March 11, 1998

Mr. Thomas Andrews, P.E.
In-Situ Oxidative Technologies, Inc.
51A Everett Drive
Lawrenceville, New Jersey 08648

Re: ISOTEC Remediation Process

Dear Mr. Andrews:

The Bureau of Petroleum Storage Systems and the Bureau of Waste Cleanup have jointly reviewed your January 27, 1998 application for an innovative technology evaluation, and hereby accept ISOTEC as an innovative technology for the remediation of contaminated sites in Florida.

ISOTEC is an in situ chemical oxidation process consisting of a proprietary blend of reagents used in specific proportions to remediate soils and groundwater contaminated with either petroleum or other organic contaminants. This two-step process involves injection of a proprietary chelated iron catalyst solution into the contaminated aquifer, along with the injection of an oxidizer (i.e. stabilized hydrogen peroxide) into the capillary fringe. In this Fenton-type reaction, the catalyst converts the oxidizer into hydroxyl radicals, which in turn oxidize petroleum hydrocarbon contaminants to carbon dioxide and water. Chlorinated hydrocarbon contaminants are converted to carbon dioxide, water and chloride ions. The iron in the catalyst is oxidized to ferric ions which adsorb to the soil matrix. Enclosure 1 is a voucher for the confidential disclosure of the proprietary ingredients.

The Department recognizes ISOTEC as a viable technology for the remediation of petroleum and 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) an appropriate administrative mechanism is identified, in cooperation with the Underground Injection Control (UIC) Section to allow the temporary injection of a fluid whose iron concentration exceeds the maximum allowable 300 micrograms per

liter (ug/l) secondary water quality standard (or the naturally occurring background iron concentration) and whose pH is slightly below 6.5. Such a mechanism may be the granting of a variance from Rule 62-522.300(2)(a), Florida Administrative Code (F.A.C.), which does not allow a zone of discharge when fluids are directly injected into Class G-I or G-II groundwater.

A variance may allow for the establishment of a discharge zone, where an elevated concentration of iron, and a pH below 6.5, may be temporarily tolerated until active remediation and a subsequent one year post remediation monitoring period is complete. At that time, all contaminants, including iron and pH, must meet applicable groundwater standards, or other applicable and appropriate criteria for termination of a cleanup effort. If a site's naturally occurring background concentrations of iron and pH do not meet groundwater standards, then those background concentrations may serve in lieu of the groundwater standards. Additionally, the following chapters of the Florida Administrative Code are cited as pertinent, as portions of them are applicable to the ISOTEC process: 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; and Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation wells. Please note that the issuance of a site specific Remedial Action Plan Approval Order by either the Bureau of Petroleum Storage Systems or the Bureau of Waste Cleanup also constitutes the granting of a Class V injection well permit.

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. For ISOTEC, the major environmental and regulatory considerations are set forth in enclosure 2.

Preparers of 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 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 a mildly exothermic reaction which creates a slight temperature rise, appropriate safety precautions must 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 the nature or composition of either or any of its principal and proprietary ingredients, or its performance 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 prescribing the product or process.

Questions regarding petroleum applications of the ISOTEC process may be directed to Rick Ruscito at (850) 487-3299. Questions about non-petroleum applications may be directed to Bill Neimes at (850) 488-3935.

Sincerely,

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

Bill Neimes, P.E.
Bureau of Waste Cleanup

enclosures (5)

cc: Will Evans - UIC, FDEP/Tallahassee
Brian Kelly - FDEP/Jacksonville
Tom Conrardy - FDEP/Tallahassee

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March 11, 1998

Mr. Thomas Andrews, P.E.
In-Situ Oxidative Technologies, Inc.
51A Everett Drive
Lawrenceville, New Jersey 08648

Re: ISOTEC Proprietary Ingredients Voucher

Dear Mr. Andrews:

The Bureau of Petroleum Storage Systems and the Bureau of Waste Cleanup jointly acknowledge the confidential disclosure, submitted by In-Situ Oxidative Technologies on January 27, 1998, for the proprietary injection fluid ingredients associated with its ISOTEC remediation process.

ISOTEC is an in situ chemical oxidation process consisting of a proprietary chelated iron catalyst and an oxidizer (typically hydrogen peroxide) used in specific proportions, to remediate soils and groundwater contaminated with either petroleum or chlorinated hydrocarbon contaminants. It is a Fenton-type reaction.

Having reviewed the confidential disclosure, we hereby vouch that iron, sulfate, pH and total dissolved solids are the only parameters associated with ISOTEC injectants that are regulated by the drinking water standards of Chapter 62-550, Florida Administrative Code (F.A.C.), and that they are regulated as secondary, not primary contaminants. For the small concentration of non-regulated stabilizers and viscosity enhancing substances in the formulation, we hereby acknowledge indication that they meet drinking water standards and the minimum criteria for groundwater as defined in Chapter 62-520.400(1), F.A.C. It is not necessary to repeat the confidential disclosure process each time a remediation plan is submitted for review. It will suffice

to make reference to the original January 27, 1998 disclosure and include a copy of this voucher as an appendix in the plan.

Your petition to the Department's Division of Water Facilities for a variance from Rule 62-522.300(2)(a), F.A.C., for the concentration of iron, which exceeds the maximum allowable 300 micrograms per liter secondary standard (or may exceed the naturally occurring background concentration), and pH, which is lower than the 6.5 to 8.5 range allowed as a secondary standard, is hereby acknowledged. The petition for variance must be approved prior to implementing ISOTEC at Florida sites. You need only once to petition and obtain approval for such a variance, as its terms will be intentionally written such that the variance will apply to each future ISOTEC project site in Florida.

For underground injection control purposes, ISOTEC remediation plans must disclose the volume of the fluids to be injected into an aquifer. A footnote could indicate that a one-time confidential disclosure regarding the proprietary composition of the ISOTEC reagents has been submitted, and accepted by the Department.

Remediation plan reviewers for petroleum contaminated site applications of ISOTEC may contact Rick Ruscito at (850) 487-3299. Remediation plan reviewers for non-petroleum site applications may contact Bill Neimes at (850) 488-3935.

Sincerely,

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

Bill Neimes, P.E.
Bureau of Waste Cleanup

cc: Will Evans - UIC, FDEP/Tallahassee
Tom Conrardy - BPSS/Tallahassee

ENCLOSURE 2

ISOTEC: ENVIRONMENTAL AND REGULATORY INFORMATION

For ISOTEC, the major environmental and regulatory concerns are listed below.

a. Groundwater cleanup standards: The responsibility shall be on users of ISOTEC to ensure that all applicable groundwater contaminant standards will be met at the time of project completion. This includes analysis of the contaminants of concern, any residuals associated with the ingredients of ISOTEC's injectants, and any byproducts produced as a result of chemical reactions. The following chapters of the Florida Administrative Code are cited: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C. for groundwater classes and standards; Chapter 62-522, F.A.C., for groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects.

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.

   A variance, issued by the Department's Division of Water Facilities, must be obtained for ISOTEC's iron and pH, which do not meet the secondary drinking water standards of Chapter 62-550, F.A.C. As of this date, the petition for such a variance has been submitted by In-Situ Oxidative Technologies, Inc.

   Since ISOTEC does not contain any ingredients that are listed as primary drinking water contaminants, there are no issues in regard to this matter. In order for technical reviewers of remediation plans prescribing ISOTEC to proceed unencumbered by concerns and issues regarding the injection of a proprietary formulation, the Bureau of Petroleum Storage Systems and the Bureau of Waste Cleanup have issued a joint "ISOTEC Proprietary Ingredients Voucher".

c. 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 ISOTEC 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.

d. 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 <u>minimum</u> 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: The Department, for environmental protection purposes, has determined that a limited amount of groundwater sampling, before and after injection, shall be conducted for regulated substances common to both groundwater and the injected ISOTEC catalyst. The <u>required</u> parameters to be sampled before and after injection, for comparison to their standards (or a site's background concentrations) are as follows: iron [300 micrograms per liter (ug/l) maximum], sulfate (250,000 ug/l maximum), total dissolved solids (500,000 ug/l maximum), and pH (range 6.5 - 8.5).

   ISOTEC, in addition to the foregoing parameters, plans to take two other types of before and after groundwater samples, for contaminants of concern and for total organic carbon (TOC). It should be understood that these samples are <u>not</u> required by the Department for environmental purposes but are necessary for ISOTEC's own process control purposes.

The Department has determined that the monitoring schedule for injected ISOTEC fluids, pursuant to Rule 62-528.615(2), F.A.C., shall include at least one pre-injection background sampling event for the above parameters, and at least one (1) post injection sampling event at any time during the three (3) months after injection.

For pre-injection background sampling, at least one (1) monitoring well located upgradient of the contamination plume, or at least one (1) non-upgradient monitoring well, located beyond the edge of the plume, shall be sampled and analyzed for the background concentration of the Department required parameters listed above. Additionally, for the remediation of sites contaminated by chlorinated hydrocarbons, the Department recommends a background sample for chloride. If more than one well is sampled, then the average value of each parameter can be used as the background value for the site.

The post injection sampling shall be conducted for at least two (2) wells, one located in the central region of the injection points, where concentrations are likely to be highest, the other downgradient, to determine if unwanted migration has occurred. For a given remediation site, costs may be kept to a minimum by installing only two monitoring wells for this purpose, whose locations are such that they may serve as both the underground injection control wells required for compliance with Rule 62-528.615(2), F.A.C., and the post remediation monitoring wells for compliance with above paragraph d.2. If post injection sample results indicate that a parameter meets an applicable standard (or its naturally occurring background level) then sampling of that parameter may be reduced in frequency or discontinued.

For ISOTEC's hydrogen peroxide oxidizer, which is reactive and decomposes at a relatively quick rate, the Department will not require injection control monitoring. In-Situ Oxidative Technologies, however, has indicated that it will conduct qualitative analysis of both hydrogen peroxide and hydroxyl radicals for its own operating and process control purposes during injection activities.

e. 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.

f. Operation:

1. Avoidance of migration: Injection of ISOTEC 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 ISOTEC 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 amount of catalyst and hydrogen peroxide that will be injected.

g. 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

ISOTEC: SUPPLEMENTAL INFORMATION

The information below, compiled from ISOTEC documentation and other sources, may be helpful to reviewers of Remedial Action Plans prescribing the ISOTEC technology. 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 should 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.

Local governments contracted by the Department to conduct technical reviews of petroleum Remedial Action Plans and Remedial Action Plan Modification proposals are instructed to follow the January 12, 1998 instructions for approval of such documents, and for submittal of the above memorandum.

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.

In-Situ Oxidative Technologies documentation for the ISOTEC process indicates that its approach to site remediation involves laboratory tests, a pilot study at the site, and design and implementation of a full-scale system. These procedures are in keeping with those either required by Chapter 62-770, F.A.C., for innovative technologies used at petroleum contaminated sites, or generally followed by the Bureau of Waste Cleanup for non-petroleum sites.

c. Applications: The ISOTEC process may be used for either in situ remediation of soil and/or groundwater, or ex situ remediation of soil.

d. Limitations: The ISOTEC process will not remediate inorganic contaminants, and it is not recommended as a cost-effective remediation method for free product that is greater than two (2) inches in thickness.

e. Characteristic behavior of the process: The ISOTEC process may cause the following temporary effects on groundwater at a site: an elevation of iron concentrations; a slight decrease in pH; and a slight rise in temperature at the point of injection. These parameters should return to background levels quickly. A petition for variance, seeking a temporary zone of discharge where elevated levels of iron and

lower levels of pH may be temporarily tolerated, conservatively requests up to 365 days for conditions at a site to return to normal. The actual recovery period is expected to be less than 365 days, with pH being the slowest to recover.

f. 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.

It may be helpful to know that pilot tests are likely to be designed using a conservatively small radius of influence, approximately 7.5 to 10 feet from the point of injection. The actual full-scale design, based on the results of the pilot test may be smaller or larger, depending upon physical situation at the site.

The ISOTEC design preference is for injection wells of four (4) inches in diameter, set in 12-inch diameter boreholes, although a smaller borehole can be tolerated if necessary due to site conditions. The intent is to effectively deliver viscosity-adjusted injectants (depending upon whether the contaminants of concern are dense or light) to the capillary fringe zone. Injection wells may be either vertical and horizontal.

g. Operating parameters: Injection rates may range from 0.1 to 10 gallons per minute, at pressures sufficient to accomplish the injection. The temperature of the groundwater, as a result of chemical reactions, may rise approximately 10 to 20 degrees Celsius.

Although the ISOTEC injection mixture will be adjusted to meet each site's specific needs, it may be helpful to know that an application in Florida may be approximately as follows: (1) injection of hydrogen peroxide solutions at varying concentrations, up to 10 percent by weight, and whose corresponding pH will be in the range of 4 to 6; and (2) injection of proprietary chelated iron catalyst solutions in varying concentrations, and whose pH will be in the range of 5.0 to 5.5.

h. Sampling parameters and measurements: In-Situ Oxidative Technologies has indicated that it considers the most important measurements for gauging the progress of an ISOTEC cleanup, after injection of the catalyst and oxidizer, to be: (1) pre vs. post sampling of the contaminants of concern; (2) analysis of total organic carbon (TOC); (3) a qualitative field measurement of hydrogen peroxide; and (4) a qualitative field measurement of hydroxyl radicals via proprietary method. Radius

of influence can be gauged by the results of the hydrogen peroxide and hydroxyl radical measurements. Other parameters that may be measured but considered less important for process control purposes are pH and temperature.

i. Stoichiometry: In each ISOTEC Remedial Action Plan submitted, In-Situ Oxidative Technologies, Inc. should indicate the mass of the contaminants of concern which are present at the site, and the prescribed amount of hydrogen peroxide that will be needed to remediate that given mass. An amount greater than the theoretical minimum will be needed, as naturally occurring TOC will compete with the contaminants of concern for hydroxyl radicals.

j. Aquifer porosity: Although there are no regulations pertaining to the amount of precipitated iron (spent catalyst in the form of solid ferric oxide, commonly known as rust) which may be deposited as immobile, nonsuspended particles in an aquifer, each Remedial Action Plan prescribing the ISOTEC process should evaluate the potential impact of this substance on aquifer porosity, and whether or not it could hamper the cleanup of future contaminant discharges into the same aquifer at the same site. The Department, based on its experience with a similar in situ oxidation process, believes that the effect on porosity will be minimal at most sites.

k. Monitoring wells as injection wells: ISOTEC catalyst and hydrogen peroxide should not be injected into monitoring wells which are intended to track the progress of remediation at a site, since a premature and false indication of complete remediation may result when those wells are sampled. However, if there is an abundance of monitoring wells at a site, and not all of them are needed for tracking the progress of remediation, then some of the spare monitoring wells can be converted to injection points.

l. Air monitoring: No air emissions monitoring is necessary for the ISOTEC process since it emits only carbon dioxide and water vapor.

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 of 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.

ENCLOSURE 5

Florida Department of
Memorandum **Environmental Protection**

TO: Richard Deuerling
Division of Water Facilities
Bureau of Resource Protection
Underground Injection Control Section

FROM:_____ (Local programs
_____ see Note 1.)

DATE:_____

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

This is to notify you of proposed injection well(s) construction for the in situ remediation of groundwater at a petroleum contaminated site. The following is a description of the site location.

Name:_____
Address:_____
City/County:_____
Latitude/Longitude:_____
FDEP Facility Number:_____

The design of the injection-type aquifer remediation system consists of the following:

Areal extent of contamination (square feet):_____
Number of injection wells:_____
Composition of injected fluid (See note 2)
(ingredient, wt. %):_____
_____
_____
_____
Injection volume per well (gallons):_____
Single or multiple injection events:_____
Injection volume total (all wells, all events):_____

Note 1. Local programs are not authorized to approve underground injections into aquifers. Reason: The Department, per agreement with EPA, has been delegated this authority but is not allowed to delegate it any further. Local programs should arrange with either Department district offices or Department headquarters to approve such injections after reviewing the Remedial Action Plan.
Note 2. Complete chemical analysis of injected fluid is required by Chapter 62-528, Florida Administrative Code (no exceptions). 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.

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

Excerpts from the remedial action plan which describe the site lithology are attached. The following is a summary description of the affected aquifer:

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

A schematic of the injection well(s) is attached. The following is a summary:

Depth of well (feet):_____
Screened interval:_____ to _____ feet below surface
Well casing diameter (inches):_____
Bore hole diameter:_____
If direct-push type well(s), describe
diameter (inches):_____ and depth (feet):_____

The in situ injection-type aquifer remediation plan for this petroleum contaminated site is a design 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 byproducts 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 groudwater quality criteria are set forth in Chapter 62-520, F.A.C.

The remedial action plan estimates that the 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 system was approved on _____ by a Remedial Action Plan Approval Order (or other enforceable document) signed by the Director of the Division of Waste Management (copy attached). The remediation system installation is expected to commence within 60 days. Please call me at _____ if you require any additional information.