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

June 19, 2007

Jim Spurlock
Accelerated Remediation Technologies, LLC
3432 Piedmont Road NE, Suite 731
Atlanta, Georgia 30305

Re: **The ART System**

Dear Mr. Spurlock:

The Bureau of Petroleum Storage Systems hereby reaffirms its acceptance of the Accelerated Remediation Technology (ART) System for in situ and ex situ bioremediation of petroleum and other suitable contaminants in groundwater and soil. This letter supersedes both the original February 28, 2005 acceptance and a May 16, 2005 update. The main reason for this update is a change of address and contact information. Some minor editing has been done and the Underground Injection Control Notification form has been replaced with the most recent revision.

The process is a closed-loop re-injection-type system that combines proven, public domain engineering and technologies for groundwater recovery, oil/water separation, collection of free product, and soil washing with FDEP-accepted surfactants to improve the bio-availability of contaminants, air stripping with carbon capture of contaminant vapors, bio-sparging to increase subsurface dissolved oxygen levels, and bio-augmentation for increased plate counts of non-pathogenic microbes.

Except for the necessary disposal of free product that is captured, there are no waste products or by-products of concern produced by this system. ART is a delivery system, not a product, and as such allows the user the freedom to select any commercially available bioremediation product or remediation agent that is appropriate for the contaminants and conditions at a given cleanup site, provided they meet applicable and appropriate Florida groundwater and underground injection control regulations and requirements.

This acceptance applies only to the regulatory jurisdiction and the remediation needs of the Bureau of Petroleum Storage Systems, which is primarily the cleanup of subsurface

petroleum contamination pursuant to Chapter 62-770, Florida Administrative Code (F.A.C.). Other government agencies and local governments may choose to recognize this acceptance if their needs and regulations are similar. This Bureau, however, is not responsible for applications beyond its own jurisdiction.

The Bureau recognizes the ART System as a viable process for the remediation of petroleum contaminated sites in Florida. There are no objections to its use provided: (a) the considerations of this letter are taken into account; (b) a site-specific Remedial Action Plan is approved by the Department; and (c) applicable and appropriate underground injection control regulations are observed. For the ART System, the major regulatory considerations are set forth in enclosure 1.

While the Department of Environmental Protection 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 and safety. Vendors must then market the products and processes on their own merits regarding performance, cost and safety in comparison to competing alternatives in the marketplace. In no way, however, shall this regulatory acceptance letter be construed as Department certification of product or process performance. Additionally, the Department emphasizes a distinction between its regulatory "acceptance" letters and an approval. Products and processes are accepted but they are not approved.

Also, 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 and appropriate rules and regulations.

Those who prepare Remedial Action Plans may include a copy of this letter in the appendix of plans they submit, and call attention to it in the text of their document. In this way, technical reviewers throughout the state will be informed that you have contacted the Department of Environmental Protection to inquire about the ART System's environmental acceptability. To aid those reviewers, the Bureau of Petroleum Storage Systems provides supplemental information as enclosure 2.

The Department reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Department 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 Remedial Action Plans proposing the product or process.

You may contact Rick Ruscito by telephone at (850) 877-1133, extension 3722, or at the letterhead address, Mail Station 4590, if there are any questions.

Sincerely,

Rick Ruscito

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

enc: (1) Regulatory Information

(2) Supplemental Information

(3) Underground Injection Control Memorandum

c: T. Conrardy – FDEP, Tallahassee/MS 4530

History

ppl #262
inn_126.doc
2/28/05

ppl #273
inn_126a.doc
5/16/05

ppl #328
inn_126b.doc
6/19/07

ENCLOSURE 1

REGULATORY INFORMATION

a. Groundwater cleanup standards: The onus shall be on users of the ART System to ensure that all applicable groundwater contaminant standards will be met at the time of project completion, for the contaminants of concern, any residuals associated with the ingredients of commercial remediation products used during the ART process, 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: 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; Chapter 62-770, F.A.C., for petroleum cleanup criteria; and Chapter 62-777, F.A.C., for cleanup target levels.

   A noteworthy aspect of the minimum criteria set forth in Chapter 62-520, F.A.C., is that it requires groundwater to 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. In effect, these "free from" requirements form a catchall. They close what would otherwise be a loophole in the regulations by preventing injection of a potentially harmful product in the event that any of its ingredients is not regulated as a specific primary or secondary drinking water contaminant.

b. Options: Those who prepare Remedial Action Plans (RAP) proposing the ART delivery system may have to comply with underground injection control regulations in one or more of following ways, depending on the nature of the fluid that will be injected: (1) the site-specific RAP can propose to inject a fluid that meets primary and secondary drinking water standards, and the minimum groundwater criteria, but it must include a complete physical and chemical analysis of the fluid to show that all the standards and criteria are met; or (2) the site-specific RAP can propose to inject a remediation product that has already been accepted by the Bureau, provided any conditions that may have been imposed by the acceptance letter are observed; or (3) the site-specific RAP can propose to inject a remediation product for which the remediation contractor is the holder of a Department-granted variance for an injection zone of discharge, provided any conditions imposed by the order granting the variance are observed; or (4) if the remediation fluid is such that a temporary injection zone of discharge can only be permitted by a variance, then such a variance must be obtained before the proposed site-specific RAP can be implemented.

c. Proprietary surfactant option: Accelerated Remediation Technologies LLC, for its surfactant needs, previously relied on Department-accepted surfactants supplied by others but now offers its own proprietary surfactant as an option. A confidential disclosure of the proprietary ingredients and their proportions was submitted to the Bureau of Petroleum Storage Systems on May 12, 2005. The Bureau has reviewed and hereby vouches for the information.

Without divulging the identity of the ingredients, the Bureau hereby provides the minimum amount of information necessary for users of the surfactant to comply with regulations. Site-specific Remedial Action Plans proposing the use of this proprietary surfactant, in order to comply with rule 62-522.300(2)(c), F.A.C., must: (a) indicate that foaming agents and ammonia nitrogen do not meet injection standards; (b) indicate the size of a temporary zone of discharge that is needed for the foaming agents and the ammonia; (c) indicate the amount of time that the temporary zone of discharge is needed; and (d) propose monitoring for the foaming agents and the ammonia nitrogen. If the concentration of the surfactant in the fluid to be injected (or re-injected in the case of closed-loop re-injection-type systems) is 1% or less, then only foaming agents and ammonia nitrogen shall be of concern and monitored per the rule. For concentrations between 1% to 2%, sodium monitoring must be added, and for concentrations greater than 2%, sulfate monitoring must be added. Foaming agents are regulated as a secondary drinking water parameter and have a standard of 0.5 milligrams per liter, maximum, per Chapter 62-550, F.A.C. Standard Method SM 5540 is currently cited by the regulations as the laboratory method for analysis of foaming agents.

d. Closed-loop re-injection: Rule 62-522.300(2)(c), F.A.C., effective August 27, 2001, applies to the ART System, which is a closed-loop, re-injection-type aquifer remediation process. This rule allows a temporary zone of discharge for such a process, for the primary standards for groundwater and for the prime constituents of the reagents used to remediate a site's contaminants, and for the secondary standards for groundwater. In order for users of the ART process to comply with this rule, a Department-approved Remedial Action Plan must address the duration and size of the injection zone of discharge, and provide for groundwater monitoring of ingredients of commercial remediation products and any site contaminants in the re-injected fluid that do not meet their respective groundwater standards.

e. Injection well permit: The issuance of a site-specific Remedial Action Plan Approval Order by either the Bureau of Petroleum Storage Systems or the Bureau of Waste Cleanup, for injection-type aquifer remediation via the ART System, constitutes the granting of a Class V injection well permit.

f. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the Department has no objection to the use of some wells as ART System injection points. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used as ART System injection points. 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.

g. Groundwater monitoring:

1. Active remediation monitoring of petroleum: During the period of active remediation, groundwater shall be monitored for petroleum contaminants of concern in accordance with the requirements set forth in Section 62-770.700, F.A.C. For non-petroleum cleanups, the monitoring should be conducted in accordance with the provisions of an approved Remedial Action Plan.

2. Post remediation monitoring of petroleum: During the period of post active remediation, groundwater monitoring for petroleum contaminants of concern shall be conducted in accordance with the requirements set forth in Section 62-770.750, F.A.C. For non-petroleum cleanups, the monitoring should be conducted in accordance with the provisions of an approved Remedial Action Plan.

3. Monitoring for underground injection control purposes: The monitoring of groundwater for underground injection control purposes during an ART System remediation project will depend on the remediation products selected for use with this flexible delivery system. If the products unconditionally meet all primary and secondary drinking water standards, and all minimum groundwater criteria as well, then no monitoring for underground injection control purposes is necessary. Any products or equipment configurations that are permitted a temporary injection zone of discharge by rule 62-522.300(2)(c), F.A.C., must propose monitoring as required by that rule, and any products for which a temporary injection zone of discharge is permitted by an order granting a variance must conduct monitoring for the specific parameters covered by the variance.

h. Underground injection control inventory: Remedial Action Plans proposing in situ injection-type aquifer remediation shall include information pursuant to Rule 62-528.630(2)(c)1 through 6, F.A.C., for the inventory purposes of underground injection control. Per Rule 62-528.630(2)(c), F.A.C., aquifer remediation projects involving injection wells may be authorized under the provisions of a Remedial Action Plan, provided the construction, operation, and monitoring requirements of Chapter 62-528, F.A.C., are met. A memorandum outlining the inventory information about injection-type aquifer remediation projects to be transmitted by Department reviewers to the Underground Injection Control Section is provided as enclosure 3.

i. Avoidance of migration: For in situ injection-type aquifer remediation projects, operation of the ART process shall be performed in such a way that no undesirable migration of either the ingredients of the commercial remediation products used or the contaminants of concern in the aquifer results, pursuant to Rule 62-528.630(3), F.A.C.

j. Operating parameters: Section 62-770.700, F.A.C., sets forth frequency requirements for the measurement of bioremediation operating parameters such as dissolved oxygen levels, rates of nutrient addition, temperature, etc. It also includes an option for reduction in the frequency or discontinuation of some measurements in situations when appropriate.

k. Abandonment of wells: Upon issuance of a petroleum Site Rehabilitation Completion Order, or a declaration of "No Further Action", 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 ART System injection wells can be removed from the inventory-tracking list.

l. Shallow galleries: The Bureau of Petroleum Storage Systems believes there may be situations where notification to the Underground Injection Control Section of the Division of Water Resource Management is not necessary, because the ART process is not injecting a remediation fluid, but rather dispersing the fluid via shallow galleries for a soil washing effect that flushes contaminants to the water table, for subsequent collection by a groundwater recovery system. A word of caution is hereby provided to users of the process that this should not be construed as carte blanche to use any remediation product or chemical of choice without regard to its toxicological impact on the groundwater at a remediation site. The toxicological effects of chemicals on groundwater are irrespective of the method by which they are introduced to an aquifer. The minimum groundwater criteria of chapters 62-520 and 62-777, F.A.C., still apply. While notification does not have to be given to the Underground Injection Control Section when a Remedial Action Plan proposing in situ soil washing via shallow galleries is approved, the Bureau would like to provide a reminder that such a Remedial Action Plan should still include groundwater monitoring of any chemical species in the soil washing fluid that are of toxicological concern, and those that exceed a primary or secondary drinking water standard, or a minimum groundwater criterion.

m. Intentions of ART, LLC: Even though a variety of commercial remediation products can be delivered by the ART System, ART LLC, as a prudent measure, has indicated a preference to use only those products already accepted by the Bureau of Petroleum Storage Systems, and to follow the Department's requirements when using them. It should be noted, though, that there is no requirement that a product first be accepted in order to propose its use in a site-specific Remedial Action Plan, provided it meets all applicable and appropriate rules and regulations.

ENCLOSURE 2

SUPPLEMENTAL INFORMATION

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

a. Department of Environmental Protection reviewers of in situ injection-type aquifer remediation plans, regardless of whether in Tallahassee or district offices, must fill in the blanks on the enclosure 3 memorandum, whose subject is "Proposed Injection Well(s) for In Situ Aquifer Remediation at a Petroleum Remedial Action Site". The completed form must be submitted to the Underground Injection Control Section at 2600 Blair Stone Road, Tallahassee, Florida, 32399-2400.

   Only the appropriate Bureau chiefs and division directors within the Department and its district offices may sign in situ injection-type remediation plan approval orders that constitute the granting of a Class V injection permit. Local program staff may review such plans but are not authorized to sign the approval orders. Reason: Although an arrangement between the U.S. Environmental Protection Agency and the Department provides for the delegation of underground injection control authority to the Department, it does not allow the Department to delegate that authority any further. This includes delegation to the Department's contracted remediation review agencies such as those operated by the counties and other local governments.

b. Pilot study: For bioremediation, per Section 62-770.700, F.A.C., a pilot study proposal shall be submitted for review, and a pilot test shall be performed prior to designing a treatment system. If conditions or the situation at a site do not warrant a pilot study, then a proposal explaining the rationale for the decision not to perform a pilot study shall be submitted for review.

c. Bacteria: It is generally reported (on a total weight basis) that bacteria are approximately 70 to 80 percent water. On a dry weight basis, approximately 95 percent of the composition is represented by 5 elements: carbon, oxygen, nitrogen, hydrogen, and phosphorus. At a petroleum remediation site, it is intended that the source of carbon for the growth of bacteria will come from the petroleum hydrocarbons themselves. Natural-occurring organic carbon at a site can also serve as a carbon source for bacteria. Depending on site's specific conditions, the remaining four elements must either be available naturally, or added as macronutrients in order to stimulate bioremediation. Micronutrients must also be present for bacteria to grow.

d. Degradation products: Carbon dioxide and water are the ultimate products of aerobic and most anaerobic biodegradations of hydrocarbons. In the case of methanogenesis, an anaerobic process, carbon dioxide and methane are produced. The intermediate products of aerobic degradation may include simple acids, alcohols, and fatty acids. Aerobic processes use oxygen as an electron acceptor to produce carbon dioxide and water.

e. Parameters: 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. Those who prepare bioremediation plans and their reviewers should determine which parameters, if any, should be investigated on a site-specific basis.

f. Dosage and application: Given that the ART System can deliver a variety of remediation fluids and products, the Bureau of Petroleum Storage Systems suggests that users of the method consult ART to determine a dosage based on the specific remediation product to be applied, and the specific conditions of the site to be remediated. Similar advice is given for the method of application; deciding whether the remediation fluid should be delivered via injection well or shallow gallery will depend on the physical characteristics of the specific site, such as soil type, permeability, the depth interval at which the target contaminants are located, limitations on work space imposed by buildings and other structures at the site, etc.

ENCLOSURE 3

Florida Department of

Memorandum **Environmental Protection**

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

FROM: _____ [see Note 1.]

_____

_____

DATE: _____

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

Pursuant to Paragraph 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 petroleum-contaminated site.

Facility name: _____
Facility address: _____
City/County: _____
Latitude/Longitude: _____
FDEP Facility Number: _____

Facility owner's name: _____
Facility owner's address: _____

_____

_____

_____

Well contractor's name: _____ [see 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: _____

Facility name: _____
FDEP Facility No.: _____

Composition of injected fluid [see Note 3.]
(ingredient, wt. %): _____
_____
_____
_____

Injection volume per well (gallons): _____
Single or multiple injection events: _____
Injection volume total (all wells, all events): _____

A facility 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 HSA/Mud rotary or Sonic *(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 land surface
Grouted interval: _____ to _____ feet below land surface
Casing diameter, if applicable (inches): _____
Cased depth, if applicable: _____ to _____ feet below land surface
Casing material, if applicable: _____

The in situ injection-type aquifer remediation plan for this petroleum contaminated site is intended to meet the groundwater petroleum cleanup criteria set forth in Chapter 62-770, 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 contaminating petroleum 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 Chapters 62-520 and 62-777, 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).

Facility name: _____
FDEP Facility No.: _____
Date: _____

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 the USEPA, the FDEP cannot delegate this authority. Local programs, after reviewing a Remedial Action Plan or an injection proposal document, should prepare the Approval Order and route it to Tallahassee for Bureau Chief's signature, and then complete this form. This form is primarily for use by state and local program technical reviewers, but petroleum remediation contractors may fill in all blanks except those labeled "FROM" and "DATE" on page 1, and the 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, F.A.C. 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.