



FLORIDA DEPARTMENT OF Environmental Protection

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December 4, 2024

Via Electronic Mail to Trevor Osorno at trevor@ozarkundergroundlab.com

Trevor Osorno
Senior Hydrogeologist
Ozark Underground Laboratory
1572 Aley Lane
Protem, MO 65733

Re: **Tracer: Fluorescein Dye
(HUE Uranine Conc. Acid Yellow 073 - Fluorescein Powdered Dye Mixture
Innovative Technology Application Acceptance Letter**

Dear Mr. Osorno:

The Florida Department of Environmental Protection's (FDEP) Division of Waste Management (Division) hereby accepts *HUE Uranine Conc. Acid Yellow 073 - Fluorescein Powdered Dye Mixture (Fluorescein Dye)* for use as a tracer solution for assistance of the assessment and remediation purposes. The composition of the fluorescein dye (approx. 70% fluorescein and 30% Glauber's salt [Na₂SO₄·10H₂O]).

The accepted use of *Fluorescein Dye* is subject to a maximum allowable injection concentration of **40 milligrams per liter**.

Enclosure 1 contains regulatory information. For in situ injections of *Fluorescein Dye*, there are underground injection control regulations that must be observed.

Since injection-type, in situ aquifer remediation is likely to be the most common application of *Fluorescein Dye*, the bulk of the regulatory requirements discussed herein will be directed to that topic.

The FDEP does not provide endorsement of specific or brand name remediation products or processes, however, 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. Vendors are responsible for marketing their product or process on its merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace. This acceptance letter shall not be construed as either an approval of the product or a certification of its performance.

Additionally, Department acceptance of any product or process does not imply it has been deemed applicable for any particular cleanup situation, or that it is preferred over other treatment or cleanup

techniques. A site-specific evaluation of applicability should 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.

It is not a requirement that a remediation product or process obtain an acceptance from the Department in order to be proposed for use in a site-specific Remedial Action Plan, but the plan must contain information to show that it meets all applicable and appropriate rules and regulations. For *Fluorescein Dye*, a copy of this acceptance letter containing regulatory compliance advice should be included in the appendix of each site-specific Remedial Action Plan that proposes its use.

The Department reserves the right to revoke its acceptance of a product or process if any component has been falsely represented.

This acceptance letter is valid for a period of ten (10) years from the issuance date above. At the end of the ten-year period, the acceptance can be renewed subject to an updated review of the product's use and formulation. The purpose of the updated review is to determine if the use conditions and monitoring requirements for this product need to be modified.

If you have any questions, contact Elena Compton at (850) 245-8911, through Mail Station 4535 at the letterhead address, or by e-mail at Elena.Compton@FloridaDEP.gov.

Sincerely,

Elena Compton, M.S., P.E.
Professional Engineer III
District Support Program, FDEP
850-245-8911

Enclosure: (1) Regulatory Information

Cc: John Perella, P.E., Arcadis US, Inc. at john.perella@arcadis.com

ENCLOSURE 1
REGULATORY INFORMATION

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1. Groundwater cleanup standards: The onus shall be on users of *Fluorescein Dye* to ensure that all applicable groundwater standards will be met at the time of project completion for the contaminants of concern being remediated, and any by-products produced as a result of chemical reactions induced or assisted by *Fluorescein Dye*. The following chapters of the Florida Administrative Code (F.A.C.) are cited: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C., for groundwater classes, for groundwater permitting, and for monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapter 62-780, F.A.C., for cleanup criteria, allowance of alternative cleanup target levels, and conditional closure requirements; and Chapter 62-777, F.A.C., for cleanup target levels.
2. Injection well permit: Per paragraph 62-528.630(2)(c), F.A.C., the issuance of an enforceable, site-specific Remedial Action Plan Approval Order by the Department for injection-type aquifer remediation constitutes the granting of a Class V injection well construction/clearance permit.
3. Underground Injection Control (UIC): Remedial Action Plans proposing injection-type aquifer remediation shall include the information required by subparagraphs 62-528.630(2)(c)1 through 6, F.A.C., for the purposes of the UIC program. Reviewers of those plans, upon issuance of a Department-enforceable Remedial Action Plan Approval Order, must transmit this information to the UIC program in Tallahassee by submitting a completed copy of the "UIC Notification". The notification for sites that are impacted with contaminants of concern is in the form of a memorandum currently located on the Internet at <https://floridadep.gov/waste/district-business-support/documents/uic-notice-remediation-products>
4. General information about temporary Zones of Discharge (ZOD): For groundwater remediation, the composition of a fluid to be injected must meet the primary and secondary drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapter 62-520, F.A.C. [and Chapter 62-777, F.A.C.], pursuant to UIC paragraph 62-528.600(2)(d), F.A.C. Aquifer remediation products that do not meet these requirements must seek relief from water quality criteria by one of two mechanisms as follows. Permission for a temporary ZOD may be obtained via paragraph 62-520.310(8)(c), F.A.C. If permission for a ZOD cannot be obtained by rule, then it will be necessary to seek a variance from Department rules in accordance with Section 120.542, Florida Statutes.

Paragraph 62-520.310(8)(c), F.A.C., allows for a temporary ZOD for closed-loop re-injection systems, for the prime constituents of the reagents used to remediate site contaminants, and for groundwater secondary standards. In order to obtain permission for a temporary ZOD by rule, a site-specific Remedial Action Plan must indicate: (a) the chemical ingredients of concern in the fluid to be injected that will be present in excess of groundwater standards; (b) the size of the ZOD that is needed; (c) the amount of time that the ZOD will be needed; and (d) a plan for monitoring the injected chemical ingredients of concern.

The size of the temporary ZOD will usually be the injection well radius of influence when the treatment system is a single injection point. For a multiple point system, the ZOD can usually be expressed and illustrated as the total area covered by all the injection points, located side-by-side with overlapping radii of influence.

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5. Upon expiration of the time-period granted for the ZOD by way of paragraph 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their site-specific background values, whichever is less stringent.

Conditional closure is also allowable provided the closure criteria of Rule 62-780.680, F.A.C., are met and there are no exceedances of a primary standard due to impurities in the product. Note that such conditional closure may require a modification of the size or duration of the ZOD. This modification must be approved in an enforceable order of the department, such as a conditional Site Rehabilitation Completion Order.

6. Site-specific Remedial Action Plans shall describe the volume and concentration of *Fluorescein Dye* that will be injected.
7. Specific ZOD information for *Fluorescein Dye*:

Prior to injections,

- *Fluorescein Dye* must be diluted to at least 40 milligrams per liter.
 - a. Please note: Chapter 62-528, F.A.C, requires that the quality of the fluid (or non-liquid substance) introduced to the sub-surface be compared to the primary and secondary drinking water standards and the minimum criteria for groundwater before it is injected (i.e., before it is diluted by the receiving groundwater). A non-compliance with dilution of *Fluorescein Dye* to at least **40 milligrams per liter** prior to its introduction into aquifer, may result in a violation of
 - i. Primary drinking water standards for sodium (160,000 micrograms per liter [ug/L]).
 - ii. This parameter is not a ZOD monitoring parameter but should be included in the baseline sampling quarterly, and then annually following treatment to demonstrate and verify compliance with Chapter 62-528, F.A.C.
 - b. If *Fluorescein Dye* is proposed to be delivered into the aquifer via injection wells, reviewers of Remedial Action Plans should check the box as shown below when filling out the UIC Notification memorandum:

ZOD permission by paragraph 62-520.310(8)(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. ...
 - c. If *Fluorescein Dye* is proposed to be delivered into the aquifer by means other than injection wells (for example, most excavations [except by large diameter augers], infiltration galleries, trenches, etc.), the UIC Notification memorandum is not required to be filed but monitoring for the UIC parameters is required.
8. Required UIC ZOD compliance for *Fluorescein Dye* to comply with paragraph 62-520.310(8)(c), F.A.C.: pre-injection dilution at least to 40 milligrams per liter. Additionally, please see 7a requiring monitoring for sodium.

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9. Quarterly monitoring should suffice in most cases. Upon expiration of the time period granted for the ZOD by way of paragraph 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their site-specific background values, whichever is less stringent, or appropriate controls are put in place to allow conditional closure under Rule 62-780.680, F.A.C.
10. Utilization of wells: If a remediation site has sufficient monitoring wells, then the Division of Waste Management has no objection to the use of some existing monitoring wells for the injection of *Fluorescein Dye*. However, no “designated” monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply *Fluorescein Dye*. Nor shall wells be used for the injection of *Fluorescein Dye* as dedicated wells for tracking remediation progress. This will avoid a premature conclusion that the site meets cleanup goals. By making sure that designated tracking wells are not 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.
11. Baseline Sampling: Baseline sampling (prior to any injection) for the ZOD monitoring parameters (and the impurities) is not required but is strongly recommended. The baseline sampling data is very useful for evaluating when the aquifer has returned to the pre-injection conditions.
12. Three categories of groundwater monitoring:
 - a. Active remediation monitoring for a cleanup site’s contaminants of concern: During the period of active remediation, groundwater shall be monitored in accordance with the requirements of the approved RAP as set forth in Rule 62-780.700, F.A.C.
 - b. Post Active Remediation Monitoring for a cleanup site’s contaminants of concern: At least one (1) year of quarterly post remediation groundwater monitoring for the contaminants of concern shall be conducted at a minimum of two (2) wells: one located in the area of highest contamination, the other at the downgradient edge of the contamination plume, pursuant to Rule 62-780.750, F.A.C.
 - c. Monitoring of the UIC zone of discharge: When *Fluorescein Dye* is utilized, in order to comply with Rule 62-520.310(8)(c), F.A.C., no ZOD monitoring is required, except for the optional one for sodium, as discussed in paragraph 7a above.
 - d. Please also note additional baseline and annual monitoring requirements, as stated in paragraph 7a above.
13. Injection operations:
 - a. Avoidance of migration: For injection-type in-situ aquifer remediation projects, injection of *Fluorescein Dye* shall be performed in such a way and at such a rate and volume that no migration of *Fluorescein Dye* (beyond the ZOD) or the contaminants of concern in the aquifer, or surface water, results, pursuant to subsection 62-528.630(3), F.A.C.
 - b. Underground Injection Control operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to paragraphs 62-528.640(1)(b) and (c), F.A.C., since no

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movement of the contamination plume is expected to accompany the treatment process, the Department requests that the information items listed in paragraph 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.

14. 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 Rule 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.