FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

March 30, 2022

Via Electronic Mail to William Newman at BNewman@rnasinc.com

Mr. William Newman, President
RNAS Remediation Products
6712 West River Road
Brooklyn Center
Minnesota 55430

Re: **QR75**
FDEP Innovative Technology Application Number: 1942

Dear Mr. Newman:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts *QR75* for use at contaminated site cleanups. QR75 is a proprietary blend of soluble hydrogen electron donors, nutrients, and vitamins intended for anaerobic bioremediation of chlorinated solvents and other suitable contaminants of concern.

Enclosure 1 is a voucher for a confidential disclosure of the proprietary ingredients submitted by RNAS. Enclosure 2 contains regulatory information. For in situ injections of *QR75*, there are underground injection control regulations that must be observed. Enclosure 3 provides Alternative Groundwater Cleanup Target Level (AGCTL) for un-ionized ammonia.

For vadose remediation such as soil blending, the underlying waters may be affected by the leaching *QR75* formulation. This remediation approach is not subject to the regulatory requirements of Chapters 62-528 and 62-520, Florida Administrative Code (F.A.C.) and has not been evaluated as part of this acceptance review. Therefore, only a regulatory advisory for a Remedial Action Plan preparers and reviewers is included in Enclosure 2 for assistance with compliance with Chapters 62-780 and 62-777, F.A.C. For in situ groundwater remediation, via direct injection of *QR75*, 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 *QR75*, the bulk of the regulatory requirements discussed herein will be directed to that topic.

The Florida Department of Environmental Protection (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, upon receipt of an acceptance, must market 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 *QR75*, 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.

The science that supports contaminated site cleanup is constantly improving and changing. New chemical concerns may emerge, and the formulation of the subject product may be modified over time, either intentionally or based upon availability of component materials. Therefore, this acceptance is valid for a period of ten (10) years from the date of issuance, at which time updated information, including updated analytical data, should be submitted for review and acceptance. Please note the analytical requirements for the renewal review may change and it is recommended that these requirements be discussed with the department prior to submitting the renewal request.

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

Digitally signed by Elena Compton
Date: 2022.03.30 11:02:12 -04'00'

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

Enclosures: (1) Voucher; (2) Regulatory Information; (3) Alternative Groundwater Cleanup Target Levels (AGCTLs) for un-ionized ammonia.

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Mr. William Newman
RNAS Remediation Products
6712 West River Road
Brooklyn Center
Minnesota 55430

Re: **Proprietary Ingredients: QR75**

Dear Mr. Newman:

The Division of Waste Management hereby acknowledges the submittal of confidential disclosure, dated March 19, 2021 (received through March 15, 2022) by RNAS Remediation Products. The disclosure provided the proprietary ingredients and their concentrations in *QR75*.

Without this voucher for the disclosures and the advice provided by the Division in Enclosure 2 based on its review of all the ingredients, users of *QR75* would not know how to comply with the requirements of Rule 62-520.310(8)(c), Florida Administrative Code (F.A.C.) for a temporary Zone of Discharge.

For underground injection control purposes, remediation plans proposing the use of *QR75* must indicate the volume and complete chemical composition of the fluid to be injected. Since the identities of some ingredients are proprietary, it will suffice to just specify the overall volume and concentration of *QR75* and then provide a footnote indicating that the confidential disclosure dated March 19, 2021, is already on file with the Division. Please direct questions regarding this voucher to Elena Compton at 850-245-8911.

Sincerely,

Elena Compton

Digitally signed by Elena Compton
Date: 2022.03.30 11:02:02 -04'00'

Elena Compton, M.S., P.E.
Professional Engineer III
DBSP, FDEP

1. Groundwater cleanup standards: The onus shall be on users of *QR75* 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 or biochemical reactions induced or assisted by *QR75* listed in the subject letter. 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; Chapters 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 Rule 62-528.630(2)(c), F.A.C., the issuance of an enforceable, site-specific Remedial Action Plan Approval Order by the Department for 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 Rules 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 petroleum contaminants of concern is in the form of a memorandum currently located on the Internet at https://floridadep.gov/sites/default/files/UIC-Notice-RemediationProducts-032411_PETROLEUM.pdf . The notification for sites impacted with any contaminants of concern is in the form of a memorandum currently located on the Internet at https://floridadep.gov/sites/default/files/UIC_NOTICE_ANY_02Dec21.pdf

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], pursuant to UIC Rule 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 Rule 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.

   Rule 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.

5. Upon expiration of the time-period granted for the ZOD by way of Rule 62-520.310(8)(c), F.A.C., the concentrations of the referenced analytes must meet their respective groundwater standards or their natural-occurring background values at the specific cleanup site, 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 *QR75* that will be injected.

7. Specific ZOD information for *QR75*:

   a. Prior to injections of *QR75*, *QR75* must be diluted to 3:1000 (three parts by volume of *QR75* to 1,000 parts by volume of water), or approximately 0.3% concentration.

   b. 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 *QR75* to 3:1000 prior to its introduction into aquifer, may result in a violation of

      i. primary drinking water standards for sodium (160,000 mg/L), antimony (6 ug/L), arsenic (10 ug/L), beryllium (4 ug/L), cadmium (5 ug/L), lead (15 ug/L), mercury (2 ug/L), selenium (50 ug/L), thallium (2 ug/L), nitrate (10,000 ug/L), and nitrite (1,000 ug/L) and

      ii. secondary drinking water standards for aluminum (200 ug/L), manganese (50 ug/L), chloride (250 ug/L), and sulfate (250,000 ug/L).

   c. For the ZOD parameters: ammonia, Total Recoverable Petroleum Hydrocarbons (TRPH), and pH shall be monitored.

   d. If *QR75* is proposed to be delivered into 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 rule* 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. …".

   e. If *QR75* 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 but monitoring for the UIC parameters is required.

8. Required UIC ZOD compliance for *QR75* to comply with Rule 62-520.310(8)(c), F.A.C.: pre-injection dilution to 0.3% concentration and monitoring for ammonia, TRPH, and pH.

9. Quarterly monitoring should suffice in most cases. Upon expiration of the time period granted for the ZOD by way of Rule 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their natural-occurring background values at the specific cleanup site, whichever is less stringent, or appropriate controls are put in place to allow conditional closure under rule 62-780.680, F.A.C.

   a. pH is a secondary drinking water pollutant with the following standard: pH = 6.5 – 8.5.

   b. TRPH is "minimum criteria systemic toxicant" and has the following Groundwater Cleanup Target Levels (GCTL): TRPH = 5,000 ug/L.

   c. Ammonia is currently identified in Chapter 62-777, F.A.C., as a "minimum criteria systemic toxicant", and it has a Groundwater Cleanup Target Level (GCTL) of 2,800 ug/L. However, the oral reference dose upon which this number is based has been withdrawn from the U.S. Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) database. Therefore, the FDEP has calculated alternative groundwater cleanup target levels in accordance with Chapter 62-780, F.A.C. The calculated Alternative Groundwater Cleanup Target Levels (AGCTLs) are attached as Enclosure 3. The Department recommends using the referenced AGCTLs for ammonia.

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 *QR75*. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply *QR75*. Nor shall wells used for the injection of *QR75* be used 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. 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 Section 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 Section 62-780.750, F.A.C.

c. Monitoring of the UIC zone of discharge: When *QR75* is utilized, in order to comply with Rule 62-520.310(8)(c), F.A.C., the ZOD shall be monitored for ammonia, TRPH, and pH, as discussed in paragraph 7c above.

12. Injection operations:

a. Avoidance of migration: For injection-type in-situ aquifer remediation projects, injection of *QR75* shall be performed in such a way and at such a rate and volume that no migration of *QR75* or the contaminants of concern in the aquifer, or surface water results, pursuant to Rule 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 Rule 62-528.640(1)(b) and (c), F.A.C., since no movement of the contamination plume is expected to accompany the 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.

13. 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.

ENCLOSURE 3

Alternative Groundwater Cleanup Target Levels (AGCTL) for un-ionized ammonia

Table 1 – AGCTLs in μg/L total ammonia based on a range of common temperature and pH values for Florida groundwater

| pH | 20°C | 21°C | 22°C | 23°C | 24°C | 25°C | 26°C | 27°C | 28°C | 29°C | 30°C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.5 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 |
| 5.6 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 |
| 5.7 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 |
| 5.8 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 340,000 |
| 5.9 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 360,000 | 330,000 | 310,000 | 290,000 | 270,000 |
| 6.0 | 360,000 | 360,000 | 360,000 | 350,000 | 330,000 | 300,000 | 280,000 | 260,000 | 250,000 | 230,000 | 210,000 |
| 6.1 | 350,000 | 320,000 | 300,000 | 280,000 | 260,000 | 240,000 | 230,000 | 210,000 | 200,000 | 180,000 | 170,000 |
| 6.2 | 270,000 | 260,000 | 240,000 | 220,000 | 210,000 | 190,000 | 180,000 | 170,000 | 160,000 | 150,000 | 130,000 |
| 6.3 | 220,000 | 200,000 | 190,000 | 180,000 | 160,000 | 150,000 | 140,000 | 130,000 | 120,000 | 120,000 | 110,000 |
| 6.4 | 170,000 | 160,000 | 150,000 | 140,000 | 130,000 | 120,000 | 110,000 | 110,000 | 98,000 | 92,000 | 86,000 |
| 6.5 | 140,000 | 130,000 | 120,000 | 110,000 | 100,000 | 96,000 | 90,000 | 84,000 | 78,000 | 73,000 | 68,000 |
| 6.6 | 110,000 | 100,000 | 95,000 | 88,000 | 82,000 | 77,000 | 71,000 | 67,000 | 62,000 | 58,000 | 54,000 |
| 6.7 | 87,000 | 81,000 | 75,000 | 70,000 | 65,000 | 61,000 | 57,000 | 53,000 | 49,000 | 46,000 | 43,000 |
| 6.8 | 69,000 | 64,000 | 60,000 | 56,000 | 52,000 | 48,000 | 45,000 | 42,000 | 39,000 | 37,000 | 34,000 |
| 6.9 | 55,000 | 51,000 | 48,000 | 44,000 | 41,000 | 38,000 | 36,000 | 33,000 | 31,000 | 29,000 | 27,000 |
| 7.0 | 44,000 | 41,000 | 38,000 | 35,000 | 33,000 | 31,000 | 28,000 | 27,000 | 25,000 | 23,000 | 22,000 |
| 7.1 | 35,000 | 32,000 | 30,000 | 28,000 | 26,000 | 24,000 | 23,000 | 21,000 | 20,000 | 18,000 | 17,000 |
| 7.2 | 28,000 | 26,000 | 24,000 | 22,000 | 21,000 | 19,000 | 18,000 | 17,000 | 16,000 | 15,000 | 14,000 |
| 7.3 | 22,000 | 20,000 | 19,000 | 18,000 | 17,000 | 15,000 | 14,000 | 13,000 | 13,000 | 12,000 | 11,000 |
| 7.4 | 18,000 | 16,000 | 15,000 | 14,000 | 13,000 | 12,000 | 11,000 | 11,000 | 10,000 | 9,300 | 8,700 |
| 7.5 | 14,000 | 13,000 | 12,000 | 11,000 | 10,000 | 9,800 | 9,200 | 8,500 | 8,000 | 7,500 | 7,000 |

Shaded values are based on the acute exposure AGCTL

AGCTLs were calculated using an f value rounded to 5 significant digits and an un-ionized ammonia concentration of 210 μg/L

AGCTLs were rounded to two significant figures