Product Application: Injections – Excavations

Jennifer L. Rogers, P.E. and James B. Russell, P.E.
Division of Waste Management | Orange County Environmental Protection Division/Petroleum Restoration Program
Florida Department of Environmental Protection

Tallahassee, Florida | April 15-17, 2025

PRODUCT APPLICATION
AGENDA

Source: James Russel, Orange County.

Product Application: Injections – Excavations

- References.
- Types of Products.
- Methods of Application.
- Underground Injection Control (UIC) Notification Memorandum.
- Product Acceptance.
- Monitoring.
- UIC Parameters.
- Closure.
- Case Studies.

PRODUCT APPLICATION
REFERENCES

- Rule – Chapter 62-780 – Contaminated Site Cleanup Criteria.
- Rule – Chapter 62-520 – Ground Water Classes, Standards, and Exemptions.
- Rule – Chapter 62-550 – Drinking Water Standards, Monitoring, and Reporting.
- Guidance: BPSS-10, In Situ Chemical Additives.
- Innovative Technology Acceptance Program – Accepted Products.
- Underground Injection Control (UIC) Variances.

PRODUCT APPLICATION
TYPES OF PRODUCTS

Oxidizers
- Chemical reaction.
- Examples:
  - Hydrogen Peroxide.
  - Proprietary oxidizers.
  - Sodium persulfate and activator.

Bio-Augmentation
- Microbial consortium.
- Electron acceptor blends.
  - Sulfate.
  - Nitrate.
  - Manganese.

Activated Carbon
- Colloidal carbon.
  - Adsorption.
- May be paired with bio-augmentation.

Surfactants
- Also known as foaming agents.
- Contaminants of Concern (COCs) desorb from soils.
- May be paired with bio-augmentation.

PRODUCT APPLICATION

METHOD OF APPLICATIONS: INJECTIONS AND EXCAVATIONS

Products may be applied by injection through:

- Wells (photo).
- Direct Push Technology (DPT) points.
- Large Diameter Auger (LDA) boring.
  - (considered injection point).

Source: James Russel, Orange County.

PRODUCT APPLICATION

METHOD OF APPLICATIONS: INJECTIONS AND EXCAVATIONS

Products may be applied to open pit excavations.

Source: Environmental Risk Management (ERMI)

PRODUCT APPLICATION
METHOD OF APPLICATIONS: INJECTIONS AND EXCAVATIONS

Injections, including LDA, and Open Pit Excavations.

- Guidance: BPSS-10, In Situ Chemical Additives.
- Per Bureau of Petroleum Storage Systems (BPSS)-10, Paragraph 14:
  - An open pit is considered a "subsurface fluid distribution system."
  - Requirements for injections apply to open pit applications.
    - Enforceable Order.
    - Establishment of Zone of Discharge (ZOD).
    - Monitoring.

BPSS-10 clips:

Petroleum Cleanup Program

REMEDIAL ACTION PLAN GUIDELINES

BUREAU OF PETROLEUM STORAGE SYSTEMS

History: New 5/1/98, Revised 11/4/98, 3/16/00, 1/22/02, 7/16/05, 3/14/11

Identification No.: BPSS-10
Topic of Guideline: In Situ Chemical Additives

Thomas W. Conaway 3/11/11
Signature and Date
CHIEF ENGINEER

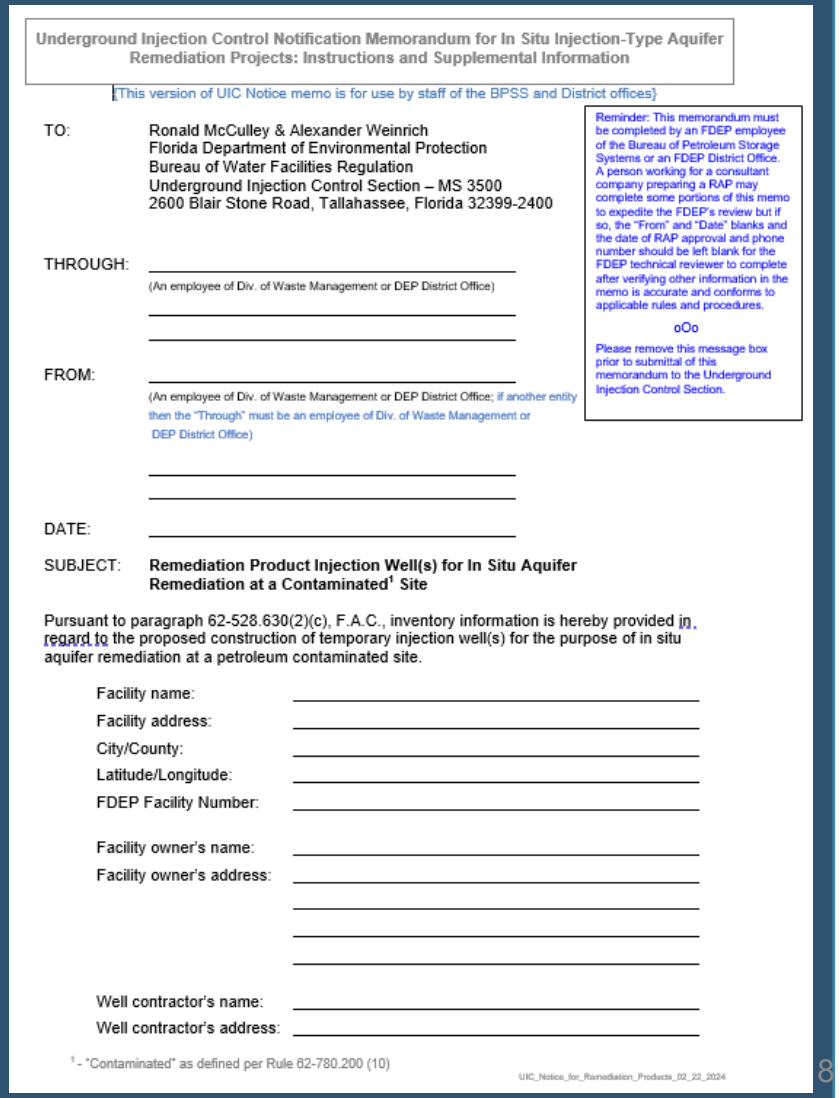
Charles T. Williams 3/11/11
Signature and Date
(ACTING) BUREAU CHIEF

14. **Open pit applications.** When used for beneficial cleanup of a contaminated site undergoing site rehabilitation under Department cleanup rules, application of remediation products to an excavation is considered to be a "subsurface fluid distribution system" and therefore may be authorized under the procedures of this guidance, including the need for prior authorization of the application of the product with an enforceable FDEP Order, establishing a zone of discharge, and post application monitoring of the residual effects of the remediation product. However, at this time these applications do not need to be reported by the cleanup programs to the Department's UIC Section.

PRODUCT APPLICATION
UNDERGROUND INJECTION CONTROL (UIC)

Underground Injection Control (UIC):

- Product application via well or injection point (including LDA application) requires a UIC Approval Order.
  - For a Remedial Action Plan (RAP) that includes injection, the RAP Order takes the place of a UIC Order.
  - For a **RAP Modification** that includes injection, for which RAP Orders are typically not issued, a UIC Order must be issued.



Underground Injection Control Notification Memorandum for In Situ Injection-Type Aquifer Remediation Projects: Instructions and Supplemental Information

{This version of UIC Notice memo is for use by staff of the BPSS and District offices}

TO: Ronald McCulley & Alexander Weinrich
Florida Department of Environmental Protection
Bureau of Water Facilities Regulation
Underground Injection Control Section – MS 3500
2600 Blair Stone Road, Tallahassee, Florida 32399-2400

THROUGH: _____
(An employee of Div. of Waste Management or DEP District Office)

FROM: _____
(An employee of Div. of Waste Management or DEP District Office; if another entity then the "Through" must be an employee of Div. of Waste Management or DEP District Office)

DATE: _____

SUBJECT: **Remediation Product Injection Well(s) for In Situ Aquifer Remediation at a Contaminated[1] Site**

Reminder: This memorandum must be completed by an FDEP employee of the Bureau of Petroleum Storage Systems or an FDEP District Office. A person working for a consultant company preparing a RAP may complete some portions of this memo to expedite the FDEP's review but if so, the "From" and "Date" blanks and the date of RAP approval and phone number should be left blank for the FDEP technical reviewer to complete after verifying other information in the memo is accurate and conforms to applicable rules and procedures.

oOo

Please remove this message box prior to submittal of this memorandum to the Underground Injection Control Section.

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

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

Facility owner's name: _____
Facility owner's address: _____

Well contractor's name: _____
Well contractor's address: _____

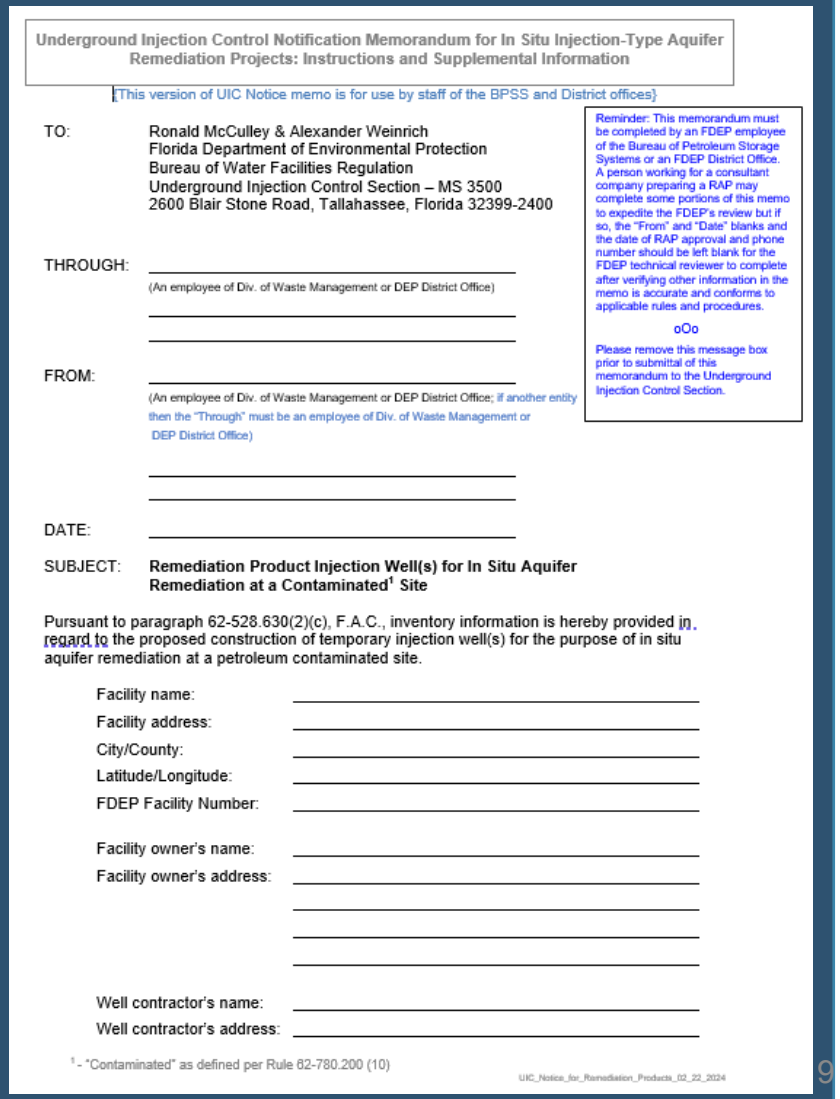
[1] - "Contaminated" as defined per Rule 62-780.200 (10)

UIC_Notice_for_Remediation_Products_02_22_2024

PRODUCT APPLICATION
UNDERGROUND INJECTION CONTROL (UIC)

UIC.

- Once RAP Order or UIC Order is issued, an employee of DEP Division of Waste or DEP District Office, must submit a UIC Notification Memorandum.
  - Clip on slide is portion of UIC Notification Memorandum.



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Facility owner's address: _____

Well contractor's name: _____
Well contractor's address: _____

[1] - "Contaminated" as defined per Rule 62-780.200 (10)

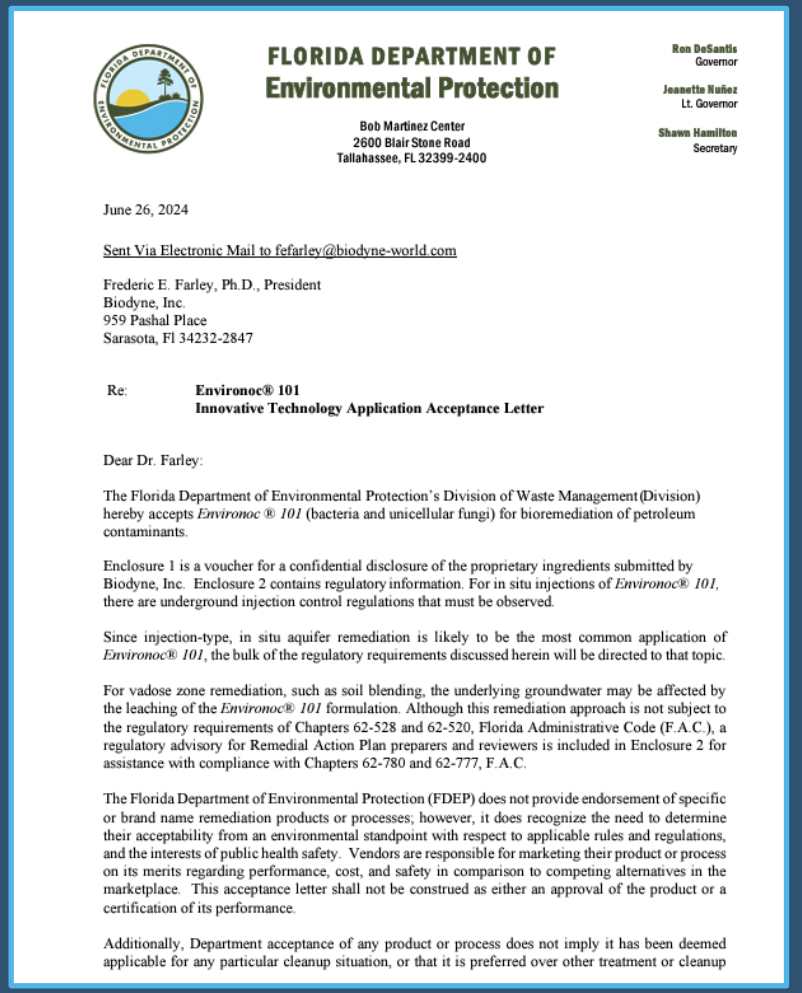
UIC_Notice_for_Remediation_Products_02_22_2024

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- DWM Listing.
- ***Acceptance*** Letters.
  - Clips on slide are portions / parts of letter.
- Letters are *acceptance*; not approvals.
- Vendor/applicant specific.
- Acceptance within 10 years.



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

June 26, 2024

Sent Via Electronic Mail to fefarley@biodyne-world.com

Frederic E. Farley, Ph.D., President
Biodyne, Inc.
959 Pashal Place
Sarasota, Fl 34232-2847

Re: **Environoc® 101**
Innovative Technology Application Acceptance Letter

Dear Dr. Farley:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts *Environoc ® 101* (bacteria and unicellular fungi) for bioremediation of petroleum contaminants.

Enclosure 1 is a voucher for a confidential disclosure of the proprietary ingredients submitted by Biodyne, Inc. Enclosure 2 contains regulatory information. For in situ injections of *Environoc® 101*, 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 *Environoc® 101*, the bulk of the regulatory requirements discussed herein will be directed to that topic.

For vadose zone remediation, such as soil blending, the underlying groundwater may be affected by the leaching of the *Environoc® 101* formulation. Although this remediation approach is not subject to the regulatory requirements of Chapters 62-528 and 62-520, Florida Administrative Code (F.A.C.), a regulatory advisory for 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.

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 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.

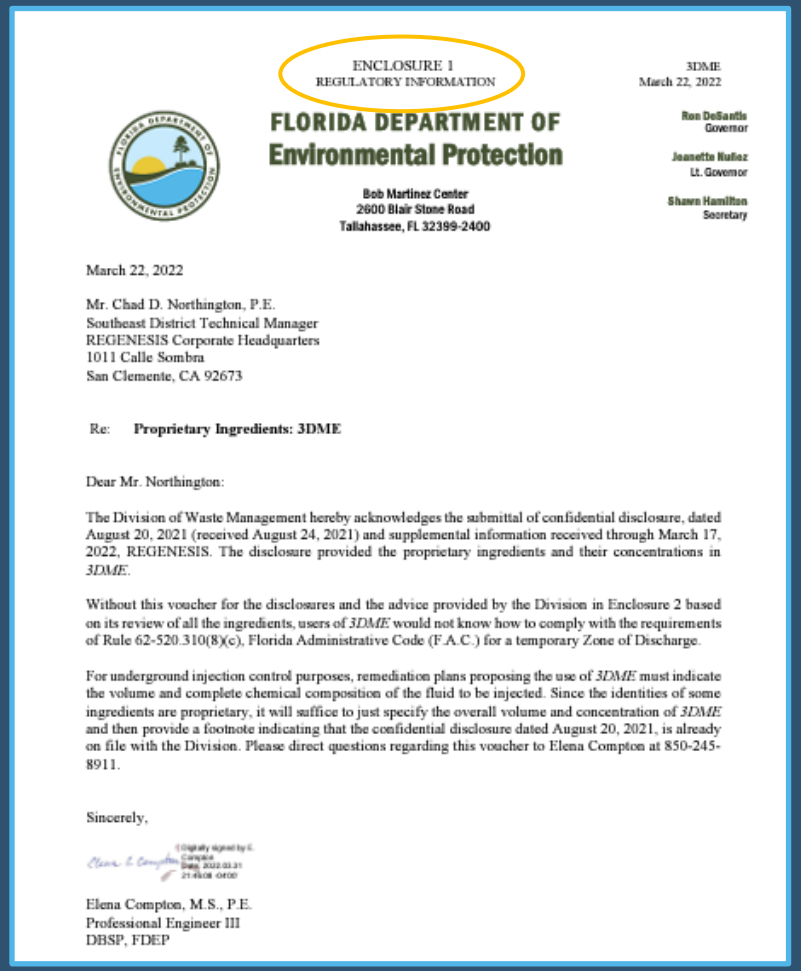
Additionally, Department acceptance of any product or process does not imply it has been deemed applicable for any particular cleanup situation, or that it is preferred over other treatment or cleanup

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- Acceptance Letters *may* Include:
  - Proprietary Ingredient Letter.
  - Regulatory Information:
    - Groundwater Monitoring.
      - Including baseline sampling.
    - Application Requirements.
- Every Acceptance varies.



ENCLOSURE 1
REGULATORY INFORMATION

3DME
March 22, 2022

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 22, 2022

Mr. Chad D. Northington, P.E.
Southeast District Technical Manager
REGENESIS Corporate Headquarters
1011 Calle Sombra
San Clemente, CA 92673

Re: **Proprietary Ingredients: 3DME**

Dear Mr. Northington:

The Division of Waste Management hereby acknowledges the submittal of confidential disclosure, dated August 20, 2021 (received August 24, 2021) and supplemental information received through March 17, 2022, REGENESIS. The disclosure provided the proprietary ingredients and their concentrations in *3DME*.

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 *3DME* 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 *3DME* 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 *3DME* and then provide a footnote indicating that the confidential disclosure dated August 20, 2021, is already on file with the Division. Please direct questions regarding this voucher to Elena Compton at 850-245-8911.

Sincerely,

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

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

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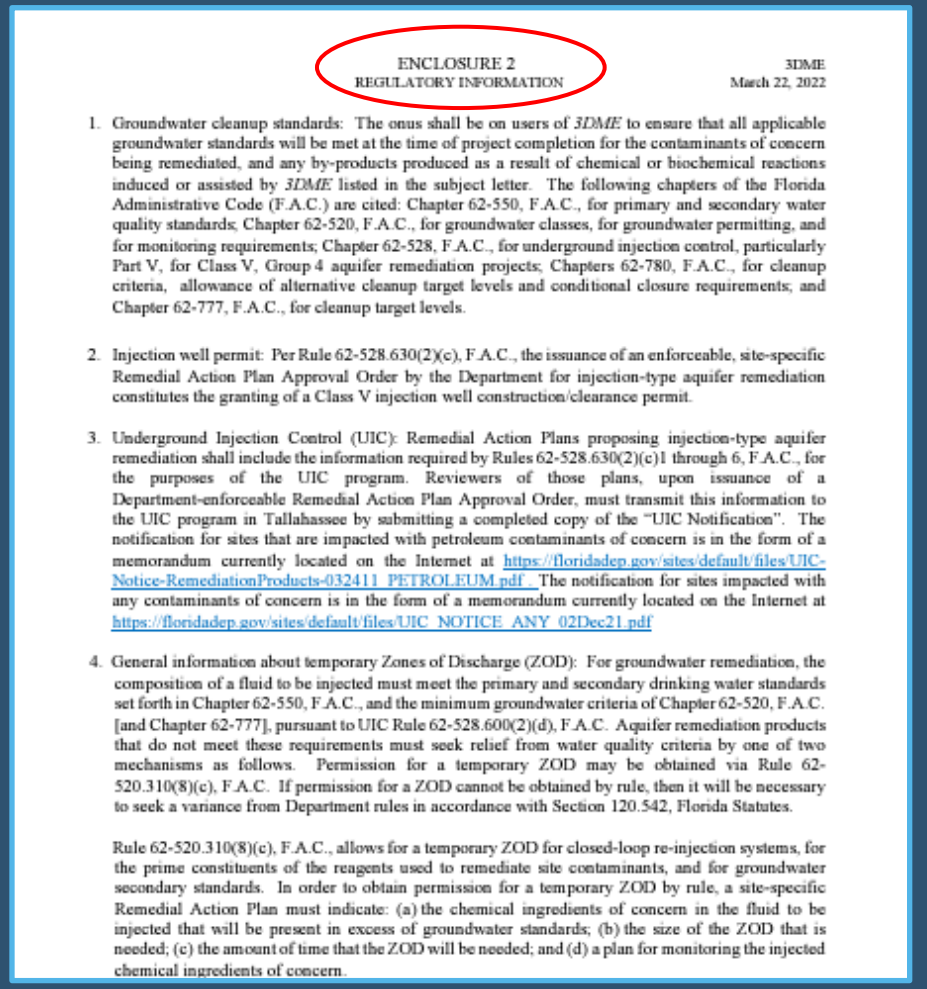


ENCLOSURE 2
REGULATORY INFORMATION

3DME
March 22, 2022

1. Groundwater cleanup standards: The onus shall be on users of *3DME* 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 *3DME* 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.

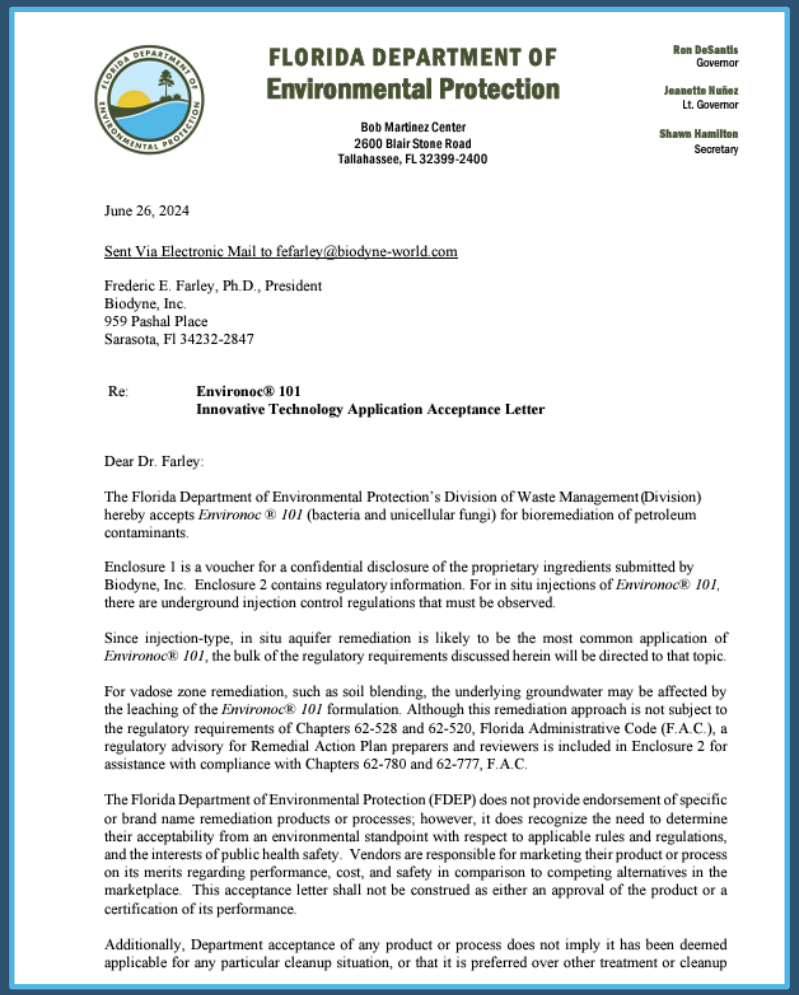
   Rule 62-520.310(8)(c), F.A.C., allows for a temporary ZOD for closed-loop re-injection systems, for the prime constituents of the reagents used to remediate site contaminants, and for groundwater secondary standards. In order to obtain permission for a temporary ZOD by rule, a site-specific Remedial 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.

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- Interim Source Removal Proposal (ISRP)/RAP/RAP Modification/Pilot Test Plan (PTP) should include:
  - Copy of acceptance letter and all enclosures.
    - Clips on slide are portions of letter.



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Sent Via Electronic Mail to fefarley@biodyne-world.com

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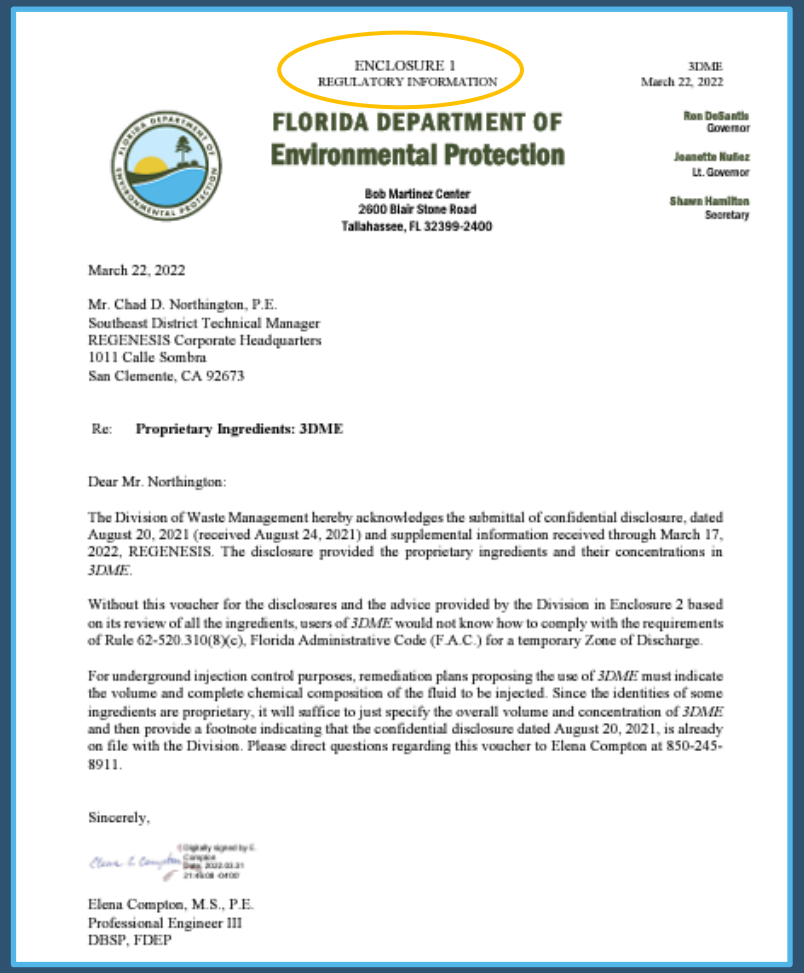
Additionally, Department acceptance of any product or process does not imply it has been deemed applicable for any particular cleanup situation, or that it is preferred over other treatment or cleanup

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- Monitoring requirements per acceptance letter.
  - For Injection **and** Excavation.
    - Explicitly and implicitly.
  - Minimum requirements.
    - Professionals can add.



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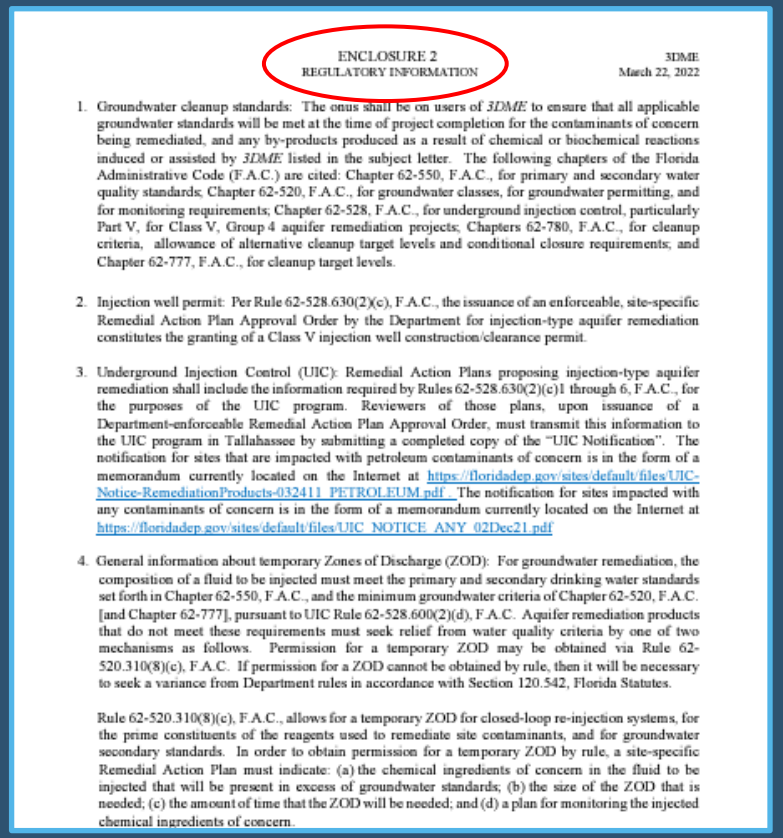
PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- UIC Notification Memo.
  - For application by injection including LDA applications.



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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

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   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.

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- Reviewing ISRP/RAP/RAP Modification/PTP:
  - Monitoring Plan Parameters match:
    - Acceptance Letter.
      - Zone of Discharge (ZOD) monitoring parameters listed specific to product.
      - ZOD permission by rule.

Acceptance Letter Regulatory Info clip:

8. Specific ZOD information for PetroFix and Electron Acceptor Blend – Nitrate Free:

c. For the ZOD parameters: aluminum, ammonia, arsenic, chromium, fluoride, lead, nickel, sulfate, and TDS shall be monitored. 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. … ".*

UIC Notification Memo clip:

TEMPORARY INJECTION ZONE OF DISCHARGE (ZOD)
(check those that apply)

☐ No ZOD needed. The fluid to be injected meets the primary and secondary groundwater standards of Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapters 62-520 and 62-777, F.A.C.

☐ 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. ZOD permission by this rule also applies to chemical species in the fluid to be injected that exceed primary groundwater standards or minimum groundwater criteria, provided those species are prime constituents of the reagents used to remediate site contaminants. The chemical species and parameters for which the approved Remedial Action Plan identifies zone size and duration, and addresses groundwater monitoring are summarized below.

Chemical species & parameters: aluminum, ammonia, arsenic, chromium, fluoride lead, nickel, sulfate, and TDS
Zone size (sq. ft.) 400 Duration (mos.) 1 Yes, monitoring addressed ☐

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- UIC Notification Memo.
  - Injections including LDA applications.
  - ZOD permission by rule.
    - List parameters.

Acceptance Letter Regulatory Info clip:

8. Specific ZOD information for PetroFix and Electron Acceptor Blend – Nitrate Free:

c. For the ZOD parameters: aluminum, ammonia, arsenic, chromium, fluoride, lead, nickel, sulfate, and TDS shall be monitored. 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. …* ".

UIC Notification Memo clip:

TEMPORARY INJECTION ZONE OF DISCHARGE (ZOD)
(check those that apply)

☐ No ZOD needed. The fluid to be injected meets the primary and secondary groundwater standards of Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapters 62-520 and 62-777, F.A.C.

☐ 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. ZOD permission by this rule also applies to chemical species in the fluid to be injected that exceed primary groundwater standards or minimum groundwater criteria, provided those species are prime constituents of the reagents used to remediate site contaminants. The chemical species and parameters for which the approved Remedial Action Plan identifies zone size and duration, and addresses groundwater monitoring are summarized below.

Chemical species & parameters: aluminum, ammonia, arsenic, chromium, fluoride lead, nickel, sulfate, and TDS
Zone size (sq. ft.) 400 Duration (mos.) 1 Yes, monitoring addressed ☐

PRODUCT APPLICATIONS AND PRODUCT ACCEPTANCE

INNOVATIVE TECHNOLOGIES

Accepted Products.

- Reviewing ISRP/RAP/RAP Modification/PTP:
  - ZOD:
    - Radius of Influence (ROI).
    - ZOD depicted on figure along with extents of groundwater impacts (plume) depicted.
      - Included in UIC Notification Memorandum.

Acceptance Letter Regulatory Info clip:

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.

UIC Notification Memo clip:

☐ If ZOD permission by rule 62-520.310(8)(c)†, F.A.C., or by variance is checked above, then a figure that delineates the ZOD is attached. (Use the lines below to more fully describe the ZOD if a figure alone will not suffice).

_____

_____

_____

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- DWM PRP Listing.
- Clips are portions of an example variance.
- Variance is for ZOD approval.
  - ZOD still applies.
- Variances are Orders.
- Vendor/applicant specific.

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In re: VENDOR/APPLICANT Petition for Variance

OGC File No. 98-2696
_____/

FINAL ORDER GRANTING PETITION FOR VARIANCE FROM RULE 62-522.300(2)(a)

On DATE, VENDOR/APPLICANT, filed a petition for variance from requirements in rule 62-522.300(2)(a) of the Florida Administrative Code, under section 120.542 of the Florida Statutes and rule 28-104.002 of the Florida Administrative Code. The petition was for a variance from rule 62-522.300(2)(a), which prohibits a zone of discharge for discharges through wells, in order to use its in-situ remedial product.

11. For the foregoing reasons, vendor/applicant has demonstrated that it is entitled to a variance from the prohibition of zones of discharge in rule 62-522.300(2)(a) for its remedial product, with the conditions below.

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- Variances **may** include:
  - Conditions.
    - Groundwater Monitoring.
      - Including baseline sampling.
    - Defined ZOD.
    - Application Requirements.
- Every Variance varies.

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In re: VENDOR/APPLICANT Petition for Variance

OGC File No. 98-2696
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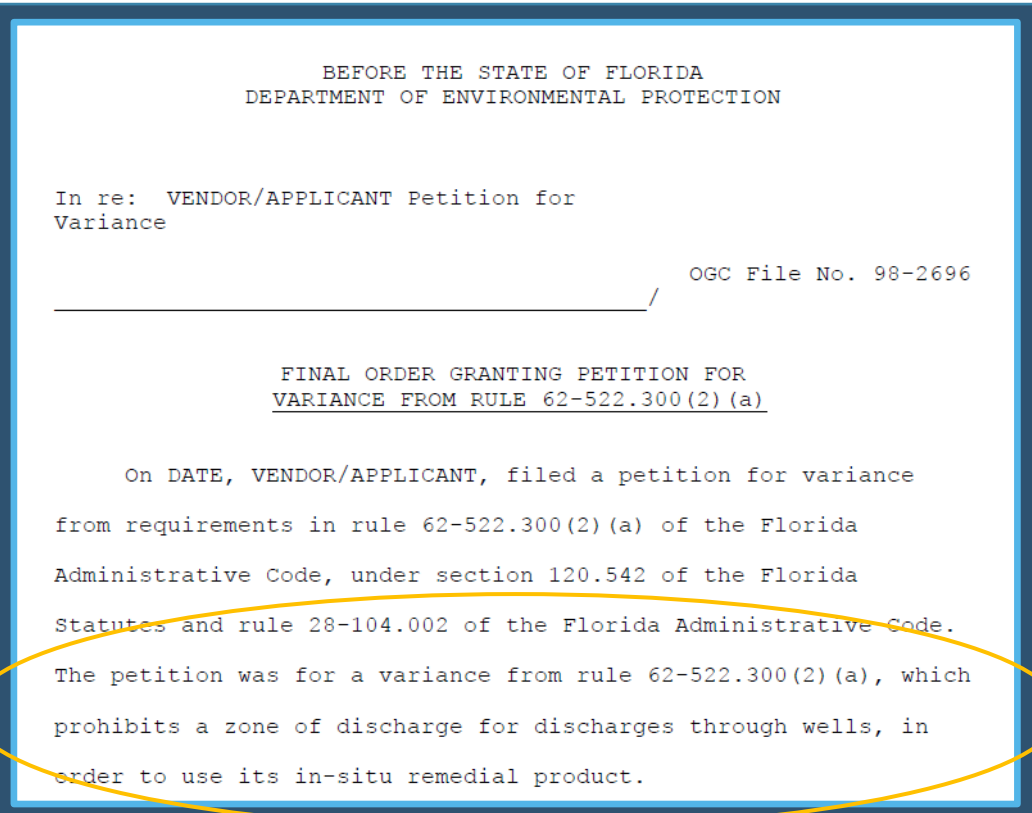
PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- ISRP/RAP/Mod/PTP should include:
  - Copy of Variance.
  - Clips are portions of an example variance.
  - Monitoring requirements per variance.
    - For Injection **and** Excavation.
      - Explicitly and implicitly.
    - Minimum Requirements.
      - Professionals can add.
  - UIC Memo.
    - For application by injection including LDA applications.



BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In re: VENDOR/APPLICANT Petition for Variance

OGC File No. 98-2696
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11. For the foregoing reasons, vendor/applicant has demonstrated that it is entitled to a variance from the prohibition of zones of discharge in rule 62-522.300(2)(a) for its remedial product, with the conditions below.

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- Reviewing ISRP/RAP/Mod/PTP:
  - Monitoring Plan Parameters match:
    - Variance.
      - Monitoring parameters listed specific to product.

Example Variance clip:

e. The Department-approved remedial action plan shall address appropriate ground water monitoring requirements associated with the use of PRODUCT for remediation based on site-specific hydrogeology and conditions. The monitoring requirements shall include the following.

(1) Nitrate, since the concentration of nitrate in PRODUCT is 8.46 mg/L and the ground water standard for nitrate is 10 mg/L, all monitoring associated with the use of PRODUCT must include nitrate.

(2) If the injected concentration of PRODUCT is greater than 3%, then ground water monitoring for the following surfactant degradation products, each with a 8.4 parts per billion minimum ground water criterion, as recommended by the University of Florida Center for Environmental and Human Toxicology shall be conducted before the use of PRODUCT: nonylphenol, nonylphenol monoethoxylate, and nonylphenol diethoxylate.

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- Reviewing ISRP/RAP/Mod/PTP:
  - Monitoring Plan Parameters match:
    - UIC Notification Memo.
      - Injections including LDA applications.
      - ZOD permission by variance.
        - List parameters.

UIC Notification Memo clip:

TEMPORARY INJECTION ZONE OF DISCHARGE (ZOD)
(check those that apply)

☐ No ZOD needed. The fluid to be injected meets the primary and secondary groundwater standards of Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapters 62-520 and 62-777, F.A.C.

☐ ZOD permission by variance because the fluid to be injected contains the following impurities that are not prime constituents of the reagents used to remediate the site's contaminants, and the concentrations of those impurities in the fluid to be injected are in excess of their primary groundwater standards:

Impurities regulated as primary groundwater contaminants: TDS, ammonia, nitrogen.

Zone size (sq. ft.) 400 Duration (mos.) 12 Yes, monitoring addressed. ☐

☐ A variance needs to be granted before the remediation can be conducted.

☐ A variance has already been granted for the impurities listed above:

Date variance granted: 9/7/2001

Zone size (sq.ft.): ROI 35-foot

Duration (mos.): one (1) year

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- Reviewing ISRP/RAP/Mod/PTP:
  - ZOD:
    - ROI.
      - Example: 35-foot ROI.
      - If defined in variance, may or may not match site-specific ROI.
        - Adjust ISRP / RAP / Mod / PTP accordingly.
  - ZOD depicted on figure with extents of impacts depicted.
    - Included in UIC Notification Memorandum.

Example Variance Clip:

> c. The extent of the zone of discharge for TDS and ammonia nitrogen, shall be a 35-foot radius from the point of injection and the duration of the zone of discharge shall be one year. This will allow ample time for the temporarily exceeded parameters to return to the applicable standards and levels set forth in chapters 62-550 and 62-777 of the Florida Administrative Code, or their naturally occurring background levels at a site, whichever is less stringent.

UIC Notification Memo clip:

☐ If ZOD permission by rule 62-520.310(8)(c)†, F.A.C., or by variance is checked above, then a figure that delineates the ZOD is attached. (Use the lines below to more fully describe the ZOD if a figure alone will not suffice).

PRODUCT APPLICATIONS
PRODUCT VARIANCE

UIC Variances.

- Each variance varies.
- Variance language is very specific.
  - Clip on slide is portion of very specific variance.
  - Example: variance lists specific site.

a. This final order only grants approval of RemOx® EC for use at the Koppers Superfund Site in Gainesville, Florida.

- Whether UIC Variance or Acceptance Letter, read through thoroughly.

FINAL ORDER GRANTING PETITION FOR
VARIANCE FROM RULE 62-522.300(3), F.A.C.

On October 8, 2007, Adventus Americas, Inc. (Adventus) filed a petition for variance from requirements in Rule 62-522.300(3) of the Florida Administrative Code (F.A.C.). The petition was for a variance under section 120.542 of the Florida Statutes, from Rule 62-522.300(3), which prohibits a zone of discharge for discharges through wells, in order to use an in-situ remediation process. This process involves the use of wells or borings which is considered installation of one or more temporary Class V underground injection control wells at the site of contamination. A notice of receipt of the petition was noticed in the Florida Administrative Weekly on November 9, 2007.

1. Petitioner is located at 2871 West Forest Road, Suite 2, Freeport, Illinois 61032.

2. Adventus wants to use an inorganic oxidant product called RemOx® EC Stabilization Reagent (RemOx® EC) to remediate ground water contaminated with organic wood preservatives at the Koppers superfund site in Gainesville, Florida (Koppers). The Koppers facility is located at 200 NW 23rd Boulevard, Gainesville, Florida 32607. RemOx® EC is typically supplied in a liquid form which is approximately 4.5% by weight sodium permanganate.

PRODUCT APPLICATIONS
PRODUCT ACCEPTANCES AND VARIANCES SUMMARY

Product Acceptances and Variances Summary.

- The ISRP/RAP/Mod/PTP, proposed application, and monitoring are to be in accordance with the acceptance letter or variance.
- Acceptance Letter or Variance should be included in ISRP/RAP/Mod/PTP.
- ZOD permission is by Rule (Acceptance Letter) or by Variance.
- Each acceptance letter and variance varies. Read through acceptance letter or variance thoroughly.
- UIC Notification Memorandum included in ISRP / RAP / Mod / PTP for injections, including LDA applications.

PRODUCT APPLICATIONS
PRODUCT ACCEPTANCES AND VARIANCES SUMMARY

Product Acceptances and Variances Summary – cont.

- UIC Order or RAP Order, including for open pit applications, is required.
- Monitoring requirements are for product application via injection, including LDA applications, and conventional excavation (i.e., open pit), whether stated explicitly or implicitly and per guidance document BPSS-10, In Situ Chemical Application.

PRODUCT APPLICATIONS

PRODUCT ACCEPTANCES AND VARIANCES SUMMARY

Product Acceptances and Variances Summary – continued.

- Upon expiration of the time period granted for the ZOD by way of Rule 62-520.310(8)(c), Florida Administrative Code (F.A.C.), or variance, the concentrations of the monitoring parameters referenced in the acceptance letter or variance 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.

PRODUCT APPLICATIONS
Monitoring

Product Applications – Monitoring.

- Why? (Rule/guidance/product acceptance/variance conditions).
- What? (parameters).
- When? (schedule/frequency).
- Where? (well locations).

- Types of Monitoring:
  - ZOD Monitoring.
  - Active Remediation Monitoring.
  - Post Active Remediation Monitoring (PARM).
  - Natural Attenuation Monitoring (NAM).

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

- Monitoring per Acceptance Letter (Variance is similar).
  - See Regulatory Information section of letter, ZOD section.
  - The acceptance letter or variance provide the parameters and frequency required for ZOD Monitoring.
    - Parameters may include sodium, foaming agents, iron, chloride, pH, etc.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

- Monitoring per Acceptance Letter (Variance is similar).
  - Monitoring is required for injections *and* application to open pits/excavations.
    - Example requirement, “If xxx 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.”
      - In line with guidance: BPSS-10, In Situ Chemical Additives.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

- Monitoring per Acceptance Letter or Variance.
  - May include monitoring in addition to ZOD parameters.
    - Example acceptance letter requirement, “these parameters are not ZOD monitoring parameters but should be included in the baseline sampling and then annually following treatment to demonstrate and verify compliance with Chapter 62-528, F.A.C.”
    - Example monitoring parameters may include:
      - Chromium, aluminum, zinc, lead, etc.

PRODUCT APPLICATIONS - MONITORING

Product Applications – Monitoring.

- Acceptance Letters and Variances provide minimum monitoring.
  - Professional judgement may be used to add monitoring to ISRP / RAP / Mod / PTP {e.g., add parameters (e.g., color), increase frequency, etc.}.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

Monitoring Wells.

- Maintain representative monitoring wells during product application.
  - For example, do not install injection points or perform application to open pits too close to monitoring wells.
    - Use site-specific ROIs, variance ROIs, or minimum 10-foot distance.
    - Pilot Tests may include wells within close proximity to injection points to determine ROI; however, those wells may become compromised with respect to providing groundwater samples representative of groundwater conditions.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

Monitoring Wells.

- No well used for product application shall be used to track remediation progress (i.e., may not be or become a designated monitoring well).
- See Guidance: BPSS-10, In Situ Chemical Additives.

PRODUCT APPLICATIONS
Monitoring

Product Applications – Monitoring.

Baseline Sampling

- Baseline Sampling is required prior to product application.
- Recommend developing based on plans for active remediation and PARM.
- More than one baseline sampling event may be beneficial.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

Baseline Sampling

- If product to be applied includes electron acceptors, and site-specific concentrations of electron acceptors has not yet been evaluated, baseline sampling may be beneficial for confirming formulation of product.
  - E.g., nitrate, manganese, sulfate, etc. may not be a limiting factor to bioremediation at the site.
  - Allow time between baseline sampling and product application to assess.
    - If not done previously, include site-specific electron acceptor assessment and confirmation of product formulation in ISRP / RAP / PTP.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

Active Remediation Monitoring.

- Portion of applied product remains active.
  - Active portion of product may be surfactants, electron acceptors, etc.
  - Product may be active for minutes, days, months, etc. after application.
- ISRP/RAP/Mod/PTP must present the conditions used to determine when the product is no longer active and when PARM will begin.
  - Active portion of product (e.g., electron acceptors) exhausted/expended.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Monitoring.

Active Remediation Monitoring.

- Minimum of two (2) wells.
  - At least one well downgradient.
  - At least one well located in the area(s) of highest groundwater impacts.
- Temporary Point of Compliance (TPOC) well(s), as applicable.
- Representative monitoring wells as needed for monitoring progress of active remediation.
  - Use professional judgement.
- See Acceptance Letters and Guidance: BPSS-10, In Situ Chemical Additives.

PRODUCT APPLICATIONS
Monitoring

Product Applications – Monitoring.

PARM or NAM.

- No residual effects of active portion of product remain.
  - Active portions of the product have been exhausted/expended.
- First PARM event 90+ days **after** there are no longer any residual effects from the product application.
  - **Consider**: point at which no residual effects of active product remain as equivalent to a system shut-down.
- Non-active by-products (e.g., chromium, fluoride, total dissolved solids (TDS), etc.) may remain above respective groundwater standards or site-specific background values.

PRODUCT APPLICATIONS
Monitoring

Product Applications – Monitoring.

PARM or NAM.

- Minimum of two (2) wells.
  - At least one well downgradient.
  - At least one well located in the area(s) of highest groundwater impacts.
- Temporary Point of Compliance (TPOC) well(s), as applicable.
- Representative monitoring wells as needed.
  - Use professional judgement.

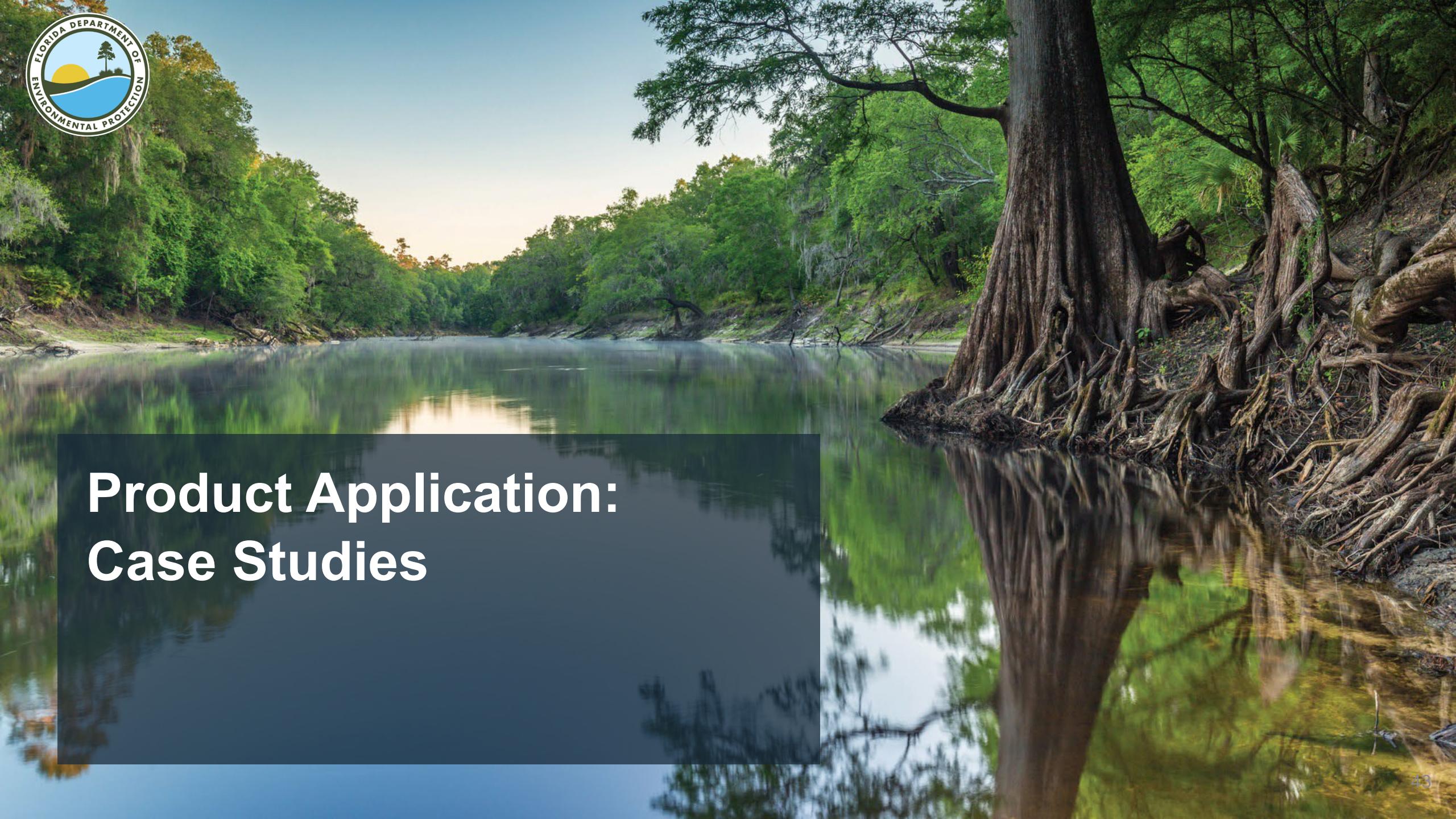
- See Acceptance Letters and Guidance: BPSS-10, In Situ Chemical Additives.

PRODUCT APPLICATIONS

Monitoring

Product Applications – Closure.

- For Closure.
  - Concentrations of monitoring parameters set by acceptance letter or variance meet their respective groundwater standards or return to their site-specific background values, whichever is less stringent.



Product Application: Case Studies

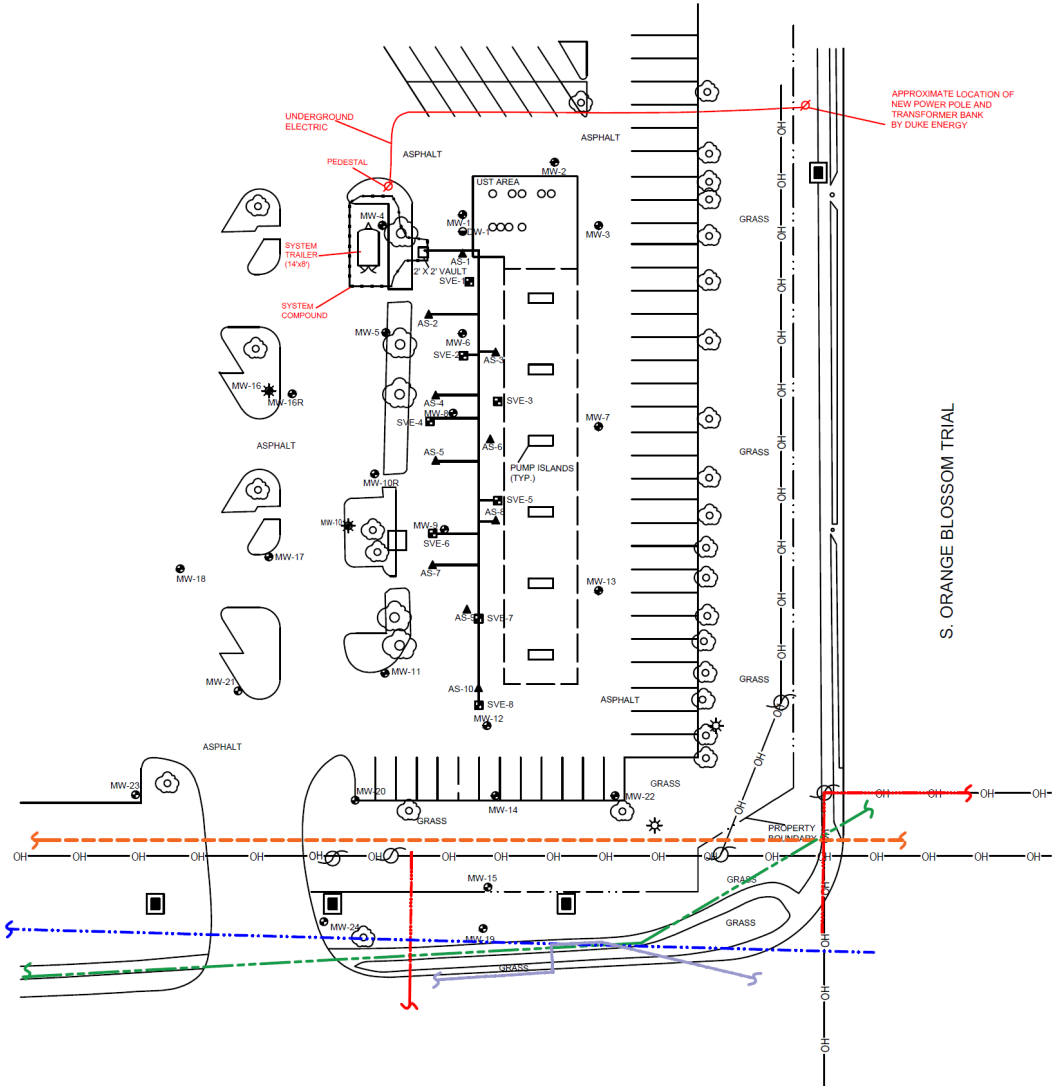
PRODUCT APPLICATIONS

Case Studies

Case Studies - Agenda

- Sam's #8290 – FACID # 489803654
  - Active Remediation
  - Bioaugmentation
  - Bio-stimulation
- Amoco 2093 – FACID # 598520812
  - Active Remediation
  - Micro-carbon Injection
- Bay Pines Marina – FACID # 528624588
  - Excavation
  - Chemical Oxidation

EXISTING SYSTEM LAYOUT

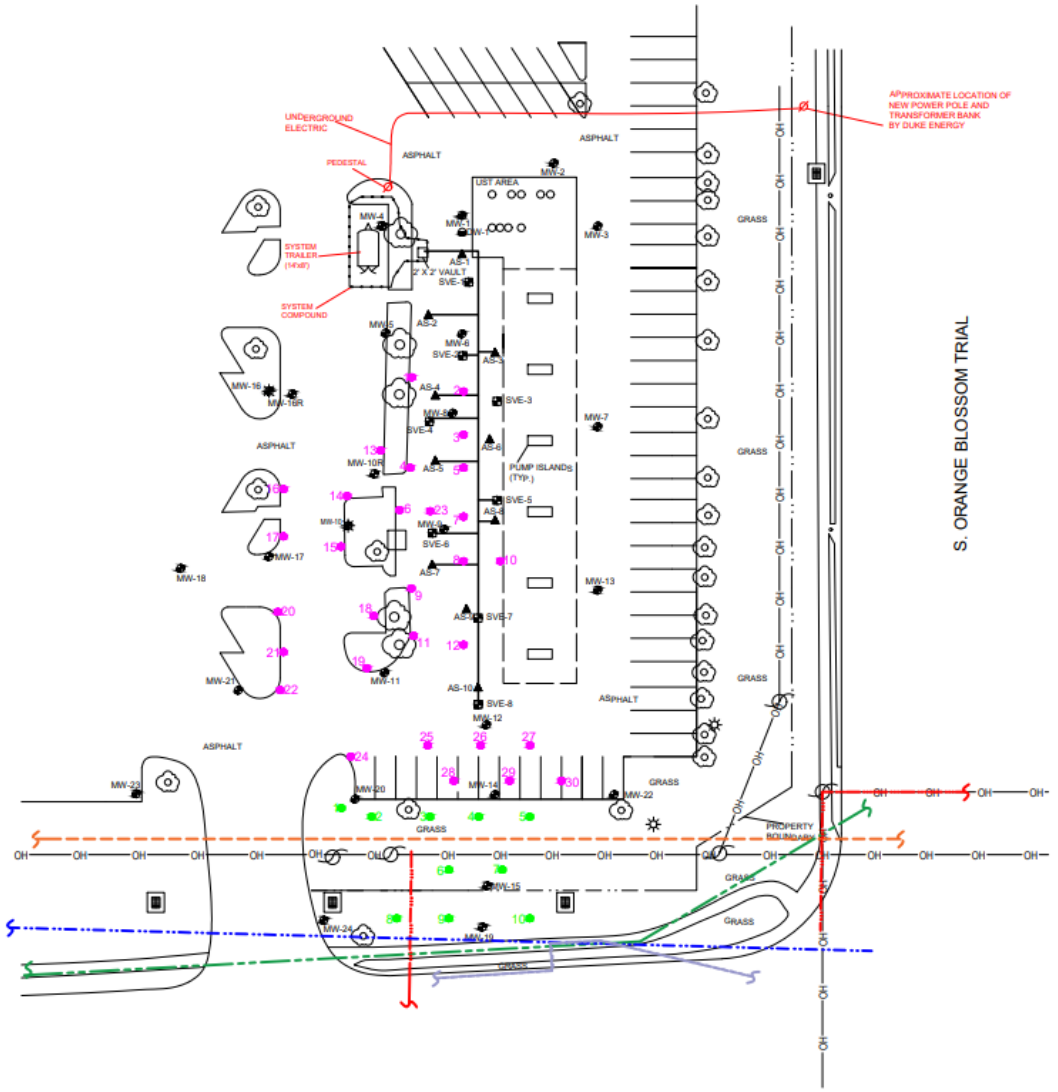


- Sam's - FACID # 489803654
  - Active Remediation
  - Bioaugmentation
  - Bio-stimulation

(Non-Program Site – Responsible Party (RP))

Consultant: Trident Treatment and Dewatering DBA MAS Environmental LLC

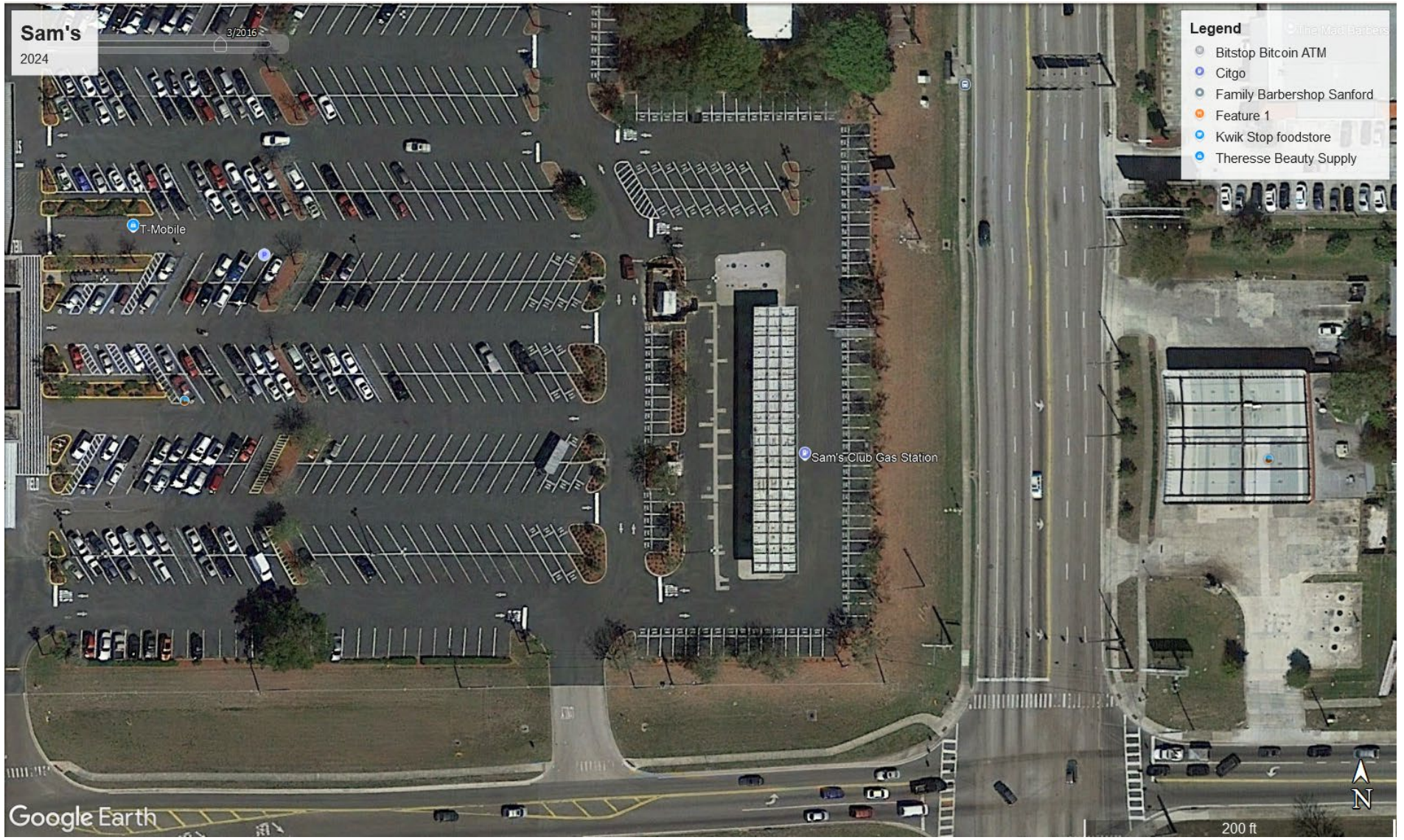
SAM'S PROPOSED INJECTION LOCATIONS



- Sams - FACID # 489803654
  - Active Remediation
  - Bioaugmentation
  - Bio-stimulation

(Non-Program Site - RP)
Consultant: Trident Treatment and Dewatering DBA MAS Environmental LLC

SAM'S #8290 - FACID # 489803654



SITE LAYOUT

Sources: Google Earth.

- Sam's – FACID # 489803654
  - Active Remediation
  - Bioaugmentation
  - Bio-stimulation
- (Non-Program Site - RP)
- Consultant: Trident Treatment and Dewatering DBA MAS Environmental LLC

GROWING THE CULTURES

Source: James Russel, Orange County.

- Sam's – FACID # 489803654
  - Active Remediation
  - Bioaugmentation
  - Bio-stimulation
- (Non-Program Site - RP)
- Consultant: Trident Treatment and Dewatering DBA MAS Environmental LLC

INJECTING THE MATERIAL

Source: James Russel, Orange County.

Source: James Russel, Orange County.

AMOCO #2092

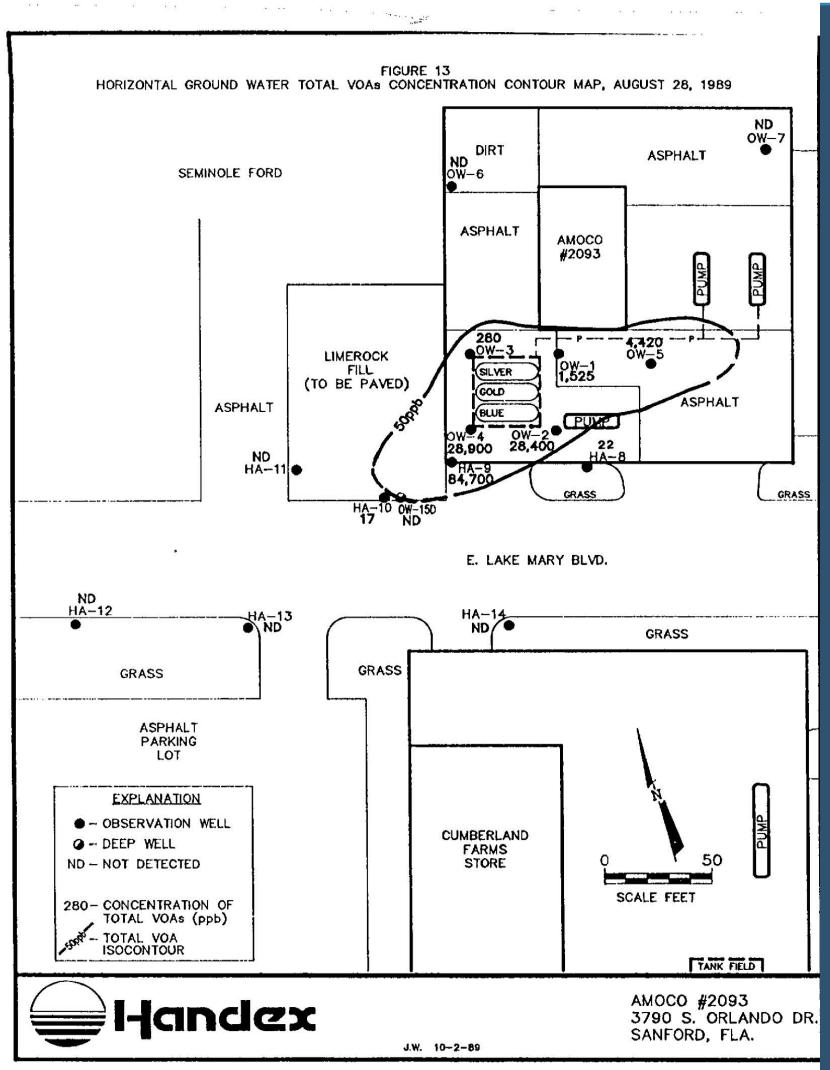


FIGURE 13
HORIZONTAL GROUND WATER TOTAL VOAs CONCENTRATION CONTOUR MAP, AUGUST 28, 1989
SEMINOLE FORD
DIRT
ND OW-6
ASPHALT
ND OW-7
ASPHALT
AMOCO #2093
PUMP
PUMP
LIMEROCK FILL (TO BE PAVED)
280 OW-3
4,420 OW-5
OW-1 1,525
SILVER
GOLD
BLUE
PUMP
ASPHALT
ASPHALT
50ppb
OW-4 28,900
OW-2 28,400
22 HA-8
ND HA-11
HA-9 84,700
GRASS
GRASS
HA-10 17
OW-150 ND
E. LAKE MARY BLVD.
ND HA-12
HA-13 ND
HA-14 ND
GRASS
GRASS
GRASS
ASPHALT PARKING LOT
EXPLANATION
● – OBSERVATION WELL
◪ – DEEP WELL
ND – NOT DETECTED
280 – CONCENTRATION OF TOTAL VOAs (ppb)
50ppb – TOTAL VOA ISOCONTOUR
CUMBERLAND FARMS STORE
N
0
50
SCALE FEET
PUMP
TANK FIELD
Handex
J.W. 10-2-89
AMOCO #2093
3790 S. ORLANDO DR.
SANFORD, FLA.

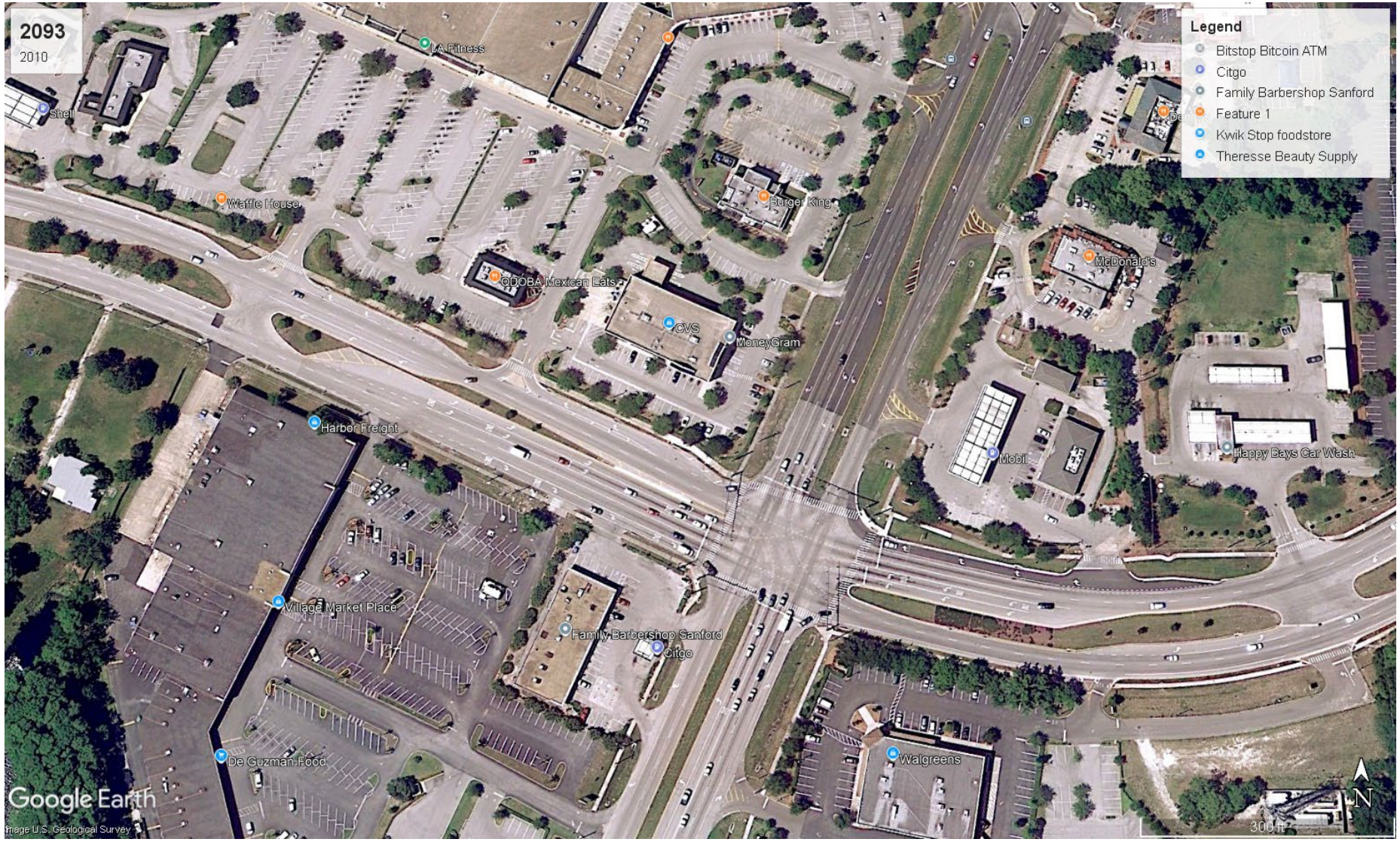
AMOCO #2092


2093
1994
Legend
Bitstop Bitcoin ATM
Citgo
Family Barbershop Sanford
Feature 1
Kwik Stop foodstore
Theresse Beauty Supply
LA Fitness
Shell
Waffle House
Burger King
McDonald's
QDOBA Mexican Eats
CVS
MoneyGram
Harbor Freight
Mobil
Happy Bays Car Wash
Village Market Place
Family Barbershop Sanford
Citgo
De Guzman Food
Walgreens
Google Earth
Image U.S. Geological Survey
N
300 ft

AMOCO #2092


2093 - 1994
Legend
/ David Press
59-8520812 / David Press
AT&T
Blockbuster
Dadaab Refugee Camp
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Great Faith Christian Center Church
Prestige Team Realty
Qdoba Mexican Grill
Us 17&92
59-8731599 / David Press
59-8520812 / David Press
59-8516588 / David Press
W Lake Mary Blvd
E Lake Mary Blvd
15
Cherokee Cir
Google Earth
Image U.S. Geological Survey
N
300 ft

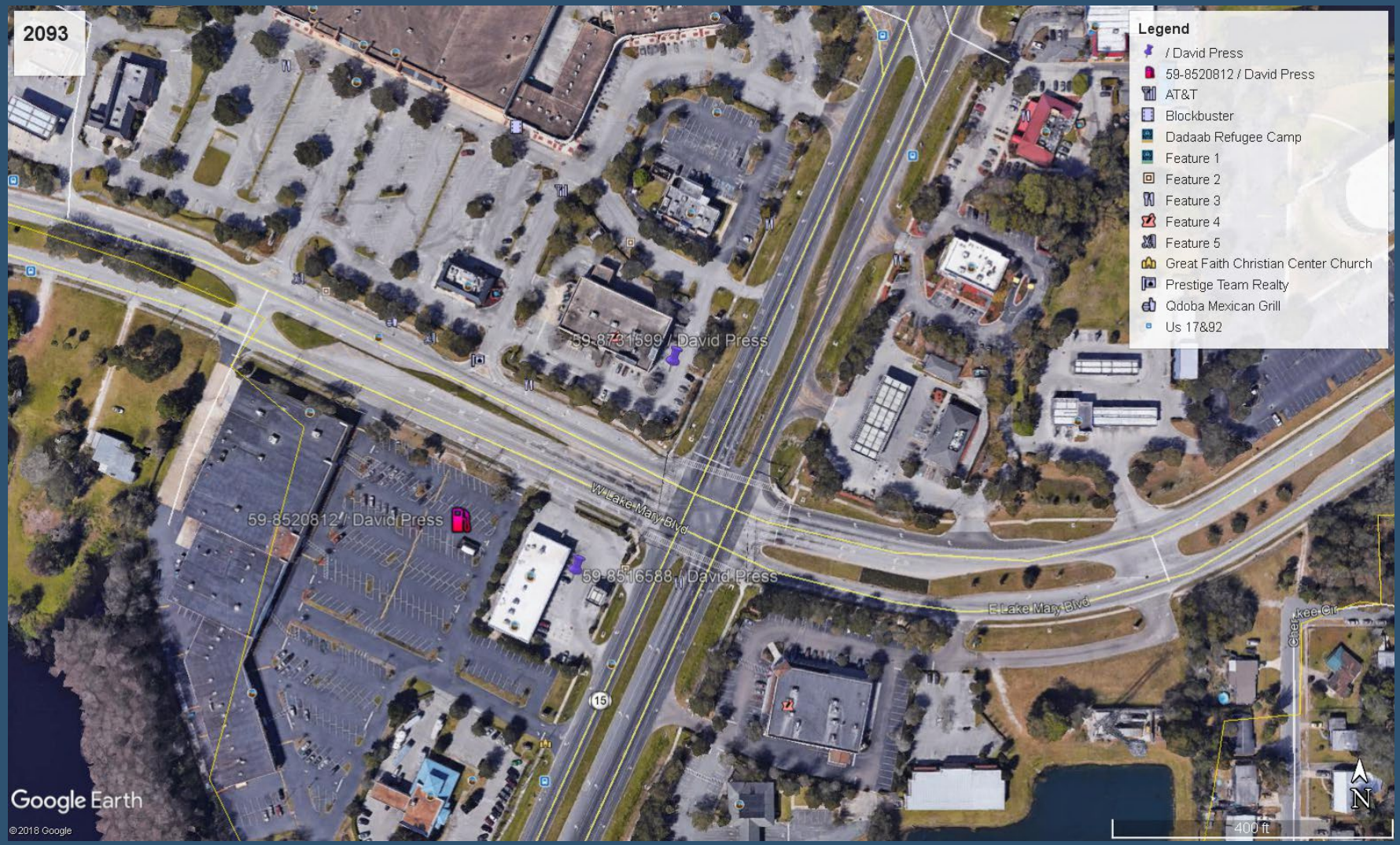
AMOCO #2092


2093
2010
Legend
Bitstop Bitcoin ATM
Citgo
Family Barbershop Sanford
Feature 1
Kwik Stop foodstore
Theresse Beauty Supply
L.A. Fitness
Shell
Waffle House
Burger King
QDOBA Mexican Eats
CVS
MoneyGram
McDonald's
Harbor Freight
Mobil
Happy Bays Car Wash
Village Market Place
Family Barbershop Sanford
Citgo
De Guzman Food
Walgreens
Google Earth
Image U.S. Geological Survey
N
300 ft

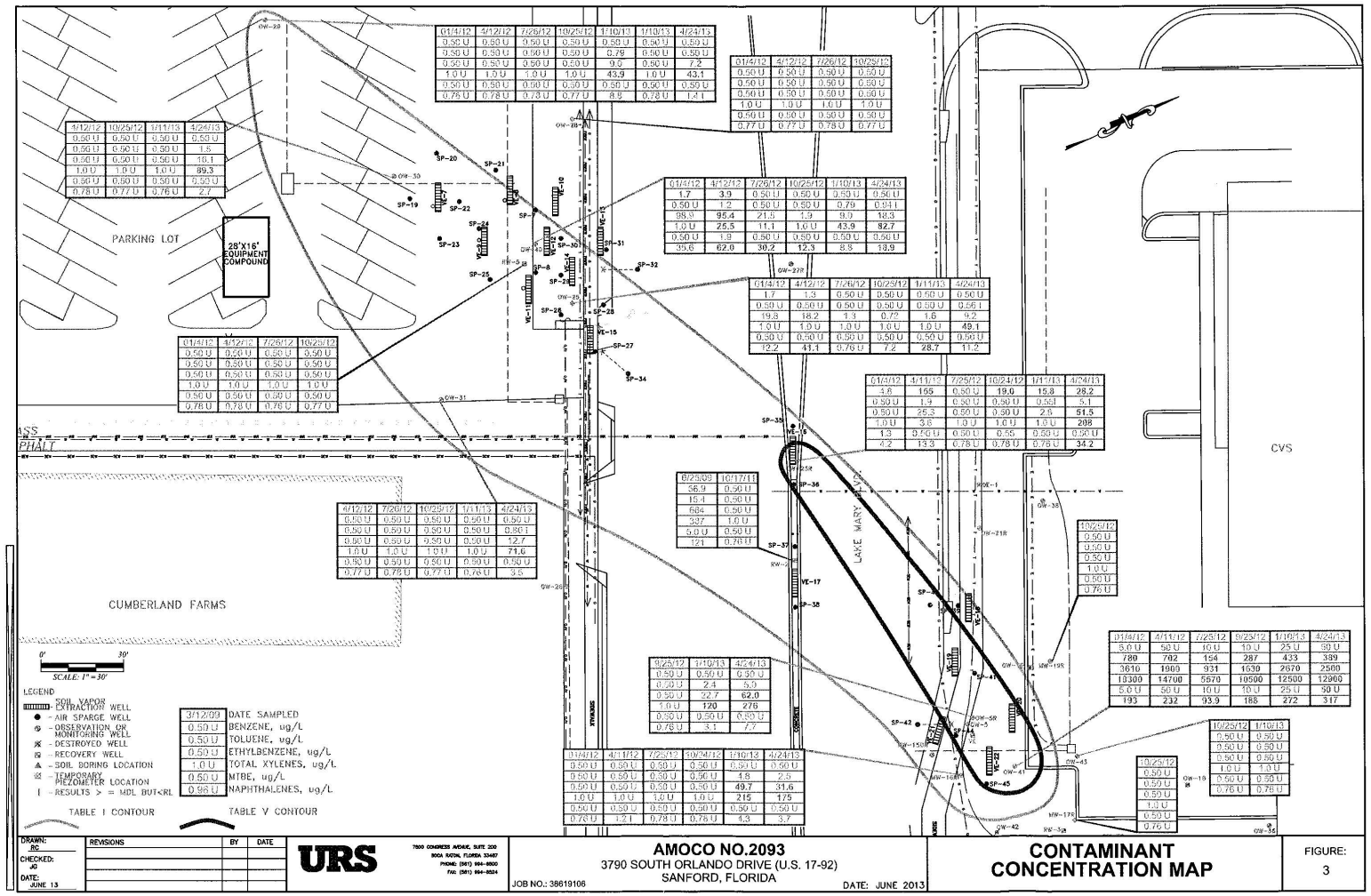
AMOCO #2092


2093
2024
Legend
Bitstop Bitcoin ATM
Citgo
Family Barbershop Sanford
Feature 1
Kwik Stop foodstore
Theresse Beauty Supply
LA Fitness
Shell
Waffle House
Burger King
McDonald's
CORONA Mexican Eats
CVS
MoneyGram
Harbor Freight
Mobil
Happy Bays Car Wash
Village Market Place
Family Barbershop Sanford
Citgo
De Guzman Food
Walgreens
Google Earth
Image U.S. Geological Survey
300 ft
N

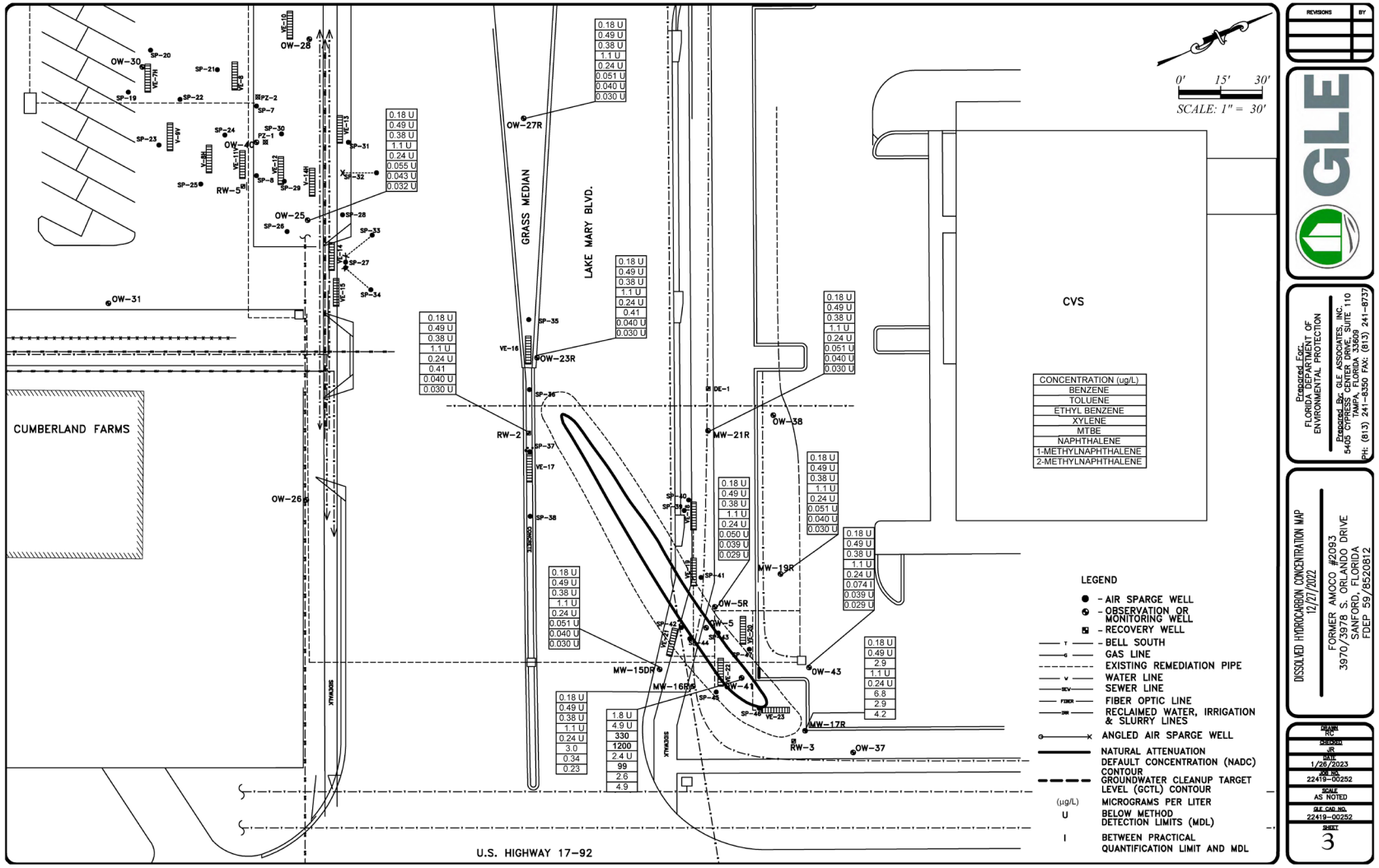
AMOCO #2092


2093
Legend
/ David Press
59-8520812 / David Press
AT&T
Blockbuster
Dadaab Refugee Camp
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Great Faith Christian Center Church
Prestige Team Realty
Qdoba Mexican Grill
Us 17&92
59-8731599 / David Press
59-8520812 / David Press
59-8516588 / David Press
W Lake Mary Blvd
E Lake Mary Blvd
Cherokee Cir
15
Google Earth
©2018 Google
400 ft
N

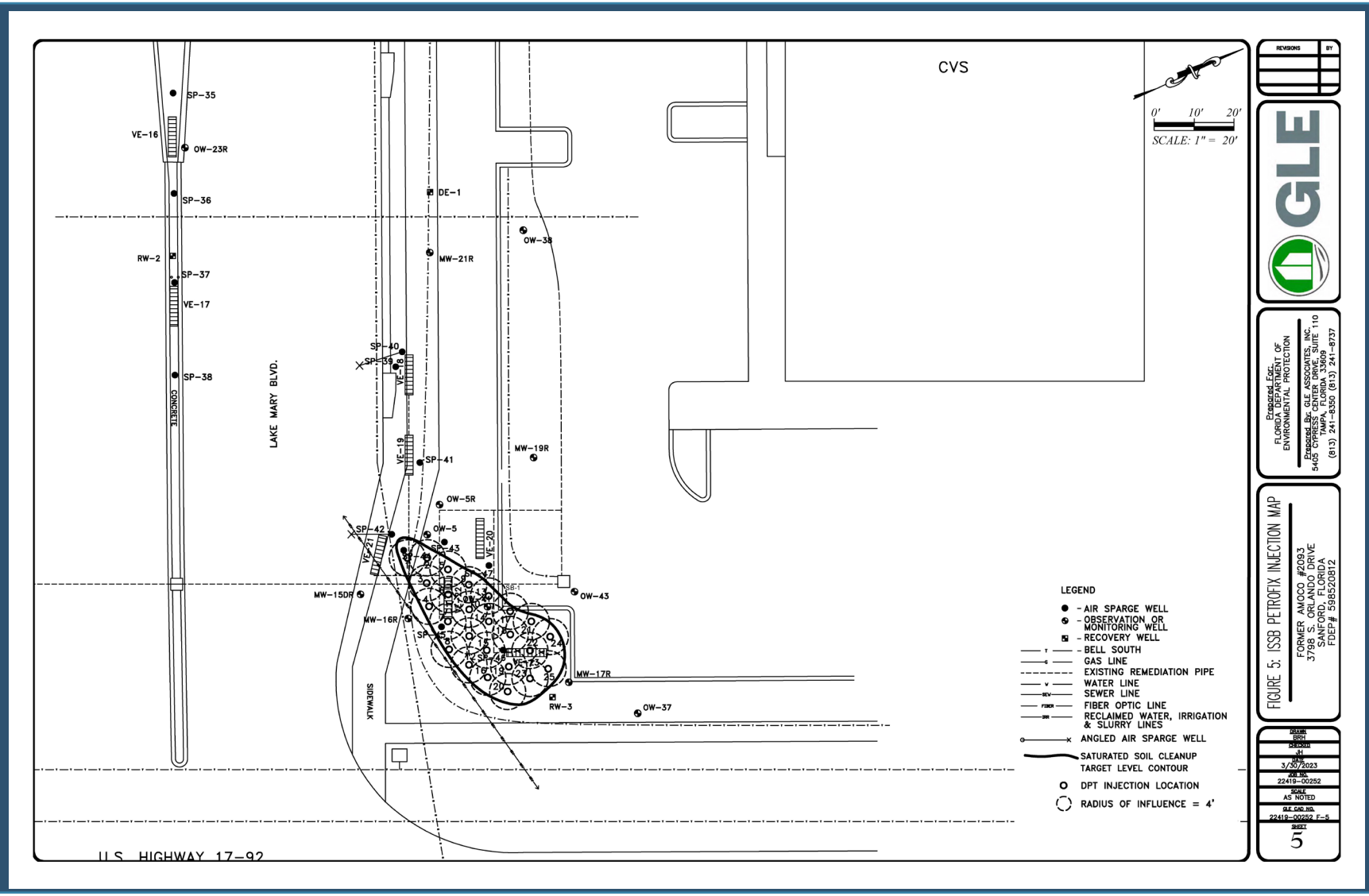
AMOCO #2092


PARKING LOT
28'X16' EQUIPMENT COMPOUND
CUMBERLAND FARMS
CVS
LAKE MARY BLVD
SCALE: 1" = 30'
LEGEND
SOIL VAPOR EXTRACTION WELL
AIR SPARGE WELL
OBSERVATION OR MONITORING WELL
DESTROYED WELL
RECOVERY WELL
SOIL BORING LOCATION
TEMPORARY PIEZOMETER LOCATION
RESULTS > = MDL BUT<RL
TABLE I CONTOUR
TABLE V CONTOUR
DATE SAMPLED
BENZENE, ug/L
TOLUENE, ug/L
ETHYLBENZENE, ug/L
TOTAL XYLENES, ug/L
MTBE, ug/L
NAPHTHALENES, ug/L
DRAWN: RC
CHECKED: JO
DATE: JUNE 13
REVISIONS
BY
DATE
URS
AMOCO NO.2093
3790 SOUTH ORLANDO DRIVE (U.S. 17-92)
SANFORD, FLORIDA
JOB NO.: 38619106
DATE: JUNE 2013
CONTAMINANT CONCENTRATION MAP
FIGURE: 3

AMOCO #2092


CUMBERLAND FARMS
CVS
GRASS MEDIAN
LAKE MARY BLVD.
U.S. HIGHWAY 17-92
SCALE: 1" = 30'
CONCENTRATION (ug/L)
BENZENE
TOLUENE
ETHYL BENZENE
XYLENE
MTBE
NAPHTHALENE
1-METHYLNAPHTHALENE
2-METHYLNAPHTHALENE
LEGEND
AIR SPARGE WELL
OBSERVATION OR MONITORING WELL
RECOVERY WELL
BELL SOUTH
GAS LINE
EXISTING REMEDIATION PIPE
WATER LINE
SEWER LINE
FIBER OPTIC LINE
RECLAIMED WATER, IRRIGATION & SLURRY LINES
ANGLED AIR SPARGE WELL
NATURAL ATTENUATION DEFAULT CONCENTRATION (NADC) CONTOUR
GROUNDWATER CLEANUP TARGET LEVEL (GCTL) CONTOUR
(µg/L) MICROGRAMS PER LITER
U BELOW METHOD DETECTION LIMITS (MDL)
I BETWEEN PRACTICAL QUANTIFICATION LIMIT AND MDL
DISSOLVED HYDROCARBON CONCENTRATION MAP
12/27/2022
FORMER AMOCO #2093
3970/3978 S. ORLANDO DRIVE
SANFORD, FLORIDA
FDEP 59/8520812
Prepared For: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Prepared By: GLE ASSOCIATES, INC.
5405 CYPRESS CENTER DRIVE, SUITE 110
TAMPA, FLORIDA 33609
PH: (813) 241-8359 FAX: (813) 241-8737
GLE
REVISIONS
DRAWN RC
DESIGN JR
DATE 1/26/2023
JOB NO. 22419-00252
SCALE AS NOTED
GLE CAD NO. 22419-00252
SHEET 3

PROPOSED INJECTION LOCATIONS



IMPACTED AREA

AMOCO #2092

Source: James Russel, Orange County.

AMOCO #2092

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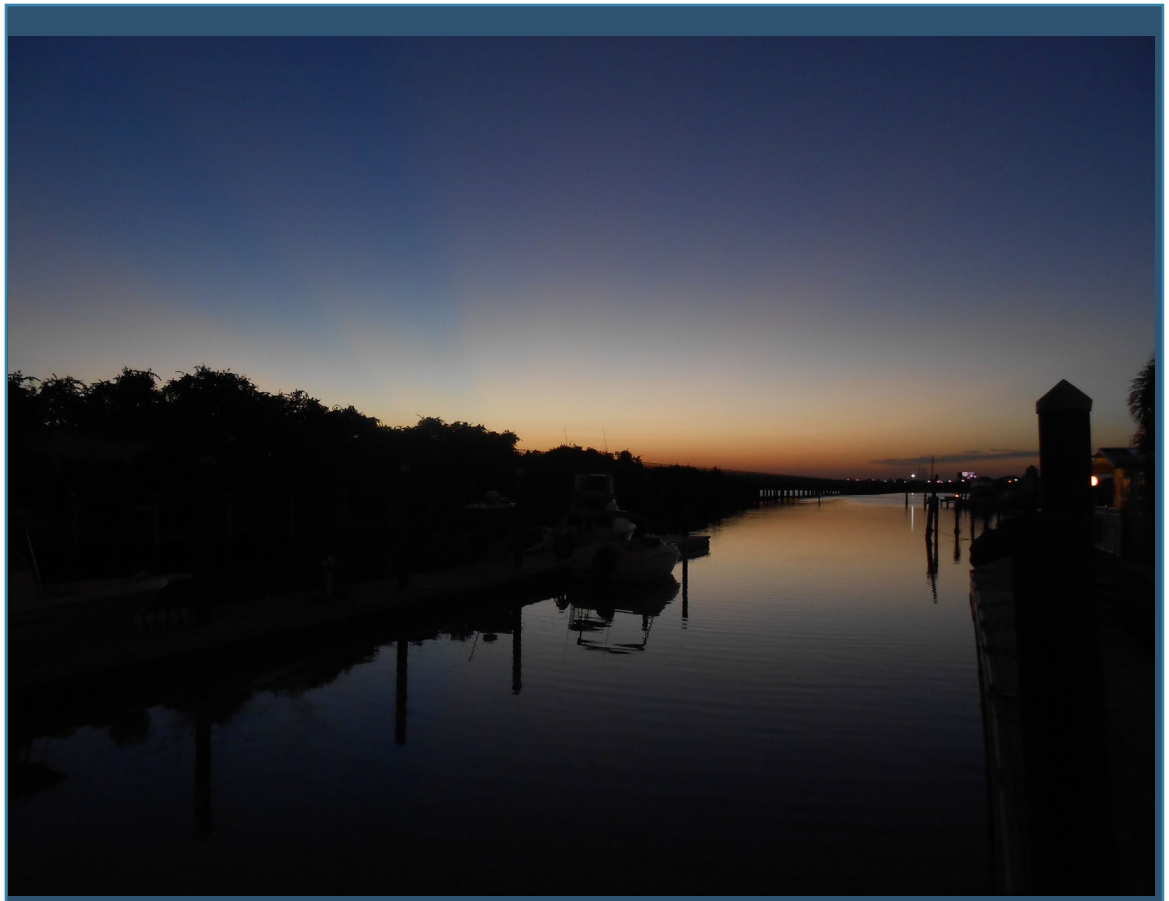
AMOCO #2092

Source: James Russel, Orange County.

AMOCO #2092

Source: James Russel, Orange County.

BAY PINES MARINA



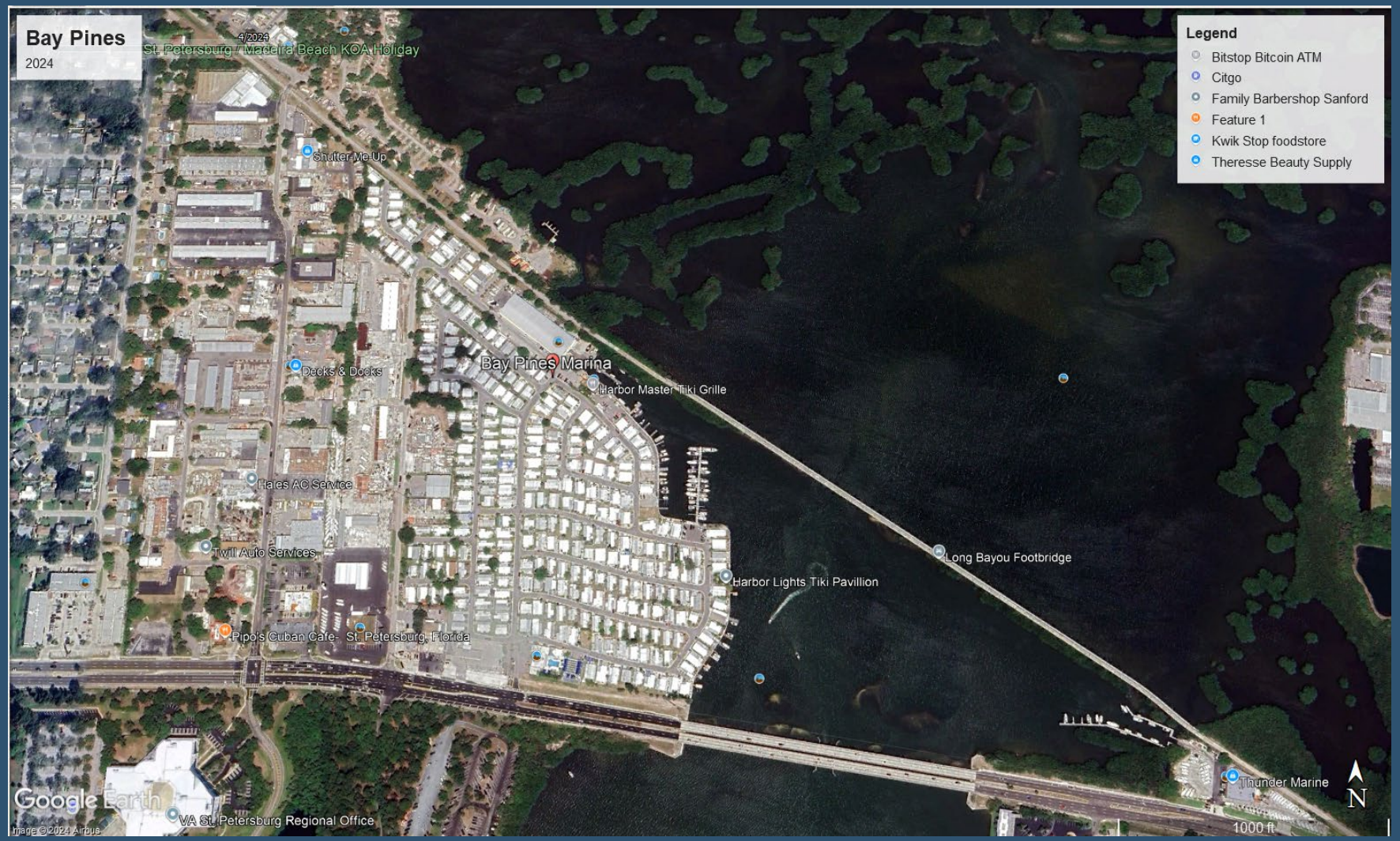
Source: James Russel, Orange County.

- Bay Pines Marina – FACID # 528624588
  - Excavation
  - Chemical Oxidation
- (Non-Program Site - Insurance)
- Consultant: Advance Environmental Technologies, LLC

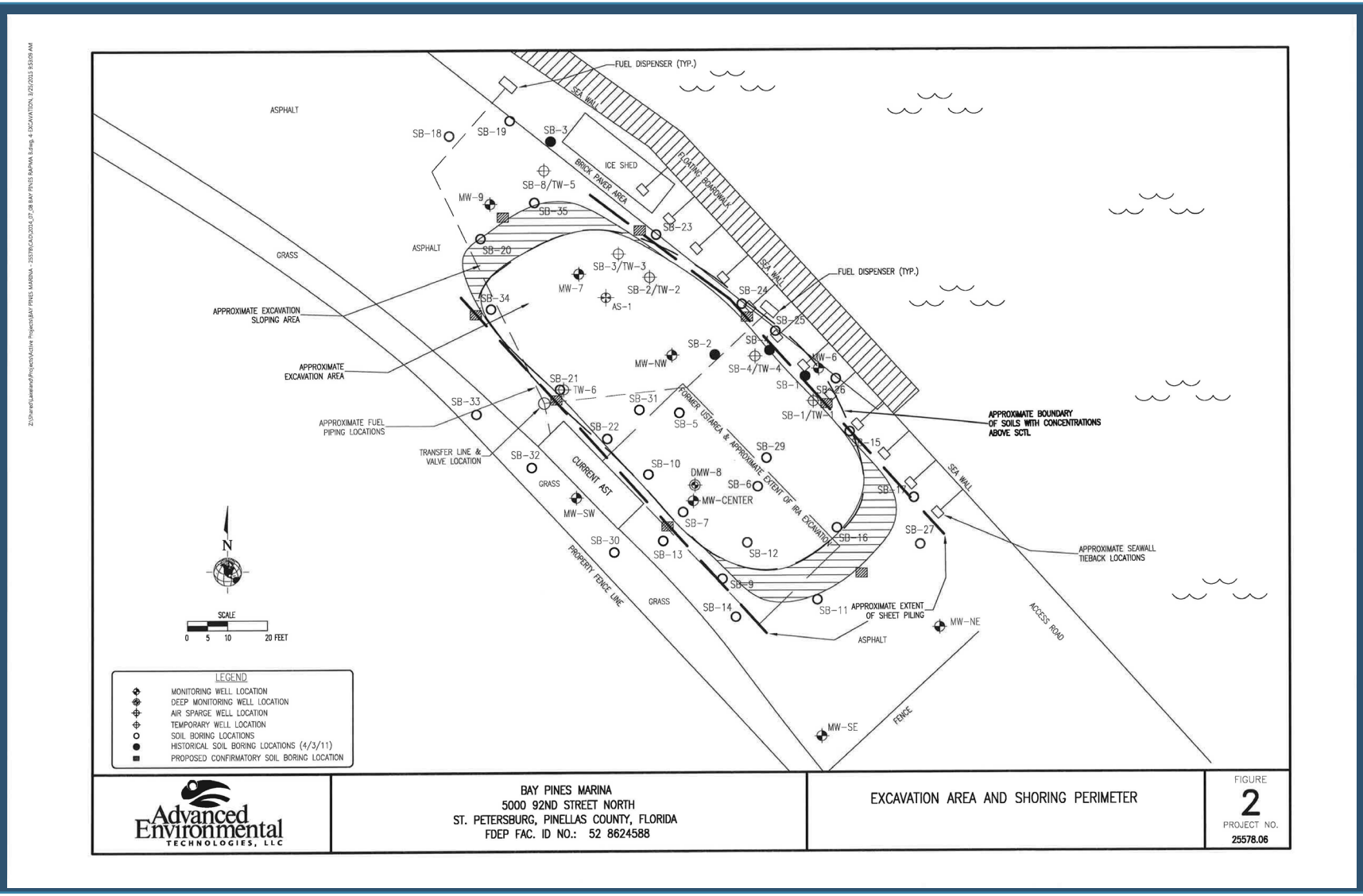
BAY PINES MARINA

Source: James Russel, Orange County.

BAY PINES MARINA



BAY PINES MARINA



BAY PINES MARINA

Source: James Russel, Orange County.

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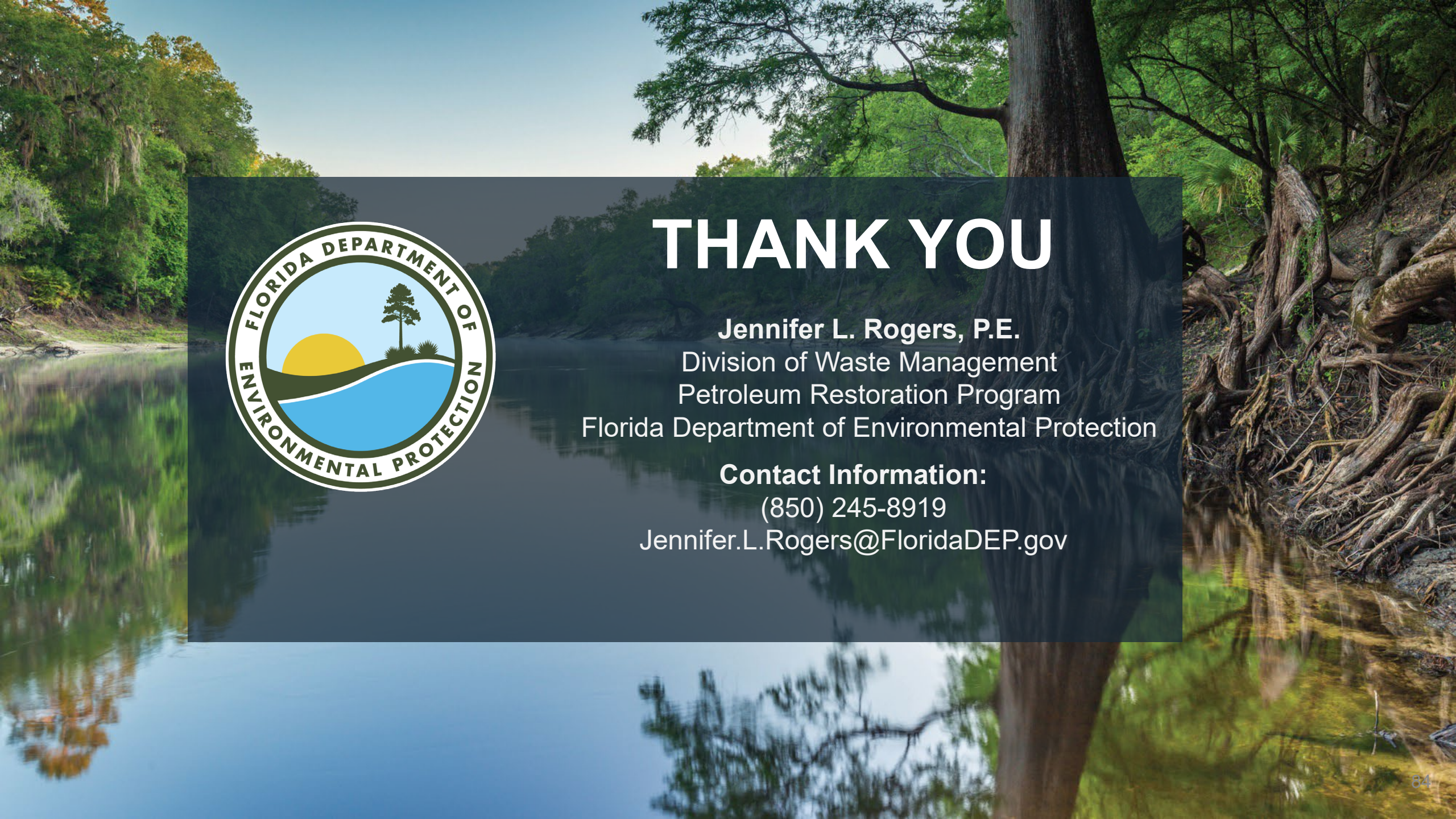

THANK YOU

Jennifer L. Rogers, P.E.
Division of Waste Management
Petroleum Restoration Program
Florida Department of Environmental Protection

Contact Information:
(850) 245-8919
Jennifer.L.Rogers@FloridaDEP.gov