



Jeb Bush
Governor

Department of Environmental Protection

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

Colleen M. Castille
Secretary

April 4, 2005

Mr. Donald Dunning
Clear Solutions
P.O. Box 94
Chapin, South Carolina 29036

Re: Nale-It

Dear Mr. Dunning:

The Bureau of Petroleum Storage Systems hereby accepts Nale-It, an enhanced aerobic bioremediation process for the degradation of petroleum contaminants, either in situ or ex situ. Nale-It contains only dilute, biodegradable surfactants and is applied topically. It does not contain microorganisms or nutrients. Instead, it relies on a native soil amendment to supply indigenous microorganisms, and increases the population of them by 2 to 3 orders of magnitude, usually within the first few days of treatment. As you have indicated, the Nale-It process is best suited for the remediation of soil that is highly contaminated by petroleum hydrocarbons; for example: 3 to 20 percent by weight.

The process can be applied in several ways. One way is an ex situ biocell process that is similar to ex situ land farming. Another way is an ex situ, self-contained mobile batch treatment process that handles 90 to 120 cubic yards of contaminated media at a time. Still, another way is an in situ "disturbed" treatment process in which earth-moving equipment is used to mix the soil amendment and Nale-It in place. The contaminated media being remediated is not excavated, but rather "disturbed" in place by the mixing.

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 Nale-It as a viable process for the remediation of petroleum contaminated sites in Florida. There are no objections to its use provided the considerations of this letter are taken into account, and a Remedial Action Plan for each cleanup site is approved by the Department. For Nale-It, the major environmental and regulatory considerations are discussed 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, safety and welfare. Vendors must then market the products and processes on their own merits regarding performance, cost and safety in

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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.

Furthermore, 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 Nale-It's 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 29, or at the letterhead address, Mail Station 4590, 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

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

Tom Luster - SPL Control LLC, P.O. Box 627, Elmore City, Oklahoma 73433

ENCLOSURE 1

ENVIRONMENTAL AND REGULATORY INFORMATION

- a. Applicable and appropriate rules and regulations: For ex situ biocell applications of Nale-It, a process similar to land farming, the Bureau of Petroleum Storage Systems suggests that Rule 62-770.300(2)(b), F.A.C., be used as a guide. Although this rule was written for conventional land farming and not specifically for Nale-It, there are aspects of it are applicable and appropriate; for example: the operation should be at least 200 feet away from any residence, school, or park; the area must be secured to prevent accidental or intentional public entry, and prevent human exposure to contaminated soil; monitoring and sampling is required; the soil cleanup target levels of Chapter 62-777, F.A.C., apply; and the degree to which the soil is remediated will determine whether it must remain on-site or may be removed. As for the engineering and operating aspects of Nale-It when used in the ex situ biocell mode, it appears that sufficient thought has been given by Clear Solutions in regard to the need for lining, diking, layering, tilling and sampling, all of which are similar to conventional land farming.
- b. Groundwater cleanup standards: The onus shall be on users of Nale-It to ensure that all applicable groundwater contaminant standards are met by the time of project completion, for the contaminants of concern, any residuals associated with the ingredients of Nale-It, 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 62-770, 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 the introduction 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.

- c. Ex situ mode: A confidential disclosure of the proprietary surfactants in Nale-It has been made to the Bureau of Petroleum Storage Systems by the manufacturer, SPL Control LLC, Elmore City, Oklahoma. The Bureau of Petroleum Storage Systems, upon receipt of the information, has taken into consideration the following: the type of surfactants; their relatively dilute concentration "as shipped" by the manufacturer; the additional 20:1 dilution that will be performed by users prior to topical application of Nale-It; the EPA's Oil Program Center's listing of Nale-It on the National Contingency Plan (NCP) for petroleum cleanup; and biodegradation test results in report M1144 by EFEH & Associates, dated August 24, 2000, that indicate Nale-It is capable of 100 percent biodegradation in 16 days. The Bureau of Petroleum Storage Systems believes that the foregoing, taken together, offer reasonable assurance that Nale-It, when used as directed, for the beneficial purpose of remediating soil that is already highly contaminated with petroleum hydrocarbons, does not pose a problem in regard to toxicity.

At petroleum cleanup sites where the Nale-It process is implemented ex situ, in either a biocell or a batch treatment vessel, the Bureau's toxicological concerns about the surfactants from both a human and environmental standpoint are minimal since both of the methods physically confine and isolate the contaminated soil being remediated. The rationale for minimal concern is that the surfactants, with a relatively quick degradation time period in comparison to the petroleum contaminants being remediated, should be completely degraded by the time the petroleum contaminants are destroyed. Thus, the treated soil, when removed from the biocell or released from the batch treatment vessel and returned to the site will not carry a residual surfactant problem with it.

- d. In situ mode: The in situ "disturbed" mode of the Nale-It process uses earth-moving equipment to mix the Nale-It surfactants, water, and native soil amendments in a trench. Although the mixture is not contained as tightly as in the ex situ methods, the Bureau believes that the rationale discussed in preceding paragraph *c* about the dilute concentration and the biodegradability of Nale-It still applies. And at sites where the in situ mixing of Nale-It extends into the water table, the product will serve to remediate contaminated groundwater as well.
- e. Groundwater monitoring: For in situ treatments, Nale-It is applied topically and then mixed into the subsurface. This is not an injection, so notification of the Department's Underground Injection Control Section is not necessary. However, this does not give the user carte blanche to introduce just any type of remediation chemical into the groundwater without any consideration at all to human and environmental toxicology, because the minimum groundwater criteria of Chapter 62-520, F.A.C., listed in paragraph *b* above, still apply. Therefore, as a prudent measure, **Remedial Action Plans proposing the in situ use of Nale-It shall include a monitoring schedule for foaming agents in the groundwater** if the in situ mixing occurs close to, or extends into the water table.

The number and frequency of samples for the foaming agents should be tailored to the size of the contamination plume being remediated. The Bureau suggests at least one groundwater sample be taken from an unaffected area outside the plume before the Nale-It is applied, in order to establish the background level of foaming agents, and then take at least one groundwater sample on a quarterly basis from the plume area where the Nale-It was applied. A year's worth of quarterly sampling should be sufficient, and sampling may be discontinued or reduced in frequency as the foaming agents reach their secondary drinking water standard, or the site's background concentration, whichever is less stringent.

Foaming agents, as a group, are regulated as a secondary drinking water contaminant by Chapter 62-550, F.A.C., which sets a maximum allowable concentration of 0.5 milligrams per liter. The Code of Federal Regulations (40 CFR 143) cites Standard Method SM 5540 C as an acceptable analytical method for foaming agents. And while the Bureau of Petroleum Storage Systems is not obligated to identify or develop an analytical method for any remediation product or process, it would still like to pass along any information that it believes may be helpful. In this case, it may be helpful to know that Nale-It contains both anionic and non-ionic surfactants. It appears that Standard Method SM 5540C is directed toward anionics, while SM 5540D is directed toward non-ionics. Additionally, method SM 5540B describes surfactant separation by sublation. The Bureau suggests that users consult their laboratory for advice on which method(s) will yield the most accurate results for a low

concentration mixture of both anionic and non-ionic surfactants in a groundwater sample. And lastly, even though the term "foaming agents" is used for the analysis of surfactants, prospective users of Nale-It should know that the process does not create an oozing lava of suds.

- f. 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.

ENCLOSURE 2

SUPPLEMENTAL INFORMATION

The information below was selected from a Nale-It information package provided by Clear Solutions to the Bureau of Petroleum Storage Systems. It is included here for the purpose of briefly conveying some major points to prospective users of Nale-It, and reviewers of Remedial Action Plans proposing Nale-It. It is not, however, intended to be a substitute for all the information that is available from Clear Solutions.

- a. Ex situ operating conditions: For illustrative purposes, the Bureau of Petroleum Storage Systems would like to pass along some information about the operating conditions for Nale-It, when used in the ex situ biocell mode. The conditions would be similar for the ex situ batch vessel mode, with exception of the volume of material that can be processed. The batch size is approximately 90 to 120 cubic yards of material. It should be kept in mind that these conditions are representative of the general case, and that adjustments may have to be made for site-specific conditions.

Thickness (biocell mode):	6 to 8 inches
Volume (biocell mode):	Limited only by available space at the site, not limited by the process.
Temperature:	40 to 113 deg. F.
Amount of native soil amendment (source of microbes) that is added to the contaminated soil:	An amount sufficient to produce an overall petroleum hydrocarbon concentration in the range of 3 to 20% by weight in the resulting mixture of amendment soil and petroleum-contaminated soil.
Concentration of Nale-It in the aqueous solution applied to the soil.	2% to 6% by volume (e.g., a 5% solution is prepared by mixing 1 volume of Nale-It with 19 volumes of water).
Amount of aqueous solution applied per unit volume of soil to be treated.	Approximately 7.6 liters per cubic meter (L/m ³)
Moisture content of the soil.	Maintain at 25 to 85% of field capacity. This is important, since contaminants must first desorb from the soil and enter the aqueous phase, where the degrading microbes reside, and in which biodegradation by microbial activity actually takes place.
pH	Keep close to neutral (range 5.5 to 8.5)
Dissolved oxygen	Greater than 2 milligrams per liter (mg/L)
Soil gas oxygen enrichment	2 to 4% by volume in the soil gas (5% max.) Greater than 5% does not produce any further significant increase in mineralization rate.

- b. Tilling and slurry consistency: Regardless of whether the Nale-It mode of operation is in situ or ex situ, the tilling (or mixing) to a slurry-like consistency plays an important role. It brings into contact the soil, moisture, contaminants, and microbes, and incorporates oxygen that is essential to aerobic biodegradation.

- c. Degradation products: The ultimate products of petroleum hydrocarbon contaminants when they are destroyed by an aerobic biodegradation process are carbon dioxide, water, and microbial cell mass.
- d. Operating sample parameters: For the purpose of controlling the Nale-It process, the following samples and measurements are made on a pre-determined schedule: contaminant concentrations, microbial population counts, pH, mixture density, moisture content, and dissolved oxygen.
- e. Purpose of the native soil amendment: Clear Solutions emphasizes that the purpose of the native soil amendment is to obtain a supply of indigenous microbes, and to adjust the contaminant concentration to an optimum range for the Nale-It biodegradation process. It is not a gimmick to accomplish "remediation due to dilution" but rather a process that truly reduces contaminant mass.
- f. Results: Clear Solutions indicates that laboratory and field tests have reduced initial contaminant concentrations by 67-95% (average 82%) after 3-5 days of treatment, and that corrective actions using the Nale-It technology usually achieve 95-99% total contaminant mass reductions in approximately 30 days.