

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

September 30, 2008

Tyler D. Perry
BioRemedial Technologies, Inc.
2700 Kirila Drive
Hermitage, Pennsylvania 16127

**Re: BioRemedial Technologies, Inc. (BRT)
BRT Nutrient Formula**

Dear Mr. Perry:

The Bureau of Petroleum Storage Systems (the Bureau) hereby accepts the BioRemedial Technologies Incorporated formulation of inorganic macro- and micro-nutrients (BRT nutrients) for the bioremediation of petroleum contamination in groundwater and soil, in situ and ex situ. This acceptance does not eliminate the requirement that a site-specific Remedial Action Plan be submitted to the Department for review and approval prior to the commencement of a cleanup. A voucher for the confidential disclosure of the proprietary ingredients for the formulation is provided as Enclosure 1. Regulatory information regarding its use is provided in Enclosure 2, and to aid regulatory agency reviewers, supplemental information is provided in Enclosure 3.

While the Bureau of Petroleum Storage Systems does not provide endorsement of specific or brand name remediation products or processes, it does recognize the need to determine their acceptability in the context of environmental regulations, protection of public health, and safety. The Bureau emphasizes a distinction between its regulatory acceptance and an approval, as products and processes are accepted but they are not approved. An acceptance shall not be construed as a certification of performance, nor shall it be construed as a preference on the part of the Bureau. As is the case with any other remediation product or process, vendors and environmental consulting companies must market them on their own merits in regard to performance, cost, and safety in comparison to competing alternatives in the marketplace.

Remedial Action Plans that propose the use of an accepted product should include a copy of the acceptance letter in the Remedial Action Plan's appendix, and reference it in the text of the document. The Bureau also emphasizes that it is not a requirement that a particular remediation product or process have an 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.

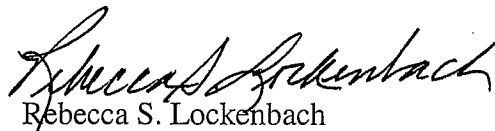
Tyler D. Perry
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The Bureau reserves the right to revoke its acceptance of a product or process if it has been falsely or incompletely represented. Additionally, Bureau acceptance of any product or process does not imply it has been deemed applicable 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 Remedial Action Plan submitted to the Department for review and approval. Please contact Rick Ruscito at (850) 877-1133, extension 3722, if there are any technical questions.

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

c: T. Conrardy - FDEP/Tallahassee

PROPRIETARY INGREDIENTS VOUCHER

Florida Department of
Environmental ProtectionBob Martinez Center
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September 30, 2008

Tyler D. Perry
BioRemedial Technologies, Inc.
2700 Kirila Drive
Hermitage, Pennsylvania 16127**Re: Voucher for Disclosure of Proprietary Ingredients for BRT Nutrient Formula**

The Bureau of Petroleum Storage Systems hereby acknowledges the submittal of an August 29, 2008 confidential disclosure by BioRemedial Technologies Incorporated, listing the proprietary ingredients and their concentrations in BRT Nutrient Formula. It is a formulation of macro- and micro-nutrients for the bioremediation of petroleum contaminants in groundwater and soil. The formulation does not contain microorganisms.

The Bureau hereby vouches for the content of the confidential disclosure, and indicates that the "typical" application will not require permission for a temporary injection zone of discharge via Rule 62-522.300(2)(c), Florida Administrative Code (F.A.C.), for the direct injection, re-injection and re-infiltration of BRT nutrients. In the "typical" application, the user adds 999 volumes of clean water to 1 volume of "as-shipped" aqueous BRT nutrients concentrate prior to use. The Bureau, using the information in the confidential disclosure, calculates that the volumetric dilution ratio prior to use can be as low as 551 to 1 without requiring permission for a temporary injection zone of discharge.

If there should ever be a need to inject (or re-inject or re-infiltrate) BRT nutrients at a higher concentration (i.e. a dilution ratio of less than 551 to 1) then advice in regard to permission for a temporary injection zone of discharge, and groundwater monitoring for Underground Injection Control compliance purposes is provided in Enclosures 2 and 3 of this acceptance.

Aquifer remediation plans proposing the injection of BRT nutrients must indicate the volume and composition of the fluid to be injected. Since the individual ingredients and their proportions are proprietary, it will suffice to indicate just the overall volumetric concentration of BRT nutrients in the fluid to be injected and the total volume of that fluid, and then provide a footnote indicating that a one-time confidential disclosure dated August 29, 2008 identifying the individual ingredients and their proportions has already been submitted to the Department.

This voucher is issued for the purposes of the Bureau of Petroleum Storage Systems, for the remediation of petroleum-contaminated sites. Other bureaus, agencies and local governments may choose to recognize this voucher if their needs are similar. The Bureau of Petroleum Storage Systems, however, is not responsible for applications beyond its jurisdiction. Please direct any questions regarding this voucher to Rick Ruscito at (850) 877-1133, extension 3722.

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

REGULATORY INFORMATION

1. Regulations: Users of the BRT nutrients shall ensure that all applicable groundwater contaminant standards are met at the time of project completion, for the contaminants of concern, any residuals associated with the ingredients of BRT nutrients, and any byproducts of concern produced as a result of chemical or biochemical reactions involving those ingredients. 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 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.
2. Temporary injection zone of discharge: Based on the information provided by BioRemedial Technologies Incorporated, BRT nutrients will usually not need permission for a temporary injection zone of discharge. Three situations are discussed below. The first two are in regard to direct injection, re-injection and re-infiltration of BRT nutrients; the third is in regard to the re-injection and re-infiltration of partially treated petroleum contaminants of concern.
 - a. Direct injection of BRT nutrients: The Bureau of Petroleum Storage Systems has determined, based on information provided by BioRemedial Technologies Incorporated, that permission for a temporary injection zone of discharge is not needed for direct injection of aqueous BRT nutrients if the user, prior to injection, dilutes one (1) volume of the "as-shipped" concentrate with at least 551 volumes of clean water. If less than 551 volumes of water will be added (in order to inject a more concentrated fluid) then see paragraph 2 of Enclosure 3 for chemical species at lower dilution ratios that will require permission for a temporary injection zone of discharge via Rule 62-522.300(2)(c), F.A.C. BioRemedial Technologies Incorporated has indicated that the typical dilution prior to use is 999 volumes of water to 1 volume of concentrate. Since this 999 to 1 ratio is well-above the minimum of 551 to 1, permission for a temporary injection zone of discharge will not be needed for the typical dosage of BRT nutrients when they are directly injected.
 - b. Re-injection and re-infiltration of BRT nutrients: Permission for a temporary injection zone of discharge via Rule 62-522.300(2)(c), F.A.C., is not necessary if the re-injected or re-infiltrated fluid is no more concentrated than the 551:1 ratio above. If the fluid will be more concentrated, then see paragraph 2 of Enclosure 3 for chemical species at various concentrations that will require permission for a temporary injection zone of discharge.

Remedial Action Plans proposing re-injection or re-infiltration will have to determine whether or not a temporary injection zone of discharge is needed for BRT nutrients in the fluid stream that is re-injected or re-infiltrated. If calculating the exact BRT nutrients concentration in this stream becomes too complicated to be worth its while, then the Bureau of Petroleum Storage Systems suggests the following simplified 3-step approach for a conservative estimate: (1) estimate the total volume of "as-shipped" BRT nutrients concentrate that will be used over the life of the re-injection or re-infiltration project; (2) calculate the volume of contaminated groundwater in the area where treatment will

occur, taking into account the porosity of the aquifer; (3) divide the volume of groundwater from step 2 by the total volume of "as-shipped" concentrate from step 1 to determine the volumetric ratio. If the ratio is less than 551, then use the table in paragraph 2 of Enclosure 3 to identify the chemical species that will need permission for a temporary injection zone of discharge via Rule 62-522.300(2)(c), F.A.C.

- c. Re-injection and re-infiltration of petroleum contaminants of concern: If the groundwater petroleum contaminants of concern at a site are fully treated by an aboveground remediation system to the cleanup target levels of Chapter 62-777, F.A.C., prior to re-injection or re-infiltration, then it is not necessary to obtain permission for a temporary injection zone of discharge for the contaminants. If, however, the aboveground remediation system only partially treats the contaminants, and the effluent does not meet the cleanup target levels of Chapter 62-777, F.A.C., prior to re-injection or re-infiltration, then it will be necessary to obtain permission for a temporary injection zone of discharge by way of Rule 62-522.300(2)(c), F.A.C., to re-inject or re-infiltrate the partially-treated petroleum contaminants of concern.
3. Class V injection-type aquifer remediation wells: Per Rule 62-528.630(2)(c) in the December 27, 2005 revision of Chapter 62-528, F.A.C., Class V injection-type aquifer remediation wells are exempt from the permitting requirements of Rule 62-528.635, F.A.C., provided they are authorized under the provisions of a Remedial Action Plan or other enforceable mechanism, and provided that 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. In other words, the issuance of an enforceable, site-specific Remedial Action Plan Approval Order by the Department for injection-type aquifer remediation using BRT nutrients constitutes the granting of a Class V injection well construction/clearance permit.
4. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then there is no objection to the use of some wells for the injection of BRT nutrients. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used as a treatment point. This will avoid a premature conclusion that the entire site meets cleanup goals. By avoiding the use of designated wells as treatment points, there will be more assurance that BRT nutrients have permeated and treated the entire site, and that they did not remain localized to the immediate area surrounding each treatment point.
5. Avoidance of migration: Per Rule 62-528.630(3), F.A.C., in situ, injection-type aquifer remediation projects shall be conducted in such a way that there is no undesirable migration of either the remediation agents used or the contaminants of concern.
6. 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 Class V aquifer remediation wells can be removed from the inventory-tracking list.

7. Open-pit application: The introduction of BRT nutrients to an open excavation pit in which the groundwater has been exposed, or to a dry open pit from which the nutrients can percolate into the underlying groundwater is not an injection. For such non-injection applications, notification of the Underground Injection Control Section is not required. This, however, should not be interpreted as carte blanche to indiscriminately introduce remediation agents to the subsurface without first giving consideration to the toxicological impacts of their ingredients on the groundwater.

The advice offered by the Bureau of Petroleum Storage Systems for the addition of remediation reagents to an open pit is to monitor the groundwater as if the application had in fact been an injection and subject to Underground Injection Control regulations. In the case of BRT nutrients, no monitoring of the groundwater is necessary if the fluid introduced to the pit is "as-shipped" BRT nutrients concentrate that has first been diluted with 551 or more equivalent volumes of clean water. The volume of groundwater that is already in the pit shall not be included in the calculation of the ratio. If the ratio is less than 551, then see paragraph 2 of Enclosure 3 for chemical species in the groundwater that should be monitored.

For relatively small pits, after backfilling, the installation of at least one monitoring well in the center area, for monitoring of BRT nutrients' chemical species of concern on a quarterly basis should suffice. Continue the monitoring until the BRT nutrients' chemical species of concern meet their respective groundwater standards or their natural-occurring background levels at the site, whichever is less stringent.

SUPPLEMENTAL INFORMATION

1. Underground Injection Control notification: Remediation 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 underground injection control. The regulatory reviewer, upon issuance of an enforceable Approval Order for an injection plan, must notify the Underground Injection Control Section about the injection by using the notification memorandum provided in Enclosure 4, regardless of whether or not the fluid to be injected requires permission for a temporary injection zone of discharge.
2. Most applications of BRT nutrients will not require permission for a temporary injection zone of discharge. In a typical application, the user, in the field prior to injection, will add nine hundred ninety-nine (999) volumes of clean water to one (1) volume of "as-shipped" BRT nutrients concentrate. Based on the information provided by Bioremedial Technologies Incorporated in its confidential disclosure of propriety ingredients, no temporary injection zone of discharge or monitoring of groundwater for underground injection control purposes is necessary for this 999 to 1 ratio. However, in order to provide as much flexibility as possible to the users of BRT nutrients, the Bureau of Petroleum Storage Systems, using the proprietary information, calculates that a volumetric dilution ratio as low as 551 to 1 can be used without triggering the need for a temporary injection zone of discharge or the monitoring of groundwater for underground injection control purposes.

Dilution ratios of less than 551 to 1, should they ever be necessary, will require permission for a temporary injection zone of discharge and monitoring per the table below. The table does not divulge the identity of any chemical compound that is a proprietary ingredient but rather lists only the chemical groups of regulatory concern that will be present in the injection fluid as a result of all the ingredients combined.

If the volumetric dilution ratio of clean water to BRT nutrients concentrate will be as low as:	Then permission for a temporary injection zone of discharge via Rule 62-522.300(2)(c), F.A.C., will be needed for:						
	<u>Ammonia Nitrogen</u>	<u>Molybdenum</u>	<u>Cobalt</u>	<u>Iron</u>	<u>Manganese</u>	<u>Zinc</u>	<u>Sulfate</u>
550 to 1	X						
72 to 1	X	X					
51 to 1	X	X	X				
19 to 1	X	X	X	X			
8 to 1	X	X	X	X	X		
2 to 1	X	X	X	X	X	X	
0 to 1	X	X	X	X	X	X	X
Current Florida groundwater standard (mg/L):	2.8	0.035	0.14	0.3	0.05	5	250

3. Obtaining permission for a temporary injection zone of discharge: BRT nutrients can be introduced to the subsurface either by direct injection, re-injection or re-infiltration. If the concentration of the fluid introduced to the subsurface is such that any of the chemical species in the table above does not meet its respective primary or secondary drinking water standard, or its respective minimum groundwater criteria, then permission for a temporary injection zone of discharge is needed. Such permission can be obtained by way of Rule 62-522.300(2)(c), F.A.C. In order for users of BRT nutrients to obtain permission by way of this rule, the site-specific Remedial Action Plan that they submit for Department approval must: (a) identify the chemical species and parameters in the fluid that will need permission for a temporary injection zone of discharge; (b) specify the amount of time that is requested for the temporary injection zone of discharge; (c) specify the size of the zone ; and (d) provide for groundwater monitoring of the chemical species for which the temporary injection zone of discharge is sought. Additional information about temporary injection zones of discharge can be found in Bureau of Petroleum Systems' guidance document "BPSS-10, In Situ Chemical Additives", currently located at web page www.dep.state.fl.us/waste/categories/pcp/pages/active.htm.
4. Groundwater monitoring: A distinction can be made between two categories of groundwater monitoring that are conducted during the course of aquifer remediation. The first category is that which is always conducted, regardless of the cleanup method employed, to monitor the concentration of the petroleum contaminants of concern. The second category is that which is conducted to monitor the concentration of chemical species of interest in remediation agents like BRT nutrients when the cleanup method involves the injection, re-injection or re-infiltration of such agents into the groundwater. Chapter 62-528, F.A.C., Underground Injection Control, and Chapter 62-522, F.A.C., Groundwater Permitting and Monitoring Requirements, are the major regulations that apply to the latter type of monitoring.

For in situ, injection-type aquifer remediation, monitoring for Underground Injection Control purposes must be addressed in a Department-approved Remedial Action Plan for any chemical species and parameters in the injected or re-injected/re-infiltrated fluid that do not meet their primary, secondary or minimum groundwater criteria. Upon expiration of the time permitted for a temporary injection zone of discharge, either by Rule 62-522.300(2)(c), F.A.C., or by variance, each chemical species and parameter for which the temporary zone was established must meet its respective groundwater water standard, or be no worse than its natural-occurring background level at the cleanup site, whichever is less stringent. In most cases, the Bureau of Petroleum Storage Systems anticipates that monitoring on a quarterly basis for underground injection control purposes will suffice.

5. Frequency and volumetric application rate of BRT nutrients: A typical volumetric application rate, irrespective of the concentration of nutrients, is one (1) gallon per cubic yard of contaminated subsurface every other month. This is for information only, as the application rate may vary due to site specific conditions.

Florida Department of
Memorandum Environmental Protection

TO: Cathy McCarty, P.G.
Bureau of Water Facilities Regulation
Underground Injection Control Section – MS 3530

FROM: _____

DATE: _____

SUBJECT: **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: _____

Well contractor's address: _____

AFFECTED AQUIFER

Name of aquifer: _____

Depth to groundwater (feet): _____

Aquifer thickness (feet): _____

Areal extent of contamination (square feet): _____

INJECTION WELLS

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

PROJECT DESCRIPTION

The in situ, injection-type aquifer remediation product/process remediates petroleum by:

(check those that apply)

☐ bioremediation,☐ chemical oxidation, or☐ other (describe) _____

Brief description of the project: _____

Summary of major design considerations and features of the project:

Number of injection wells: _____

Injection volume per well (gallons): _____

Single or multiple injection events: _____

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

FLUID TO BE INJECTEDComposition of injected fluid (ingredient, wt. %): _____
_____**TEMPORARY INJECTION ZONE OF DISCHARGE (ZOD)**

(check those that apply)

- ☐ No ZOD needed. The fluid to be injected meets the primary and secondary drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater quality criteria set forth in Chapters 62-520 and 62-777, F.A.C.
- ☐ ZOD permission by paragraph 62-522.300(2)(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. ZOD permission by this paragraph also applies to chemical species in the fluid to be injected that exceed primary groundwater standards or minimum groundwater criteria, provided those species are prime constituents of the reagents used to remediate site contaminants. The list of chemical species and parameters for which the approved remediation plan identifies zone size, duration and groundwater monitoring are as follows:

- ☐ ZOD permission by paragraph 62-522.300(2)(c), F.A.C., for the following petroleum products' contaminants of concern that exceed their groundwater standards in the fluid to be re-injected as part of a closed-loop re-injection system for which the approved remediation plan identifies zone size, duration and groundwater monitoring:

- ☐ ZOD permission by variance because the fluid to be injected contains the following impurities that are not prime constituents of the reagents used to remediate the site's contaminants, and the concentrations of those impurities in the fluid to be injected are in excess of their primary groundwater standards:

- ☐ A variance needs to be granted before the remediation can be conducted.
- ☐ A variance has already been granted for the impurities listed above:
Date variance granted: _____
Zone size (square feet): _____
Duration (months): _____
- ☐ If ZOD permission by paragraph 62-522.300(2)(c), F.A.C., or by variance is checked above, then a figure that delineates the ZOD is attached, or
- ☐ The ZOD is described as follows: _____

CLEANUP CRITERIA AND ENFORCEABLE APPROVAL ORDER

The in situ injection-type aquifer remediation plan for this petroleum contaminated site is intended to meet the groundwater petroleum cleanup criteria referenced 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 product 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).

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.