plans that include use of an "accepted" product should include a copy of the acceptance letter in the RAP's appendix and reference it in the text of the document. To aid regulatory agency reviewers, supplemental information is provided as Enclosure 3. 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 RAP. The RAP, 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 or incompletely 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 design details must be provided in a site-specific RAP submitted for Department review and approval. You may contact me at (850) 245-7502, if you have any questions.

Sincerely,



Gary Millington, P.E.
Program & Technical Support Section
Bureau of Waste Cleanup

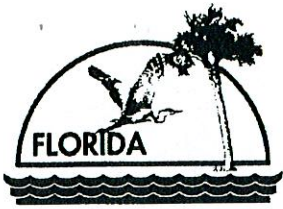
Enclosures (4)

c: G. Heuler - UIC, FDEP/Tallahassee
Cynthia Christen - OGC, FDEP/Tallahassee
T. Conrardy - BPSS, FDEP/Tallahassee

History:

ppl #087
INN_055a
2/9/2001

INN_055b
1/8/2008



ENCLOSURE 1

STI PROPRIETARY ANALYSIS VOUCHER

Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

February 9, 2001

Mr. Michael J. Fitzsimmons
Partners for a Better Environment, Inc.
6 Skyview Road
Wayne, New Jersey 07470

Re: STI Proprietary Analysis Voucher

Dear Mr. Fitzsimmons:

The Bureau of Petroleum Storage Systems hereby acknowledges receipt of a confidential disclosure dated November 15, 2000, from Partners for a Better Environment Incorporated. The disclosure is for the results of a proprietary chemical analysis of STI, a remediation product. The product works by first cleaving some of the molecular bonds in contaminant molecules, and then serves as a reagent in chemical reactions that produce oxygen and nutrients, which are in turn used by the indigenous microorganisms at a contaminated site to degrade petroleum hydrocarbons and suitable contaminants.

Having reviewed the confidential disclosure, we hereby vouch for the analysis of a 0.05 percent by weight aqueous solution of STI. Having reviewed the analysis, we also vouch for the correct identification of seven (7) parameters for which Partners for a Better Environment obtained a variance from the Department on February 8, 2001, for a zone of discharge for the injection of STI. The parameters are aluminum, chloride, iron, nitrate, nitrite, and pH, which exceed their respective drinking water standards set forth in Chapter 62-550, Florida Administrative Code (F.A.C.), and ammonia, which exceeds its minimum groundwater criterion set forth in Chapter 62-777, F.A.C. Based on the analytical results, the bureau is reasonably assured that the product, when injected into aquifers, will not violate any other drinking water or groundwater criteria set forth by these Chapters of the Florida Administrative Code, and the minimum criteria for groundwater set forth in Section 62-520.400, F.A.C.

Section 62-520.400, F.A.C., requires that the groundwater of the state be free from substances that are harmful to plants, animals, and organisms, and free from substances that are carcinogenic, mutagenic, teratogenic or toxic to human beings. However, the obligation to comply with the minimum groundwater criteria, and all other applicable rules and regulations, ultimately rests with Partners for a Better Environment and users of the product, not the Bureau of Petroleum Storage Systems. No ingredients, chemical species, or byproducts formed as a result of using STI shall result in a violation of any applicable and appropriate rule or regulation.

Mr. Michael J. Fitzsimmons
February 9, 2001
Page Two

For underground injection control purposes, remediation plans prescribing the use of STI must disclose the volume and composition of the fluid to be injected into an aquifer. Since the composition is proprietary, it will suffice to indicate the overall concentration of the solution and then provide a footnote indicating that a one-time confidential disclosure regarding the composition has been submitted to the Department and accepted. Reference should be made to the original November 15, 2000 disclosure, and a copy of this voucher should be included as an appendix in the plan. Remediation plan reviewers for petroleum contaminated site applications involving STI may contact Rick Ruscito in the Bureau of Petroleum Storage Systems at (850) 487-3299. Questions about the remediation of sites contaminated by chlorinated organic compounds should be directed to the Bureau of Waste Cleanup at (850) 488-0190.

Sincerely,

Rick Ruscito, P.E.
Bureau of Petroleum Storage Systems

ENCLOSURE 2

STI: REGULATORY INFORMATION

For STI, the major environmental and regulatory concerns are discussed below.

- a. Applicable rules and regulations: Users of STI shall comply with all applicable regulations, particularly those regarding underground injection control and groundwater quality.

For in-situ vadose remediation, when the underlying groundwater will not be affected by the leaching of this product, there are no special concerns beyond those which would normally need to be addressed in a Remedial Action Plan (RAP) and conducting a cleanup in accordance with the requirements of Chapter 62-780, Florida Administrative Code (F.A.C.). For ex-situ groundwater treatment, when an aboveground treatment system produces effluent meeting the cleanup criteria of Chapter 62-777, F.A.C., and the drinking water standards of Chapter 62-550, F.A.C., for disposal via recharge gallery or NPDES permit, there are no special concerns. But for in-situ groundwater remediation via injection of the product into an aquifer, there are underground injection control (UIC) regulations that must be observed. Since in-situ aquifer remediation via injection is likely to be the most common application of this product, the bulk of the regulatory requirements discussed herein will be directed to that topic.

All applicable groundwater contaminant standards shall be met at the time of project completion for the contaminants of concern, any residuals associated with the ingredients of STI, and any byproducts produced as a result of chemical or biochemical reactions involving those ingredients. The following chapters of the Florida Administrative Code are cited as applicable but should not be construed as an exhaustive list: 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 wells; Chapters 62-780, 62-672, and 62-785, F.A.C., for cleanup criteria; and Chapter 62-777, F.A.C., for contaminant cleanup target levels.

Chapter 62-520, F.A.C., requires groundwater to be free from substances which are harmful to plants, animals, and organisms, and free from substances that are carcinogenic, mutagenic, teratogenic or toxic to human

beings. These "free from" requirements prohibit injection of potentially harmful products in the event that any of their ingredients are not regulated by specific primary or secondary drinking standards.

- b. Injection well permit: The issuance of a site-specific Remedial Action Plan Approval Order for injection-type aquifer remediation constitutes the granting of a Class V injection well permit. Per Rule 62-528.630(2)(c), F.A.C., aquifer remediation projects involving injection wells may be authorized under the provisions of a RAP, provided the construction, operation, and monitoring requirements of Chapter 62-528, F.A.C., are met. Department reviewers of injection-type aquifer remediation plans must complete Enclosure 4 and submit it to the Underground Injection Control Section at 2600 Blair Stone Road, Mail Station 3530, Tallahassee, Florida 32399-2400. Only Department reviewers may approve injection-type remediation plans in which the approval constitutes the issuance of a Class V injection permit.
- c. Underground injection control inventory: Remedial Action Plans prescribing in-situ injection-type aquifer remediation shall include information pursuant to Rule 62-528.630(2)(c)1 through 6, F.A.C., for inventory purposes.
- d. Variance summary: A February 8, 2001 variance granted to Partners for a Better Environment Inc., now Natural Remediation, LLC, is for an exemption from Rule 62-522.300(3), F.A.C., in order to create a 35 foot temporary zone of discharge (ZOD) in the aquifer around each injection point. Within this ZOD, for a period of time not to exceed one (1) year, a temporary exceedance of the drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater criteria set forth in Chapter 62-777, F.A.C., may occur for aluminum, chloride, iron, nitrate, nitrite, pH and ammonia. Users of STI must monitor aluminum, ammonia, chloride, iron, nitrate, nitrite, an pH in the groundwater at the downgradient edge of the ZOD for at least one (1) year after active remediation to ensure compliance with the ZOD requirements.

By the end of the 1-year period, the groundwater within the ZOD must meet the ground water standards set forth in the Florida Administrative Code, or the natural-occurring background value for each of parameter at a given remediation site, whichever is less stringent. The current drinking water standards for these parameters are as follows: aluminum, 0.2 milligrams per liter (mg/L), maximum; chloride, 250 mg/L, maximum; iron, 0.3 mg/L, maximum; nitrate, 10 mg/L, maximum; nitrite, 1 mg/L, maximum; and pH, range 6.5 to 8.5. The minimum criteria groundwater concentration for ammonia is currently 2.8 mg/L. No other chemical species in STI are expected to exceed groundwater standards.

The variance granted by the Department is a general variance, which may be applied to each site-specific RAP proposing the use of STI submitted hereafter. Natural Remediation, LLC, or STI users do not have to petition for a new variance each time STI is proposed for the remediation of a site, provided there is no deviation from the terms of the variance.

- e. Additional nutrients: In the event that a user of STI decides to augment the injection of it into an aquifer with nutrients or other substances, then that user must provide a complete chemical analysis of the augmenting injection fluid in a site-specific RAP that will be reviewed for approval by the Department. The augmenting fluid must meet applicable groundwater standards. An exception to the need for a chemical analysis would be a case in which the augmenting nutrients or substances are on the list of injection-type aquifer remediation products already accepted by the Bureau, for which a chemical analysis has already been provided.
- 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 application of STI. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling), shall be used to apply STI. This will avoid premature conclusions that the entire 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.
- g. Avoidance of migration: For in-situ injection-type aquifer remediation projects, injection of STI shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either the product's ingredients or the contaminants of concern in the aquifer results, pursuant to Rule 62-528.630(3), F.A.C.
- 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. The Underground Injection Control Section of the department shall be notified so that the injection wells can be removed from the inventory tracking list.

ENCLOSURE 3

STI: SUPPLEMENTAL INFORMATION

The information below, compiled from several sources, may be helpful to reviewers of Remedial Action Plans prescribing STI.

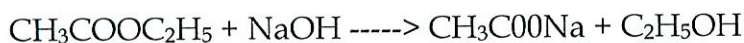
- a. Nature of the product: STI is a proprietary calcium oxide-based powder that is mixed with water by the user prior to application. STI stimulates bioremediation of contaminants by indigenous microbes at a contaminated site. It works by first cleaving some of the bonds in the contaminant molecules. Then, it serves as a reagent in chemical reactions that produce oxygen and nutrients, which in turn are used by indigenous microbes to complete the biodegradation of contaminants.
- b. Bioremediation indicator samples: Prior to preparation of a RAP for full-scale in-situ injection-type aquifer remediation of a site, the Bureau recommends the sampling of monitoring wells that are upgradient, within, and downgradient of the groundwater contamination plume for bioremediation parameters in order to determine whether intrinsic bioremediation is already occurring across the plume.

The following parameters may be useful in determining the potential for bioremediation at a site, or whether bioremediation is already occurring. They were selected from a list that appears in the publication "In-Situ Treatment Technology" by E. Nyer et al., Lewis Publishers, 1996. The parameters are: dissolved oxygen; redox potential; pH; temperature; specific conductance; volatile organic compounds; nitrate; nitrite; ammonia nitrogen; manganese (total and dissolved); iron (total, dissolved, and ferrous); sulfate; sulfide; and total organic carbon. Gaseous parameters include carbon dioxide, oxygen, nitrogen, and methane. Other parameters that may be helpful are chemical oxygen demand, biochemical oxygen demand, and total organic carbon. Preparers of bioremediation plans and their reviewers should determine which parameters, if any, should be investigated on a site specific basis. This sampling suggestion is for technical, not regulatory purposes. It is not mandatory but is recommended as a matter of good practice.

- c. Dosage and application rate: Per information about STI submitted to the Bureau, one (1) pound of dry STI powder is mixed into 250 gallons of water prior to use. This mixture is equivalent to an STI concentration of 0.05% by weight. The application rate (expressed, for example, as gallons of STI

mixture per cubic yard of contaminated vadose and/or aquifer) will depend on site-specific conditions.

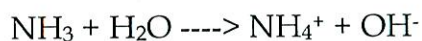
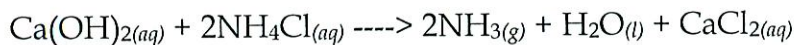
- d. It is reported that base-catalyzed hydrolysis reactions can be used for the in-situ treatment of organic chemicals such as esters, amides, carbamates, organophosphorus compounds, and some pesticides such as parathion, malathion, 2-4D esters, and DDT. Water with lime or sodium hydroxide serve as reagents. In such reactions a hydroxyl ion attacks a carbon or phosphorus atom in the contaminant molecule, causing bond cleavage.
- e. The simplest representation of a hydrolytic reaction is illustrated in texts as follows: $XY + H_2O \rightarrow HY + XOH$, where XY denotes the compound undergoing hydrolysis. The water molecule involved in the reaction is also split in the process and redistributed as a hydrogen atom and a hydroxyl.
- f. An example of a base-catalyzed hydrolysis reaction (using sodium hydroxide in this case) is the hydrolysis of an ester to an alcohol as follows:



(ester)

(alcohol)

- g. A myriad of reactions can occur in groundwater, given the number of natural-occurring chemical species that are present. Textbook examples of some aqueous reactions involving chemical species like those found in STI are listed below. These species would be the macronutrients involved in the biodegradation of contaminant molecules after STI has initially cleaved some of their bonds. There is no particular order to the listing of reactions below.



Memorandum**Florida Department of
Environmental Protection**

TO: Richard Deuerling, Mail Station 3530
Division of Water Facilities
Underground Injection Control Section
Florida Department of Environmental Protection
2600 Blair Stone Road, Tallahassee, FL 32399-2400

FROM: _____ (Note 1.)

DATE: _____

SUBJ: **Proposed Injection Well(s) for In Situ Aquifer
Remediation at a Remedial Action Site**

Pursuant to Rule 62-528.630(2)(c), F.A.C, inventory information is hereby provided regarding the proposed construction of temporary injection well(s) for the purpose of in-situ aquifer remediation at a contaminated site.

Site name: _____

Site address: _____

City/County: _____

Latitude/Longitude: _____

FDEP Facility Number: _____

Site owner's name: _____

Site owner's address: _____

Well contractor's name: _____ (Note 2.)

Well contractor's address: _____

Brief description of the in-situ injection-type aquifer remediation project:

Summary of major design considerations and features of the project:

Areal extent of contamination (square feet): _____

Number of injection wells: _____

Composition of injected fluid (Note 3)

(ingredient, wt. %): _____

Injection volume per well (gallons): _____

Single or multiple injection events: _____

Injection volume total (all wells, all
events): _____

Richard Deuerling
Page Two
Date: _____

Site name: _____
FDEP facility no.: _____

A site map showing the areal extent of the groundwater contamination plume, and the location and spacing of injection wells and associated monitoring wells is attached.

The following is a summary description of the affected aquifer:

Name of aquifer: _____
Depth to groundwater (feet): _____
Aquifer thickness (feet): _____

The injection well(s) features are summarized below, and/or a schematic of the injection well(s) is attached.

Direct-push or Conventional (*circle the appropriate well type*)
Diameter of well(s) (i.e., riser pipe & screen) (inches): _____
Total depth of well(s) (feet): _____
Screened interval: _____ to _____ feet below surface
Grouted interval: _____ to _____ feet below surface
Casing diameter, if applicable (inches): _____
Cased depth, if applic.: _____ to _____ feet below surface
Casing material, if applic.: _____

The in-situ injection-type aquifer remediation plan for this contaminated site is intended to meet the groundwater cleanup criteria set forth in Chapter 62-780, F.A.C. Additionally, all other groundwater standards will be met at the time of project completion for any residuals associated with the ingredients of the injected remediation products, and any by-products or intermediates produced as a result of the chemical or biochemical transformation of those ingredients or the site contaminants during their use. Applicable primary and secondary drinking water standards are set forth in Chapter 62-550, F.A.C., and additional groundwater quality criteria are set forth in Chapter 62-520, F.A.C.

The remediation plan estimates that site remediation will take _____ months. We will notify you if there are any modifications to the remediation strategy which will affect the injection well design or the chemical composition and volume of the injected remediation product(s).

The proposed remediation plan was approved on _____ by an enforceable approval order. A copy is attached. The remediation system installation is expected to commence within 60 days. Please call me at _____ if you require additional information.

-
- Note 1. Local programs are not authorized to approve underground injections into aquifers. Reason: Per agreement with EPA, the FDEP cannot delegate this authority. Local programs, after reviewing a Remedial Action Plan or an injection proposal document, should follow the instructions in a March 16, 2000 memorandum to arrange for Department headquarters' execution of an approval order, and then complete this form. This form is primarily for use by state and local program technical reviewers, but remediation contractors may fill in all blanks except those labeled "FROM", "DATE", and "approval date", and "telephone number" blanks in the last paragraph. Those blanks should be completed only by a state or local program reviewer.
- Note 2. If an injection well installation contractor has not yet been selected, then indicate the name and address of the project's general remediation contractor/consultant.
- Note 3. Complete chemical analysis of injected fluid is required by Chapter 62-528, Florida Administrative Code. Proprietary formulations shall make confidential disclosure. Injected fluids must meet drinking water standards of Chapter 62-550, F.A.C., unless an exemption or variance has been granted.