

Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

February 19, 2002

Mr. Ronald F. Adams, P.E.
EBSI Incorporated
224 Clearwater Drive
Ponte Vedra, Florida 32082

Re: **On-Contact** Process

Dear Mr. Adams:

The Bureau of Petroleum Storage Systems hereby accepts the On-Contact remediation process, by Environmental Business Solutions International (EBSI), as an innovative technology for the remediation of groundwater and soil at contaminated sites in Florida.

On-Contact is a proprietary in situ chemical oxidation process for the remediation of sites contaminated by petroleum or other suitable contaminants. It involves injection of oxidants, reducing agents, and food-grade additives into a contaminated aquifer. The ultimate by-products of the reactions that take place are carbon dioxide and water when petroleum hydrocarbon contaminants are chemically oxidized. When chlorinated hydrocarbon contaminants are oxidized, the ultimate by-products include carbon dioxide, water and chloride ions. Enclosure 1 is a voucher for the confidential disclosure of proprietary information.

The department recognizes On-Contact as a viable technology for the remediation of petroleum and suitable non-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 Remedial Action Plan is approved by the department; and (c) the terms of the temporary zone of discharge variance granted to EBSI by the department on July 3, 2001, for the purpose of underground injection control, are observed.

Readers of this letter, in the case of this process, may find it worth noting that new rule 62-522.300(2)(c), Florida Administrative Code (F.A.C.), effective August 27, 2001, now permits by rule the temporary zone of discharge that formerly could only be granted by a variance. In the case of EBSI's On-Contact process, which was granted a zone of discharge variance prior to the new rule, users have a choice of either complying with the terms of the variance, or the requirements of rule 62-522.300(2)(c), F.A.C. They both cover the same topics: the zone size; its temporary duration period; and groundwater monitoring for the secondary drinking water parameters of iron, pH, sulfate and total dissolved solids, which are present in the fluid to be injected at values in excess of their secondary drinking water standards.

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 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 a regulatory "acceptance" and an approval. Products and processes are accepted; they are not approved. For On-Contact, the major environmental and regulatory considerations are set forth in enclosure 2.

Those who prepare Remedial Action Plans are advised to 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 the Department of Environmental Protection has determined the environmental acceptability of this process. To aid those reviewers, supplemental information is provided in enclosure 3.

Since this remediation process involves an exothermic reaction, appropriate safety precautions should be considered. An in situ chemical oxidation safety advisory is included as enclosure 4.

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.

Questions regarding petroleum applications of the On-Contact process may be directed to Rick Ruscito at (850) 487-3299.

Sincerely,

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

c: Environmental Business Solutions International, Inc.
1127 Crossing Way
Wayne, New Jersey 07470

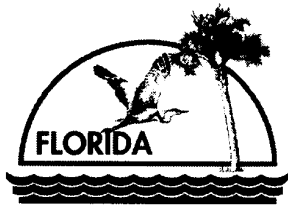
George Heuler - UIC, FDEP/Tallahassee

Cynthia Christen - OGC, FDEP/Tallahassee

Tom Conrardy - FDEP/Tallahassee

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ENCLOSURE 1

On-Contact
February 19, 2002

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David B. Struhs
Secretary

February 19, 2002

Mr. Ronald F. Adams, P.E.
EBSI Incorporated
224 Clearwater Drive
Ponte Vedra, Florida 32082

Re: On-Contact Proprietary Information Voucher

Dear Mr. Adams:

The Bureau of Petroleum Storage Systems hereby acknowledges the confidential disclosures by Environmental Business Solutions International (EBSI), dated May 3, 2001 and May 8, 2001, regarding its On-Contact remediation process.

On-Contact is a proprietary in situ chemical oxidation process that involves the use of oxidants, reducing agents, and food-grade additives. The ultimate by-products of the reactions that take place are carbon dioxide and water when petroleum hydrocarbon contaminants are chemically oxidized. When chlorinated hydrocarbon contaminants are oxidized, the ultimate by-products include carbon dioxide, water and chloride ions.

Having reviewed the confidential disclosure, we hereby vouch that iron, pH, sulfate and total dissolved solids are the only parameters associated with the injected fluid of the On-Contact process that do not meet the injection criteria of Chapter 62-528, Florida Administrative Code (F.A.C.). The injection criteria include the drinking water standards of Chapter 62-550, F.A.C., which regulates iron, pH, sulfate and total dissolved solids as secondary drinking water standards. This voucher applies to the oxidizer and chemicals described in the May 2001 disclosures. If other oxidizers and chemicals are substituted or added, then the onus shall be on EBSI and those who prepare the remediation plan to indicate any changes, and to meet applicable and appropriate injection regulations. If the other oxidizers and chemicals are proprietary, then they too can be submitted to the department as a confidential disclosure, for comparison to the underground injection control regulations of Chapter 62-528, F.A.C.

It is not necessary to repeat the confidential disclosure process each time a remediation plan proposing the On-Contact process is submitted for review. It will suffice to make reference to the original May 2001 disclosures and to include a copy of this voucher as an appendix in the plan.

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We also hereby indicate that a variance was issued to Environmental Business Solutions International, Inc. by the Florida Department of Environmental Protection on July 3, 2001, granting a variance from Rule 62-522.300(3), F.A.C., to create a 60-foot radius zone of discharge for each On-Contact injection point, in which a temporary 365-day exceedance of the secondary drinking water standards set forth in Chapter 62-550, F.A.C., for iron, sulfate, pH, and total dissolved solids would be tolerated. The variance is not site-specific and is therefore valid for use in any future On-Contact projects in Florida, provided its terms are observed, and a remediation plan is approved by the department.

For underground injection control purposes, On-Contact remediation plans must disclose the volume of fluid to be injected into an aquifer. A note or a footnote can be included in each remedial action plan hereafter to indicate that a one-time confidential disclosure regarding the proprietary aspects of the On-Contact reagents have already been disclosed to the department, and accepted. Remediation plan reviewers for petroleum-contaminated site applications of On-Contact may contact Rick Ruscito at (850) 487-3299.

Sincerely,

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

ENCLOSURE 2

ENVIRONMENTAL AND REGULATORY INFORMATION

For On-Contact, the major environmental and regulatory concerns are listed below.

- a. Applicable rules and regulations: The responsibility shall be on Environmental Business Solutions International, Inc. and users of On-Contact to ensure that all applicable groundwater contaminant standards will be met at the time of project completion. This includes the standards for the contaminants of concern at a site, any residuals associated with the ingredients of On-Contact's injectants, and any by-products produced as a result of chemical reactions. The following chapters of the Florida Administrative Code are cited but should not be construed as an exhaustive list: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C. for groundwater classes and standards; Chapter 62-522, F.A.C., for groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapter 62-770, F.A.C., for petroleum cleanup; and Chapter 62-777, F.A.C., for cleanup criteria.
- b. Groundwater injection standards: For in situ aquifer remediation, the composition of the injected fluid must meet the drinking water standards set forth in Chapter 62-550, F.A.C., pursuant to underground injection control Rule 62-528.600(2)(d), F.A.C. Additionally, any non-regulated substances in the formulation must meet the minimum criteria for groundwater as defined in Chapter 62-520.400(1), F.A.C.
- c. Temporary zone of discharge: A variance was granted by the department to EBSI on July 3, 2001 from Rule 62-522.300(3), F.A.C., which does not allow a zone of discharge when fluids are injected into Class G-I or G-II groundwater. Its terms establish a zone of discharge defined as a sixty (60) foot radius from each point of injection, in which a temporary exceedance of the following secondary drinking water parameters will be tolerated for a period of 365 days after injection: iron, pH, sulfate and total dissolved solids. The standards set forth for these parameters in the drinking water standards of Chapter 62-550, F.A.C., are as follows: pH, range 6.5-8.5; total dissolved solids, 500 milligrams per liter (mg/L), maximum; iron, 0.3 mg/L, maximum; and sulfate, 250 mg/L, maximum.

By the end of the 365-day variance period, the groundwater standards for iron, pH, sulfate and total dissolved solids must be met. However, if a site's natural-occurring background value for any one of those individual parameters already exceeds its standard, then the background value may serve in lieu of the groundwater standard.

- d. Injection permit: The issuance of a site-specific approval order by either the Bureau of Petroleum Storage Systems or the Bureau of Waste Cleanup for an EBSI in situ injection-type aquifer remediation plan also serves as the granting of a Class V injection well permit by the State of Florida.
- e. 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 On-Contact injectants. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used for injection. 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.

- f. Groundwater monitoring: As in any remediation effort, the actual petroleum and/or non-petroleum contaminants of concern are to be monitored in accordance with applicable rules and regulations. Several aspects of monitoring are discussed below.
1. Active remediation monitoring: During the period of active remediation, groundwater shall be monitored for contaminants of concern in accordance with the requirements set forth in Section 62-770.700, F.A.C., for petroleum contaminated sites, or in accordance with the provisions of an approved Remedial Action Plan for non-petroleum sites, whichever applies. The selection of designated monitoring wells shall be of sufficient quantity to demonstrate remediation of the aquifer.
 2. Post remediation monitoring: At least one (1) year of quarterly post remediation groundwater monitoring for contaminants of concern shall be conducted at a minimum of two (2) wells, one located in the area of maximum contamination, the other downgradient of the area of maximum contamination. (For specific information about post active remediation monitoring at petroleum contaminated sites, please refer to Section 62-770.750, F.A.C.)
 3. Underground injection control monitoring: In accordance with the terms of the temporary zone of discharge variance granted by the department to EBSI on July 3, 2001, the monitoring of groundwater for iron, pH, sulfate and total dissolved solids shall be addressed in a department-approved remediation plan.

The monitoring must include the establishment of the remediation site's natural-occurring background values of these parameters by sampling monitoring wells outside the contamination plume before the injection of On-Contact. These same parameters must also be monitored after injection, for a period of one (1) year at monitoring wells located downgradient from the injection points. Additionally, the Bureau of Petroleum Storage Systems believes these parameters should be monitored at locations within the contamination plume itself after injection, and at radial locations outside the plume, in directions other than downgradient if there is concern that On-Contact fluids could migrate in these other directions.

For situations in which an On-Contact temporary zone of discharge is permitted by way of new Rule 62-522.300(2)(c), F.A.C., effective August 27, 2001, rather than a variance, the groundwater monitoring must also be addressed in a department-approved remedial action plan, along with the size and duration of the zone. Since the rule addresses the same concerns as a variance, the Bureau of Petroleum Storage Systems recommends that On-Contact remediation plans submitted pursuant to the new rule propose underground injection control groundwater monitoring that is identical to that required by the July 3, 2001 order granting a variance.

The reason that On-Contact has two ways of obtaining a temporary zone of discharge is because a variance was issued on July 3, 2001, just prior to the August 27, 2001 effective date of 62-522.200(2)(c), F.A.C., which more easily provides a zone of discharge via rule. Any

new products and processes proposed to the department after August 27, 2001 that need a temporary zone of discharge will be handled only by the rule, unless the constituents of the injected fluid are such that they are not covered by the rule. In those cases, a variance may still be necessary.

Regardless of whether the variance or the rule is cited as the instrument permitting a temporary zone of discharge for On-Contact, the secondary groundwater standards that apply are as follows: iron [0.3 milligrams per liter (mg/L) maximum]; sulfate (250 mg/L, maximum); total dissolved solids (500 mg/L, maximum); and pH (range 6.5 - 8.5).

- g. Underground injection control inventory: Remedial Action Plans prescribing in situ aquifer injection type 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 plans to be transmitted by department reviewers to the Underground Injection Control Section is provided as Enclosure 5.
- h. Operation:
 - 1. Avoidance of migration: Injection of On-Contact fluids shall be performed in such a way, and at such a rate and volume, that no undesirable migration of either the product's ingredients or the contaminants in the aquifer results, pursuant to Rule 62-528.630(3), F.A.C.
 - 2. Underground injection control operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to Rule 62-528.640(1)(b), and 62-528.640(1)(c), F.A.C., since no movement of the contamination plume is expected to accompany the On-Contact treatment process, the department requests that the information items listed in Rule 62-528.640(1)(b), F.A.C., be considered and included in Remedial Action Plan proposals as a matter of good and thorough design practice. Briefly summarized, they are: quality of water in the aquifer; quality of the injected fluid; existing and potential uses of the affected aquifer; and well construction details. Additionally, each Remedial Action Plan should clearly indicate the total volume of On-Contact fluid that will be injected.
- i. 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.
- j. Additional regulatory information: For further regulatory information about in situ chemical additives associated with aquifer remediation, please see guidance document BPSS-10, titled "In Situ Chemical Additives" at web page www.dep.state.fl.us/waste/categories/pcp/pages/active.htm.

ENCLOSURE 3

SUPPLEMENTAL INFORMATION

The information below, compiled from various sources, may be helpful to reviewers of Remedial Action Plans prescribing the On-Contact process. It is provided as information only and should not be construed as absolute, nor should it be used as a substitute for technical judgments that need to be made on a site-specific basis.

- a. UIC Notification: 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 5 memorandum, whose subject is "Proposed Injection Well(s) for In Situ Aquifer Remediation at a Contaminated Site". The completed form must be submitted to the Underground Injection Control Section at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.
- b. Bench-scale through full-scale activities: For any innovative remediation product or process that is proposed for the cleanup of a site, 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. Applications: The On-Contact process can be used for remediation of soil and groundwater.
- d. Overview of the process: Information provided by EBSI indicates that On-Contact is a four-stage process. The first stage is a fracturing-like process that creates a disk-like "propagation" zone of 2 to 4 centimeters in thickness, and up to 120 feet in diameter. The thickness of the zone that can be treated by a propagation is indicated to range from 7 to 22 feet, and extends both above and below the propagation. The second stage is the use of chemicals to desorb the contaminants from the soil. The third stage is the use of oxidizers and catalysts to destroy the contaminants. The fourth stage is monitoring.
- e. Design parameters: For the preparation of Remedial Action Plans for petroleum contaminated sites, a Remedial Action Plan Checklist, which includes a section on chemical oxidation is available. Most of the items in that section of the checklist can apply to the preparation of Remedial Action Plans for non-petroleum sites as well.

ENCLOSURE 4

IN SITU CHEMICAL OXIDATION SAFETY ADVISORY

The volatility of some contaminants may be sensitive to temperature and there could be a significant change in both the concentration and distribution of flammable vapors and/or toxic non-flammable vapors when using an in situ chemical oxidation method. This dynamic environment is less predictable than most other cleanup situations, where less powerful remediation methods are unable to drive the cleanup by greatly changing a site's established equilibrium of contaminants that are distributed amongst the vapor, liquid, and adsorbed phases. Therefore, both precautionary and preventative measures are appropriate.

As is the case in any petroleum or flammable solvent remediation effort, design considerations must take potential fire and explosion hazards into consideration, so that appropriate equipment and operating procedures can be specified for their prevention. For petroleum cleanups, a Remedial Action Plan Checklist recognizes the potential for a fire or explosion, so it includes reminders regarding the following items: migration via underground conduits and utilities; lower explosive level (LEL); National Electrical Code practices intended to minimize ignitions from electrical devices; explosion-proof motors; spark-resistant materials of construction for vapor blower housings and impellers; and in the case of thermal oxidizers, items to consider for the prevention of furnace explosions.

The Remedial Action Plan Checklist for petroleum cleanup sites has been revised to include a section addressing in situ chemical oxidation. The items listed below summarize a portion of the checklist and should be helpful to preparers and reviewers of in situ chemical oxidation remediation plans in identifying potential fire and explosion hazards. The suggested items to consider are, but not necessarily limited to:

- a. the potential for subsurface migration of vapors, either through pathways in the aquifer and soil itself, or via underground conduits such as sewer lines, utilities, storm drains, etc., and the destination of those pathways should migration occur;
- b. the presence of free product in the subsurface, either in underground utilities, or in the form of non-aqueous phase liquids, which could be volatilized by the heat of an exothermic chemical reaction, in concentrations which exceed the lower explosive level;
- c. the presence of underground petroleum or flammable liquid storage tanks and dispenser pipelines which may be near the source of heat generated by chemical oxidation reactions, and measures to prevent them from exposure to excessive amounts of heat;
- d. identification and control of possible ignition sources (electrical equipment, devices, and switches, vehicle exhaust sparks, mechanical sources of sparks, etc.) at potential vapor migration pathway destinations;
- e. monitoring of vapor concentrations, for comparison with lower explosive levels, at the site and/or in conduits and other potential pathways during operation of the chemical oxidation system;
- f. the chemical reactants involved and the amount of heat liberated by their reaction;

- g. monitoring of aquifer and/or vadose temperature during treatment;
- h. a maximum temperature that may be tolerated before shutting down the operation is necessary;
- i. control of reactant concentrations and/or quantities as a means of controlling temperature;
- j. the possibility of using a vacuum extraction system to collect vapors at sites where significant amounts of volatilization is expected to occur; and
- k. safety of workers involved with the actual handling of chemicals.

The foregoing list should not be applied in blanket fashion, and technical judgments should be made on a site-specific basis. For chlorinated hydrocarbon remediation via chemical oxidation methods, the risk of a fire is reduced, since those compounds are not flammable. However, caution should be exercised in order to prevent the release or migration of quantities and concentrations of chlorinated vapors that may be harmful from a toxicological or environmental standpoint.

Memorandum

Florida Department of
Environmental Protection

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

FROM: _____ (Note 1.)

DATE: _____

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

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

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

Site owner's name: _____
Site owner's address: _____

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

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

Summary of major design considerations and features of the project:

Areal extent of contamination (square feet): _____
Number of injection wells: _____
Composition of injected fluid (Note 3)
(ingredient, wt. %): _____

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

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

The following is a summary description of the affected aquifer:

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

Richard Deuerling
Page Two
Date: _____

Site name: _____
FDEP facility no.: _____

Aquifer thickness (feet): _____

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

Direct-push or Conventional (*circle the appropriate well type*)

Diameter of well(s) (i.e., riser pipe & screen)(inches): _____
Total depth of well(s) (feet): _____
Screened interval: _____ to _____ feet below surface
Grouted interval: _____ to _____ feet below surface
Casing diameter, if applicable (inches): _____
Cased depth, if applic.: _____ to _____ feet below surface
Casing material, if applic.: _____

The in situ injection-type aquifer remediation plan for this 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 Chapter 62-520, F.A.C.

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

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

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