



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

August 10, 2009

Brian Garner, P.E.
Aqua Clean Engineering Services
661 Maplewood Drive, Suite 15
Jupiter, Florida 33458

Re: **Aqua Kleen**

Dear Mr. Garner:

The Bureau of Petroleum Storage Systems hereby reaffirms and updates its May 20, 2004 acceptance of Aqua Kleen for soil washing, and as an adjunct agent for the bioremediation of petroleum hydrocarbons in groundwater, in situ and ex situ.

Aqua Kleen is a blend of biodegradable surfactants that produce a colloidal effect upon contact with petroleum in the presence of water. It is not so much intended as a stand-alone remediation product as it is for use in combination with microorganisms and enzymes. Aqua Kleen is shipped as a concentrate that is diluted with water in a 100:1 volumetric ratio by the user prior to application. Enclosure 1 is a voucher for the confidential disclosure of its proprietary ingredients to the Florida Department of Environmental Protection.

This letter supersedes the original May 20, 2004 acceptance of Aqua Kleen that was issued to Coleman Labs LLC. Although there has been a change in the name of the firm, the formulation of Aqua Kleen itself remains the same, but there are two noteworthy changes in this update. First, the Bureau of Petroleum Storage Systems, having re-evaluated the formulation, now advises that site-specific Remedial Action Plans proposing the use of Aqua Kleen seek permission for a temporary injection zone of discharge, for surfactant, pursuant to rule 62-522.300(2)(c), Florida Administrative Code (F.A.C.). The second noteworthy change is an updating of Enclosure 4 to the most recent revision of the Underground Injection Control Notification Memorandum.

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, 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 jurisdiction.

For injection-type, in situ groundwater remediation via direct injection of Aqua Kleen into an aquifer, there are underground injection control (UIC) regulations that must be observed. Since injection-type remediation 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.

The Bureau recognizes Aqua Kleen as a viable product for the cleanup of petroleum-contaminated sites in Florida. There are no objections to its use provided: (a) a site-specific Remedial Action Plan is submitted pursuant to Chapter 62-770, F.A.C., for Department review and approval; and (b) the Remedial Action Plan seeks permission for a temporary injection zone of discharge for surfactant by addressing the requirements of rule 62-522.300(2)(c), F.A.C. Some major environmental and regulatory considerations that apply to Aqua Kleen are listed in Enclosure 2.

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 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. For chemical and biological products and processes, the portions of the Florida Administrative Code pertaining to underground injection control and groundwater quality will usually be the most important.

It is suggested that Remedial Action Plans proposing the use of Aqua Kleen include a copy of this letter, in its entirety, as an appendix. In this way, technical reviewers throughout the state will be informed that you have contacted the Department of Environmental Protection to inquire about the environmental acceptability of Aqua Kleen. To aid those reviewers, the Bureau of Petroleum Storage Systems provides supplemental information as Enclosure 3.

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 a Remedial Action Plan. You may contact me at (850) 877-1133, extension 3722 if there are any 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

Enclosures: (1) Proprietary Ingredients Voucher for Aqua Kleen
(2) Regulatory Information
(3) Supplemental Information
(4) Underground Injection Control Notification Memorandum

c: T. Conrardy - FDEP/Tallahassee

History:

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5/20/04

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inn_115a
8/10/09



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August 10, 2009

Brian Garner, P.E.
Aqua Clean Engineering Services
661 Maplewood Drive, Suite 15
Jupiter, Florida 33458

Re: **Proprietary Ingredients Voucher for Aqua Kleen**

Dear Mr. Garner:

On May 6, 2004, the Bureau of Petroleum Storage Systems received from Coleman Labs LLC a confidential disclosure regarding the proprietary ingredients and their proportions in the adjunct remediation agent known as Aqua Kleen, for the cleanup of petroleum-contaminated groundwater and soil pursuant to Chapter 62-770, F.A.C. Aqua Kleen is a blend of biodegradable surfactants, mostly nonionic but also including anionic and amphoteric. They produce a colloidal effect upon contact with petroleum in the presence of water. Aqua Kleen is shipped as a concentrate that is diluted with water in a 100:1 volumetric ratio by the user prior to application.

The Bureau also acknowledges receipt of supplemental correspondence dated May 18, 2004 from Coleman Labs LLC, indicating that one (1) particular proprietary surfactant, mentioned in the May 6, 2004 list of ingredients, would be omitted from the Aqua Kleen surfactant blend that is marketed in Florida for groundwater remediation. The purpose of the elimination was to make Aqua Kleen more environmentally benign. The amount of the eliminated surfactant was minor in comparison to the amounts of those that remained, and its absence would have a negligible effect on performance.

For underground injection control purposes, Remedial Action Plans proposing in situ, injection-type aquifer remediation must provide the volume and composition of the fluid to be injected. Since the composition of the Aqua Kleen fluid to be injected is proprietary, it will suffice in a Remedial Action Plan to just indicate the total volume of the fluid to be injected, its overall concentration of Aqua Kleen, and to attach as an appendix, a copy of this August 10, 2009 acceptance letter that includes this voucher for the one-time confidential disclosure of the proprietary ingredients and their proportions.

Brian Garner, P.E.

August 10, 2009

Page 2

Aqua Kleen Voucher

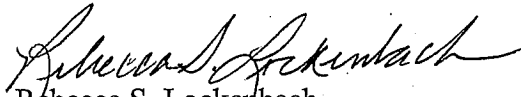
The Remedial Action Plan proposing the use of the Aqua Kleen must also address the requirements of rule 62-522.300(2)(c), F.A.C., in order for Department approval of the plan to also constitute the granting of permission for a temporary injection zone of discharge for surfactant.

Remediation plan reviewers for petroleum-contaminated site applications involving Aqua Kleen may contact me 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

ENCLOSURE 2

REGULATORY INFORMATION

- a. Groundwater cleanup standards: The onus shall be on users of Aqua Kleen to ensure that all applicable groundwater standards will be met at the time of project completion, for petroleum, other contaminants that may be present, any residuals associated with the ingredients of Aqua Kleen, 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, and minimum criteria; 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., also for minimum groundwater criteria.
- b. Injection well permit: Pursuant to 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 remediation by injection of Aqua Kleen into an aquifer also constitutes the granting of a Class V injection well permit.
- c. Groundwater injection standards: For in situ aquifer remediation, the composition of an injected fluid must meet the drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater criteria set forth in 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 contaminants are also listed in Chapter 62-777, F.A.C. If the fluid to be injected does not meet drinking water standards, then permission must be sought for a temporary injection zone of discharge.
- d. Permission for a temporary injection zone of discharge (ZOD): Even though Aqua Kleen concentrate will be highly diluted with water in a 100:1 volumetric ratio by the user prior to application, the resulting 1% solution to be injected still does not meet the 0.5-milligram per liter (mg/L) secondary drinking water standard for surfactant that is set forth in Chapter 62-550, F.A.C. For that reason, it will be necessary for each site-specific Remedial Action Plan proposing the use of Aqua Kleen to request permission for a temporary injection zone of discharge. In fact, for all practical purposes, it will always be necessary to request such permission for the injection of Aqua Kleen, since the threshold dilution ratio that no longer requires a ZOD --- as calculated by the Bureau of Petroleum Storage Systems using the proprietary proportions of ingredients --- is an impractical 61,855 parts water to 1 part Aqua Kleen.

Each site-specific Remedial Action Plan that seeks permission for a temporary injection zone of discharge for Aqua Kleen must: (1) indicate that surfactant is the parameter for which ZOD permission is sought; (2) indicate the size of the zone that is requested; (3) indicate the

time period for which the temporary zone is requested; and (4) provide for post injection monitoring of the groundwater for surfactant.

The size of the discharge zone for a single injection point is usually considered to be its injection radius of influence. For projects in which more than a single injection point is used, and the points are closely spaced, the size of the zone can be described by the dimensions that result for the entire cluster.

For the post injection monitoring of surfactant in the groundwater at most sites, two (2) samples on a quarterly basis should suffice: one taken from a monitoring well located approximately at the center of the injection area, and the other taken at a downgradient monitoring well to guard against unwanted migration. Sites for which a large number of injection points have been used to treat a large area of concern may require more surfactant monitoring points in order to be representative.

By the expiration of the time period for which a ZOD was sought, the concentration of surfactant in the groundwater must not be in excess of its 0.5 mg/L secondary drinking water standard or the site's natural-occurring background level, whichever is less stringent. If the concentration of surfactant in the groundwater meets this requirement prior to expiration of zone time, then its monitoring can cease earlier.

- e. Analysis of groundwater samples for surfactant: Chapter 62-550, F.A.C., describes surfactants as foaming agents (albeit all do not necessarily foam) and sets forth the secondary drinking water standard of 0.5 mg/L, maximum, for them. Chapter 62-550, F.A.C., also cites, as an acceptable method for the analysis of surfactants, Standard Method SM 5540. The Bureau of Petroleum Storage Systems, having reviewed the proprietary list of surfactants blended into Aqua Kleen, and having searched the literature for some additional information about them, notes that most are of the nonionic type. For that reason, the Bureau suggests that groundwater samples containing Aqua Kleen be analyzed by Standard Method SM 5540 D for nonionic surfactants.
- 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 for the application of Aqua Kleen. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply Aqua Kleen. 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. Additives: Aqua Kleen is an adjunct remediation agent intended for use in combination with other bioremediation products. The onus is on the user to make sure that the use of those other products is in accordance with the underground injection control requirements of Chapter 62-528, F.A.C., which require that substances injected meet the drinking water standards set forth Chapter 62-550, F.A.C., the minimum groundwater criteria of Chapter

62-520, F.A.C., and the additional minimum groundwater criteria for the specific chemicals listed in Chapter 62-777, F.A.C. If any of the other products used in combination with the Aqua Kleen does not meet these requirements, then it will be necessary to obtain permission for a temporary injection zone of discharge. Depending on the chemical composition of those other products to be injected, permission will be granted either by way of rule 62-522.300(2)(c), F.A.C., or by petitioning the Department's Division of Water Resource Management for a variance. It is also possible that, in some cases, the chemical composition of a product could be such that some of its constituents will have to obtain permission by rule, while others may have to obtain permission by variance.

h. Three types of groundwater monitoring:

1. Active remediation monitoring: During the period of active remediation, groundwater shall be monitored in accordance with the requirements set forth in Section 62-770.700, F.A.C., for the petroleum contaminants of concern.
 2. Post remediation monitoring: At least one (1) year of quarterly post remediation groundwater monitoring shall be conducted in accordance with the requirements of Section 62-770.750, F.A.C., for the petroleum contaminants of concern.
 3. Underground injection control monitoring: Since the Aqua Kleen solution to be injected will contain surfactant in excess of its 0.5-mg/L secondary drinking water standard, it will be necessary to monitor the groundwater for surfactant in the temporary injection zone of discharge pursuant to rule 62-522.300(2)(c), F.A.C. As indicated in paragraph d above, two (2) samples on a quarterly basis should suffice: one taken from a monitoring well located approximately at the center of the injection area, and the other taken at a downgradient monitoring well to guard against unwanted migration.
- i. Underground injection control inventory: Remedial Action Plans proposing injection-type, in situ 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. A memorandum outlining the information to be transmitted by Department reviewers to the Underground Injection Control Section is provided as Enclosure 4.
- j. Avoidance of migration: For injection-type, in situ aquifer remediation projects, injection of Aqua Kleen 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 petroleum contaminants in the aquifer results. [Rule 62-528.630(3), F.A.C.]
- k. Abandonment of wells: Upon issuance of a Site Rehabilitation Completion Order, or a declaration of "No Further Action", injection wells shall be abandoned pursuant to 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

SUPPLEMENTAL INFORMATION

- a. Pilot study: For bioremediation, per rule 62-770.700(2), 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 to forego a pilot study shall be submitted for review.
- b. Dosage and application rate: The Bureau of Petroleum Storage Systems recommends that users consult Aqua Clean Engineering Services to determine a site-specific dosage and application rate for Aqua Kleen.
- c. Oxygen: Since emulsification of petroleum hydrocarbon contaminants by Aqua Kleen is followed by aerobic biodegradation, the Bureau of Petroleum Storage Systems hereby provides a reminder to make sure that sufficient oxygen is available at each site where Aqua Kleen will be used. If sufficient oxygen is not available, then it will have to be added in order to create conditions conducive for microorganisms to thrive. For aquifer remediation, the concentration of dissolved oxygen in the groundwater can be increased by either installing air sparges, direct injection of oxygen from a gas cylinder, or chemically by way of a peroxide. Users should contact the manufacturer to determine which method would be most appropriate for a given set of site-specific conditions.

Memorandum**Florida Department of
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 INJECTED

Composition 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.