U.S. ENVIRONMENTAL PROTECTION AGENCY

SUPERFUND PROPOSED PLAN

MADISON COUNTY SANITARY LANDFILL SITE

GROUNDWATER REMEDY

Madison, Madison County, Florida **December 2021**

This Proposed Plan is not considered to be a technical document but has been prepared to provide an abridged summary to the public.

You are Invited to Comment on this Proposed Action for the Madison County Sanitary Landfill Site Groundwater Remedy

A. INTRODUCTION

The United States Environmental Protection Agency (EPA), the lead agency, in consultation with Florida Department of Environmental Protection (FDEP), the support agency, is issuing this Proposed Plan to present its Preferred Alternative to remediate contaminants of concern (COCs [See Table 1]) in groundwater at the Madison County Sanitary Landfill site (the Site) in Madison County, Florida. EPA's Preferred Alternative (Alternative III) will restore groundwater to its beneficial use as a potential source of drinking water and eliminate future potential unacceptable risk to human health from exposure to COCs in groundwater. Additionally, EPA will add 1,4-dioxane as groundwater COC and propose a cleanup level for the contaminant.

EPA selected a pump-and-treat system to remediate groundwater COCs in 1992. The remedy also included capping source material (a 9-acre landfill known as the Yard Trash Area) and institutional controls. The cap is functioning as intended and institutional controls are in place (See Figure 1). A five-year review completed in 2010 documented that the groundwater pump-and-treat system is not sufficiently reducing COC concentrations. Further 1,4-dioxan was detected at concentrations above the Florida groundwater cleanup target level (GTCL) of 3.2 micrograms per liter (µg/L). EPA and FDEP approved the temporary shutdown of the groundwater pump-and-treat system in 2010, because there is no current exposure to contaminated groundwater, and groundwater with 1,4-dioxan above the Florida GTCL cannot be reinjected into the aquifer.

EPA is now proposing to fundamentally change the groundwater remedy from pump-and-treat to in-situ treatment. The proposed remedy modification is based on the results of a pilot test demonstrating that enhanced reductive dechlorination can reduce the concentration of groundwater COCs. EPA is also proposing a phased approach, as chemical oxidation may be needed to achieve Florida GTCLs for 1,4-dioxane and vinyl chloride. A detailed description of Alternative III, and all other alternatives considered, can be found in the Summary of Remedial Alternatives section (Section G) of the Proposed Plan.

EPA, in consultation with FDEP, will select a final groundwater remedy for the Site after considering relevant comments submitted during the public comment period. **The public comment period runs for thirty (30) days from December 15th to January 14th.** Details on submitting written comments can be found on page. EPA also encourages community members to view the pre-recorded video presentation that will be posted on the Site webpage www.epa.gov/superfund/madison-county-sanitary-landfill on December 15th. Additionally, to gain a more comprehensive understanding of the Site and the Superfund activities conducted at the Site to date, EPA and FDEP encourages the public to review the supporting documents (e.g., remedial investigation, feasibility study, record of decision, five-year reviews) in the Administrative Record. The supporting documents are available under the Site Documents & Data tab on the Madison County Sanitary Landfill Site webpage and at the designated Site repository:

North Florida College Library
325 NW Turner Davis Drive Madison, Florida 32340
Phone: 850-973-1624; E-mail: library@nfc.edu
Website: https://www.nfc.edu/learning-resources/

EPA may modify its Preferred Alternative or select another alternative based on new information or public comments. The public will be notified of the ROD Amendment in a local newspaper notice and through the Site webpage. The ROD Amendment will include a responsiveness summary that summarizes EPA's responses to public comment on this Proposed Plan. Based on new information and/or public comments received during the public comment period, the selected remedy may differ in some details form the Preferred Alternative presented in this Proposed Plan.

Details of the Proposed Plan public comment period, pre-recorded presentation, and EPA contacts for the Site can be found below.

Community Involvement Coordination: Public Comment Period
Dates: December 15th – January 14th
Purpose: To solicit comments on the Proposed Cleanup Plan

Pre-recorded Proposed Plan Public Presentation
Date: December 15th
Time: Available by 9 AM
Place: Online at the following link: www.epa.gov/superfund/madison-county-sanitary-landfill
Purpose: To discuss the Proposed Cleanup Plan for groundwater at the Madison County Sanitary Landfill Superfund Site

EPA Contacts:
Direct questions or written comments can be sent to:

Jasmin Jefferies, Remedial Project Manager
Jefferies.Jasmin@epa.gov

or

Brenda Bonner, Community Involvement Coordinator
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B. SITE BACKGROUND

SITE LOCATION AND DESCRIPTION

The Madison County Sanitary Landfill Site (also referred to as the Former Madison County Landfill or FMCL in some text) is located approximately two miles northeast of the city of Madison, Florida, on County Road C-591. The property is approximately 90-acres in area. The 1992 ROD addressed a 9-acre source area located in the southeastern portion of the property known as the Yard Trash Area and associated groundwater contamination. The Yard Trash Area was used for disposal of construction and demolition debris and drums containing industrial waste.

A closed Class 1 sanitary landfill and associated stormwater pond are located in the northern portion of the property. The County's Department of Transportation, Department of Public Works Recycling Center, and aviation landing strip are also located on the property. A residential mobile home is situated about 800 feet southeast of the Site on a hill. A site location and layout map are presented in Figure 2.

The Site is a municipal landfill, surrounded by rural residential and agricultural land. The county and city have implemented institutional controls that restrict groundwater use until cleanup levels are achieved and institutional controls that restrict residential land use and activities that would compromise the integrity of the Yard Trash Area cap are in place. Access to the Yard Trash Area is controlled by a locked fence.

HISTORY OF CONTAMINATION

The former landfill was originally operated as an unlined trench and fill operation. Trenches (cells) of varying lengths and widths, typically 50 feet by 30 feet and approximately 15 to 25 feet in depth, were used. Municipal/domestic and industrial wastes from the area were placed in the trenches and covered with excavated material. Reportedly, there was no master plan directing waste placement or trench orientation. At the time the 1992 ROD was written, approximately 40 tons of waste per day was disposed into the group of remaining active waste cells at the Site. However, in May 1992, the Florida Department of Environmental Protection, at the time known as the Florida Department of Environmental Regulation (FDER), ordered the portion of the landfill actively used for waste disposal to be closed. The order also consisted of the construction of an earthen/clay cap.

The 9-acre Yard Trash Area (YTA), located in the southeastern portion of the landfill, was primarily used to dispose of large bulk debris usually associated with construction and demolition activities as well as drums containing industrial wastes. The former Acid Disposal Area located in the southern

portion of the property was reportedly used for disposal of acid wash water.

Information compiled by EPA suggests that ITT (formerly known as ITT Thompson), one of the three identified potentially responsible parties (PRPs), delivered an undetermined quantity of liquid waste solvents, semi-solid waste buffing compounds, and acid wash water to the landfill for disposal. The City of Madison and Madison County were also identified as PRPs as owner/operator of the landfill and for their contribution to the contaminated soil and groundwater at the Site.

PREVIOUS RESPONSE ACTIONS

Pre-CERCAL Activities
FDEP (formerly the Florida Department of Environmental Regulation) removed and disposed approximately 40 drums containing volatile organic compounds from the Yard Trash Area in November 1984 and March 1985.

The Suwannee River Water Management District (SRWMD) designed and installed a groundwater monitoring network at the property in 1984. The results of the sampling events indicated the presence of several volatile organic compounds (SVOCs) in the landfill monitoring wells (in and around the Yard Trash Area) and residential wells of homes nearby. This prompted the state to take protective action, and in 1986, entered into a Consent Order with the City, County, and ITT Thompson (the three identified potentially responsible parties [PRPs]) requiring them to investigate groundwater near the property. The PRPs identified the affected private wells and provided those homes with bottled water and ice, eventually connecting each home to City water lines. EPA added the Site to the National Priorities List on June 24, 1988.

CERCLA Activities
EPA entered into a Consent Order with the PRPs on June 11,1990, requiring the performance of a remedial investigation/feasibility study (RI/FS). Implementation of field activities commenced on December 10, 1990 under EPA supervision.

During the RI/FS field work activities, ITT collected soil, sediment, and surface water samples and installed and sampled 27 groundwater monitoring wells. Based on the results of the initial phase of RI/FS field work, EPA recommended additional field work to further assess the extent of soil and groundwater contamination at the property. The additional field work focused on the Yard Trash Area and the installation of an additional monitoring well, along with the collection of a second round of groundwater samples. The final phase of the RI/FS field work was completed in late 1991. Due to financial hardship asserted by the City and County, ITT solely conducted the RI/FS and submitted the reports to EPA. The RI report, completed in April 1992, concluded that contamination was migrating from the Trash Yard Area to soil and groundwater. Unacceptable risk was attributed to ingestion of contaminated groundwater. EPA approved the FS report in July 1992.

EPA issued a Proposed Plan on August 24, 1992 and a ROD on September 28, 1992. The components of the groundwater remedy include:

- Institutional controls to restrict groundwater use and restrict the installation of wells.

- Groundwater pump-and treat system (air stripping and granular activated carbon) and reinjection of treated groundwater into the Floridan Aquifer near the Yard Trash Area.
- Groundwater monitoring and installation of two additional monitoring well clusters.
- Long-term operation and maintenance of the ground treatment system.

The locations of the current groundwater monitoring wells can be found in Figure 3.

ITT completed construction of the groundwater remedy in 1996. Details on the implementation of institutional controls is contained in the 2020 five-year review report for the site. EPA has conducted five, five-year reviews to date.

Monitoring data compiled to support a five-year review conducted in 2010, demonstrated that cleanup levels were consistently exceeded without a significant decline in COC concentrations in some of the on- site wells. This finding suggested the presence of additional source material in the saturated zone outside the capped Yard Trash Area. At the request of EPA and FDEP, ITT added 1,4-dioxane to the groundwater sampling program in November 2010. The trends of 1,4-dioxane in the YTA and older wells can be found in Figure 4, and the 1,4-dixoane concentrations and general trends in newer wells can be found in Table 2. ITT shut down the pump- and-treat system in December 2010, because 1,4-dioxane concentrations in the air stripper influent and effluent were above the Florida GCTL. FDEP injection requirements from Chapter 62-528 of the Florida Administrative Code (FAC) prohibit the reinjection of contaminants above GCTLs or primary drinking water standards such as maximum contaminant levels (MCLs). The groundwater pump-and-treat system remained shut down as ITT continued to delineate the plume, locate additional source material, and evaluate remedial alternatives to address 1,4-dioxane.

In 2011, ITT completed a draft focused feasibility study (FFS) that recommended monitored natural attenuation (MNA) to address 1,4-dioxane in groundwater. However, EPA and FDEP determined the data was insufficient to support MNA and recommended pilot studies for active treatment options. In 2011, ITT began additional delineation of COCs and 1,4-dioxane in the Yard Trash Area. ITT conducted a bench-scale pilot study from December 2011 to July 2012, evaluating an advanced oxidation process to treat 1,4- dioxane. In April 2013, the EPA requested that the groundwater pump-and-treat system be turned back on as soon as possible, as required by the 1992 ROD. ITT responded by submitting a final FFS report in November 2013, recommending an advanced oxidation process remedial alternative to augment the existing pump-and-treat system to address 1,4-dioxane. In July 2014, ITT notified EPA that the advanced oxidation process remedial alternative was not feasible due to a planned bankruptcy notice from the contractor.

ITT completed additional Yard Trash Area investigations from August 2014 to September 2016 and recommended using enhanced reductive dechlorination (ERD) using emulsified vegetable oil (EVO) to reduce COC and 1,4-dioxane concentrations. EPA and FDEP approved ITT's ERD Pilot Test Work plan and ITT completed the pilot test in the southeast corner of the Yard Trash Area between October and June 2018. A comparison of baseline sampling data to the 18-month post-injection sampling data demonstrated that groundwater COC concentrations decreased, suggesting that that ERD, using EVO as the substrate, may be an effective treatment technology for the Yard Trash Area. The

December 2019 ERD Pilot Test Post Injection Performance Monitoring Letter Report, submitted by ITT, concluded the following:

- TCE concentrations are substantially decreasing and corresponding cis-1,2-DCE and vinyl chloride concentrations are increasing (daughter products of TCE)
- Overall, mean CVOC concentrations from the baseline to the 18-month post injection sampling show an 87% reduction of TCE concentrations (1,483 µg/L to 189 µg/L), a 42% reduction of cis-1,2-DCE concentrations (31,845 µg/L to 18,330 µg/L), and a 1% reduction of vinyl chloride concentrations (392 µg/L to 388 µg/L).
- There is strong evidence that reductive dechlorination is occurring at the Yard Trash Area based on the declines in CVOCs and the results of the geochemical parameters measured during the pilot study (e.g., temperature, dissolved oxygen, pH and oxidation-reduction potential).

ITT submitted a feasibility study on April 15, 2021, for EPA review and approval.

C. SITE CHARACTERISTICS

SITE GEOLOGY AND HYDROLOGY

Groundwater occurs in the unconfined surficial aquifer, which recharges the underlying upper Floridan Aquifer. The highest COC concentrations are in the surficial aquifer with lower concentrations in the Floridan. Groundwater COCs and corresponding cleanup levels are presented in Table 1. Flow direction in both aquifers is to the south/southeast except that the surficial aquifer flows to the west/southwest at a topographic low area in the southeast corner of the Yard Trash Area. These aquifers are future potential drinking water aquifers. The County's public water supply comes from wells located in the City, which are not impacted by the Site. All city residences are connected to public water supply lines.

Soil and groundwater sampling was conducted within three areas of the Yard Trash Area from November 2011 to August 2018:

- Northwest corner
- Southeast corner
- Southwest corner

The purpose of the sampling was to evaluate isolated areas with high COC concentrations and 1,4-dioxane contamination.

Northwest Corner
The geology in this area isunaltered by karst activity and consists of predominantly sand and clayey sand that grades into sandy phosphatic clay and is underlain by limestone at a depth of approximately 60 feet below land surface.

Groundwater
The surficial aquifer was encountered in the overburden deposits in March 2020 at about 38 feet below land surface which corresponds to a saturated overburdenthickness of approximately 22 feet. The water table elevation exhibits seasonal fluctuation of about 5 feet.

COCs in the northwest corner of the Yard Trash Area migrate horizontally to the east and into a sand-filled paleosink. COCs also migrated vertically downward in the paleosink for the following reasons:

- The infilled sand is well sorted and considerably more permeable than the natural geologic deposits and does not contain any fine-grained impeding or confining clayey lenses.
- A notable vertical hydraulic gradient of -0.03 ft/ft is present.
- COCs are denser than the groundwater.

The majority of the COC mass is present in a 36-foot-thick interval from 34–70 feet below land surface. COC concentrations decrease notably at depths of 67 and 74 feet below land surface (DP25 and DP26, respectively).

The predominant COCs detected, and concentration range, were cis 1, 2 DCE (non-detect to 98,000 µg/L) and vinyl chloride (non-detect to 6,200 µg/L). Trichloroethene (TCE) ranged from non-detect to 1,400 µg/L. The contaminant, 1,4-dioxane, ranged from non-detect to an estimated concentration of 9.25 µg/L.

Soil

Nine soil borings (SB01 to SB09) were collected in vadose zone. Twenty-five soil samples submitted for COC laboratory analyses. No soil samples exceeded Florida commercial soil cleanup target levels (SCTL).

Southeast Corner

The geology has been altered by karst activity and is located within a paleosink that has been infilled with sandy clay and silty clay that grades into fine sand with depth. Limestone was encountered at 39 feet below ground surface.

Groundwater

Groundwater movement in both the surficial aquifer and the upper Floridan aquifer is to the south/southeast. The surficial aquifer was encountered in the overburden deposits at about 31 feet below land surface, which corresponds to a saturated overburden thickness above limestone bedrock of approximately eight feet.

COCs in the southeast corner of the Yard Trash Area migrate to the west/southwest into the sand-filled paleosink and to the southeast, south, and southwest into natural limestone bedrock. The infilled paleosink sand beneath the clayey deposits, as well as sand deposits to the west/southwest, are well sorted, permeable, and do not contain any fine-grained impeding or confining clayey lenses. For these reasons, the COC plume has expanded to both the west/southwest through paleosink sand deposits and to the south/southwest where limestone bedrock is present.

The predominant COCs detected, and concentration range, were TCE (non-detect to 260,000 µg/L); cis 1, 2- DCE (non-detect to 170,000 µg/L); and vinyl chloride (non-detect to 16,000 µg/L). The highest TCE concentrations in this area may provide indirect evidence of dense non-aqueous phase liquid (DNAPL); however, no visual or olfactory evidence of DNAPL was ever noted during extensive soil

and groundwater investigations. The contaminant, 1,4-dioxane, was detected at concentrations ranging from non-detect to 2,120 µg/L. The 1,4-dioxane concentrations exceeding 100 µg/L (5 depth intervals) were detected at DP61, exclusively. COC concentrations decreased notably at a depth of 54 feet (DP03).

Soil

Nine soil borings were collected from the vadose zone (SB10 to SB18). Twenty-three soil samples were submitted for COC laboratory analyses, Six samples, collected from SB13 and SB14, exceeded Florida commercial SCTLs. The COC exceedances were detected primarily in the center boring SB14 below the cap. The COC mass associated with SB14 is

Southwest Corner

The geology in this area is outside the paleosink feature and consists of predominantly interbedded sand and sandy clay to a depth of 50 feet below land surface, where limestone bedrock was encountered.

Groundwater

The surficial aquifer was encountered in the overburden deposits at about 45 feet below land surface, which corresponds to a saturated overburden thickness above bedrock of approximately five feet. Groundwater movement in the surficial aquifer converges from both the north and south into the east/west-oriented topographically lower area just south of the Yard Trash Area, and likely correlates to the orientation and weathering of underlying bedrock fractures. Groundwater in the surficial aquifer migrates to the underlying Upper Floridan aquifer.

An isolated high COC concentration area is located outside the Yard Trash Area fence line in the vicinity direct push technology samples IT22LS and IT22S. COCs migrate vertically from the IT22LS/IT22S area through the sandy clayey deposits and into the upper portion of the limestone bedrock. The COCs migrate in an east/west direction in the area encompassed by DP74 and DP64, following the orientation of the underlying bedrock fractures.

PRINCIPLE THREAT WASTE

Principal threat waste is site-related waste that includes or contains hazardous substances, pollutants or contaminants that act as source for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. In the NCP, it is stated that EPA expects to:

- Use treatment to address principal threats posed by a site, wherever practicable.
- Use engineering controls, such as containment, for wastes that pose a relatively low long-term threat or where treatment is impracticable.
- Use a combination of methods, as appropriate, to achieve protection of human health and the environment, with a priority placed on treating waste that is liquid, highly toxic or highly mobile.

- Use institutional controls to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances.

Although TCE concentrations (non-detect to 16,000 µg/L) detected in the southwest corner of the Yard Trash Area could indicate the presence of dense non-aqueous phase liquid (DNAPL), a principal threat waste, no visual or olfactory evidence of DNAPL was ever noted during the extensive soil and groundwater investigations.

D. SCOPE AND ROLE OF PROPOSED REMEDY

This Proposed Plan recommends a fundamental change to the groundwater remedy originally selected and implemented at the Site under the 1992 ROD. The recommended change is described in more detail in Sections G through I. At the end of the review and public comment period for this Proposed Plan, the selected remedy will be documented in a ROD Amendment.

This Proposed Plan provides the rationale for amending the pump-and-treat remedy, based on the results of the 2019 ERD pilot study. COC mass was reduced by 48% in the treatment area over an 18-month period. An extrapolation of the mass reduction versus time plot results in a groundwater restoration timeframe of 12 to 27 years. This timeframe, however, may account for the time needed or treatment technology needed to remediate vinyl chloride and 1,4-dioxine. If these COCs are not decreasing, ISCO may be employed. The decision to employ ISCO will be based on one or more of the following: data used to support the 2025 five-year review, a Remedy Management Framework developed through EPA and FDEP to evaluate remedy performance and guide optimization decisions, or by analyzing the trends in molar mass of the contaminants over a period of time (to be determined).
This Proposed Plan does not affect institutional controls or monitoring components of the groundwater remedy. However, this document does propose to modify the groundwater COCs and cleanup levels. The rationale for adding 1,4-dioxane is presented in the Risk Summary section. RAOs are presented in Section F and the cleanup levels can be found in Table 1.

Surficial and intermediate groundwater located at the Site is classified by FDEP as Class G-II per F.A.C. 62-520.410. Therefore, EPA expects restoration to achieve its beneficial use by attaining drinking water standards (e.g., Safe Drinking Water Act MCLs or more stringent State standards (e.g. FDEP Groundwater CTLs at F.A.C. 62-777.170) throughout the plume.

E. SUMMARY OF SITE RISKS

HUMAN HEALTH RISK

CVOCs
A baseline human health risk assessment was conducted as part of the 1992 RI. The assessment concluded that future groundwater use (residential) results in a cancer risk outside EPA's acceptable risk range. EPA generally deems health risks to be significant if cancer risk exceeds 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) and/or the hazard index is greater than 1 (40 Code of Federal Regulations part 300.430(e)(2)(I)(A)(2)).

1,4-dioxane

A screening-level risk analysis conducted as part of the 2020 five-year review concluded that future groundwater use (residential) results in a cancer risk outside EPA's acceptable risk range of 1 x 10-4 and 1 x 10-6 and noncancer hazard quotient above 1. The screening-level risk evaluation of 1,4-dioxane in Site groundwater can be found in Table 3.

Vapor Intrusion

The vapor intrusion pathway at the Yard Trash Area is considered incomplete because there are no buildings or structures overlying the contaminated groundwater plume. Additionally, the 1992 ROD requires institutional controls that restrict residential land use and restrict activities that would impact the integrity of the cap over the Yard Trash Area. Institutional control instruments include City Ordinance 2001-6 and a Declaration of Restrictive Covenants, May 31, 2019.

The vapor intrusion pathway at the residential mobile home situated 800 feet southeast of the Site is considered incomplete because the residence is not downgradient of the surficial aquifer contaminant plume.

ECOLOGICAL RISK

The ecological risk assessment conducted as part of the 1992 RI concluded that site- related contamination did not present an unacceptable risk to birds or mammals.

F. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are the overall goals that an alternative is to achieve and are used to guide the development of the remedial alternatives. The EPA issued 1992 ROD identifies the following RAOs for landfill waste and groundwater.

1. Minimize the migration of contamination from the landfill to the surrounding community.
2. Prevent the exposure of human receptors to contaminated groundwater both on and off the Site.
3. Restore the groundwater to drinking water quality for the COCs.
4. Monitor groundwater in a manner that will verify the effectiveness of the selected remedy.

The RAOs are still relevant and will remain the same in the ROD Amendment.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In 2013, the County purchased three parcels of land adjacent to the YTA (11-1N-09-3486-001-000) to expand the site boundary for monitoring the groundwater plume. These parcels include the parcel east of the YTA (11-1N-09-3487-003-000) and two parcels southeast of the Site (11-1N-09-3488-001-01A and 11-1N-09-3488-002-001). In May 2019, the County filed a Declaration of Restrictive Covenants to

restrict land use and groundwater use at all four parcels. All required institutional controls are in place, as summarized in Table 4. Figure 2 shows the current interpretation of the groundwater plume and the institutional control boundaries. In addition, county and city ordinances are in place that restrict groundwater use and installation of wells. As a result, and also documented in previous FYRs, private wells are no longer used for drinking water, and downgradient property owners are connected to the City of Madison water supply.

POTENTIAL TBC CRITERIA

Many Federal and State environmental and public health agencies develop criteria, advisories, guidance, and proposed standards that are not legally enforceable but contain information that would be helpful in carrying out, or in determining the level of protectiveness of, selected remedies. In other words, "to be considered" (TBCs) are meant to complement the use of ARARs, not to compete with or replace them. Because TBCs are not ARARs, their identification and use are not mandatory.

No TBCs have been identified at the Site.

G. SUMMARY OF REMEDIAL ALTERNATIVES

The remedial action alternatives for groundwater at the Madison County Sanitary Landfill Site are presented below. They are numbered to correspond with the FS.

Alternative I: No Action
The No Action alternative is required to be evaluated under the NCP as a baseline against which all other alternatives are compared. Under this alternative, no remedial actions would take place. There are no costs associated with Alternative 1.

Alternative II: Phased ISCO Followed by Performance Monitoring
Alternative 2 consists of an initial phase of ISCO treatment of the plume source areas (those above 10X NADC) followed by a second phase of ISCO treatment of the remaining CVOC dissolved phase groundwater above NADCs and 1,4- dioxane above GCTLs, where present, in each of the three areas (northwest corner, southeast corner, and southwest corner). It is anticipated ISCO treatments would be completed using an oxidant such as activated persulfate. Direct push technology (DPT) would be used, along with groundwater monitoring wells, to evaluate and monitor treatment effectiveness. Performance Monitoring would be implemented for the remaining areas of the plume containing CVOC concentrations below NADC levels.

The estimated timeframe for construction completion is 50.5 weeks. The estimated capital cost associated with Alternative 2 is $6,646,000 and the annual O&M cost is $1,661,000 The total present worth cost of Alternative 2 is $8,307,000.

Alternative III: Phased ERD with Supplemental Amendments Followed by Performance Monitoring and Optional ISCO Hotspot Treatment for 1,4-Dioxane
Alternative 3 consists of phased treatment using ERD with supplemental amendments (such as

dehalobacter bioaugmentation, lactate or ethanol, highly degradable soluble carbon substrates, and/or EZVI) followed by Performance Monitoring. An initial phase of ERD with supplemental amendments would be used to treat the elevated CVOC areas (above 10X NADC) in groundwater at each of the three areas (northwest corner, southeast corner, and southwest corner). The selected use of supplemental amendments would be based on localized conditions within the treatment areas of the plume. A second phase of ERD treatment with supplemental amendments would then be conducted to address hotspot concentrations remaining in the elevated CVOC areas as well as groundwater plume areas above NADCs. If DNAPL is confirmed in any of the elevated CVOC areas, a targeted hotspot treatment would be further evaluated. Performance monitoring would be implemented for the remaining areas of the plume containing COC concentrations below NADCs but above GCTLs. DPT would be used, along with groundwater monitoring wells, to evaluate and monitor treatment effectiveness.

If the dechlorination process stalls at vinyl chloride, additional treatments utilizing ERD injections with supplemental amendments or ISCO may be evaluated. If this occurs, then the vinyl chloride hotspots would be treated utilizing the selected supplemental amendments with ERD or as part of a phased remediation approach. Should ERD change subsurface conditions to allow for vinyl chloride to naturally attenuate, no further evaluation on supplemental treatment for vinyl chloride would be necessary.

Additionally, as an optional contingency if ERD does not change subsurface conditions to allow for 1,4-dioxane to naturally attenuate, 1,4-dioxane hotspots would be treated using ISCO with an oxidant such as activated persulfate as part of a phased remediation approach. Should ERD change subsurface conditions to allow for 1,4-dioxane to naturally attenuate, no further treatment for 1,4-dioxane would be necessary.

The zone of treatment will extend beyond the source area target zones and is expected to reach beneath the landfill cover within the source areas into the paleokarst feature based on the groundwater flow in the surficial water-bearing unit and Upper Floridan. This treated groundwater will likely diffuse through the paleosink feature (comprised of infilled very fine- to-medium sand) between the three areas (northwest corner, southeast corner, and southwest corner) around the YTA.

It is estimated that it will take 12-27 years for the CVOCs to reach MCLs. This was determined from analyzing the mass reduction data trend from two direct push points from the recent ERD pilot test performed at the site, where contaminant mass was reduced by 48% in the treatment area over the 18-month study period. An extrapolation of the mass reduction versus time plot approximates the time for CVOCs to reach MCLs. However, there is too much uncertainty associated with the remedial timeframe estimate; therefore, the remedial timeframe estimate will be refined during the remedial design phase. The actual remediation timeframe will be determined using a Remedy Management Framework developed through discussions with EPA and FDEP to evaluate remedy performance and guide optimization decisions.

The estimated timeframe for construction completion of Alternative 3 is 50 weeks. The estimated capital cost associated with Alternative III is $4,854,000 and the annual O&M cost is $1,729,000. The total present worth cost of Alternative 3 is $6,583,000.

H. EVALUATION OF REMEDIAL ALTERNATIVES

The EPA uses nine CERCLA criteria to evaluate the alternatives and select remedial actions. This section summarizes the relative performance of each alternative against the nine criteria and each other. A detailed analysis of alternatives is provided in the FS.

The nine criteria consist of two threshold criteria, five balancing criteria, and two modifying criteria. The threshold criteria include overall protectiveness of human health and the environment and compliance with ARARs. These two criteria must be met by any remedial alternative for it to be considered a viable remedial action. The five balancing criteria include the following: long-term effectiveness and permanence; short-term effectiveness; reduction of toxicity, mobility, and volume through treatment; implementability; and cost. These are the primary criteria upon which the detailed analysis was based. The remaining two criteria include state acceptance and community acceptance. These modifying criteria are typically evaluated following a public comment period on the Proposed Plan and will be documented in the ROD Amendment.

COMPARISON OF REMEDIAL ALTERNATIVES

1. Overall Protection of Human Health and the Environment

All Alternatives evaluated in the FS except for Alternative I (No Further Action) would be protective of human health and the environment.

2. Compliance with ARARs

Alternatives II and II would comply with ARARs. Alternative I would not.

3. Long-Term Effectiveness and Permanence

Alternative I is not effective or permanent.

Alternative II (phased ISCO) would provide long- term effectiveness and permanence if there is sufficient contact between the oxidizer and contaminants (CVOCs and 1,4 dioxane). The complex geologic stratigraphy within the source areas could impede the effectiveness of ISCO and could require multiple and ongoing injections of oxidizer, potentially limiting the long- term effectiveness and permanence of the alternative.

4. Reduction of Toxicology, Mobility, and/or Volume Through Treatment

Alternative I would not reduce toxicity, mobility, or volume of contaminants.
Alternative II (phased ISCO) would achieve a high reduction of toxicity, mobility, and volume of CVOCs and 1,4 dioxane from the groundwater as long as sufficient contact occurs between the oxidizer and contaminants.

Alternative III (phased ERD for CVOCs & optional
ISCO for 1,4-dioxane) would achieve a high reduction of toxicity, mobility, and volume of CVOCs by ERD and if needed optional 1,4 dioxane treatment by ISCO hotspot treatment should ERD not change subsurface conditions to allow for 1,4- dioxane to naturally attenuate.

5. Short-Term Effectiveness

Alternatives II and III would have minimal short-term effects that could be managed. Alternative I would have no short-term effects.

6. Implementability

There would be nothing to implement for Alternative I (No Action Alternative).

All components would be able to be implemented with Alternative II. The equipment, materials, and contractors needed to implement Alternative II are readily available.

Likewise, all components would be able to be implemented for Alternative III. An ERD pilot test

has already been conducted at the site. The equipment, materials, and contractors needed to implement this remedy are readily available and would be easily implemented.

7. Cost

Alternative I
There is no cost associated with Alternative I.

Alternative II
Capital cost: $6,646,000
30-year present worth of O&M: $1,661,000
30-year present worth of Alternative II: $8,307,000.

Alternative III
Capital cost: $4,854,000
30-year present worth of O&M: $1,729,000
30-year present worth of Alternative III: $6,583,000

8. Support Agency Acceptance

FDEP has been actively involved in the development and review of the FS and the cleanup plan for the Site. State support for the preferred alternative is anticipated.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD.

I. PREFERRED ALTERNATIVE

Alternative III is EPA's Preferred Alternative. Alternative III consists of the following elements: phased ERD with supplemental amendments followed by performance monitoring and optional ISCO hotspot treatment for 1,4-dioxane This alternative is recommended because the results of the post monitoring events of the ERD Pilot Test indicates that groundwater conditions are conducive to reductive dechlorination of CVOCs.

The December 2019 ERD Pilot Test Post Injection Performance Monitoring Letter Report, submitted by ITT, concluded the following:

- TCE concentrations are substantially decreasing and corresponding cis-1,2-DCE and vinyl chloride concentrations are increasing (daughter products of TCE).
- Overall, mean CVOC concentrations from the baseline to the 18-month post injection sampling show an 87% reduction of TCE concentrations (1,483 µg/L to 189 µg/L), a 42% reduction of cis-1,2-DCE concentrations (31,845 µg/L to 18,330 µg/L), and a 1% reduction of vinyl chloride concentrations (392 µg/L to 388 µg/L).
- There is strong evidence that reductive dechlorination is occurring at the YTA based on the declines in CVOCs and the results of the geochemical parameters measured during the pilot study (e.g., temperature, dissolved oxygen, pH and oxidation-reduction potential).

The preferred alternative was selected over the other alternatives because of its overall potential effectiveness and efficiency in addressing the Site contamination. The proposed remedy will provide for permanent long-term risk reduction.

Based on the information available now, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the alternatives evaluated with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element or explain why the preference for treatment will not be met. The Preferred Alternative can change in response to public comment or new information.

SUPPORT AGENCY COORDINATION

FDEP reviewed the FS, concurred with the alternatives evaluated, and concurred with how the alternatives were screened and analyzed.

FDEP will have an opportunity to review this Proposed Plan and provide their support, or lack thereof, of the Preferred Alternative. FDEP's response will be documented in a Responsiveness Summary, which will be included in the ROD.

J. COMMUNITY PARTICIPATION

The RI report, FS report, this Proposed Plan, and all supporting documents are available online at

http://www.epa.gov/superfund/madison-county-sanitary-landfill and have been placed in the Administrative Record for the Madison County Sanitary Landfill Site. The public is encouraged to review and comment on all the alternatives presented in the Proposed Plan. The public comment period for the Proposed Plan begins June 17th and ends July 16th.

A pre-recorded presentation will be made available on the Site webpage on December 15th. Written comments may be provided starting on December 15th via email or US mail before the close of the comment period on January 14th. Please refer to the information below for written comments:

Jasmin Jefferies, Remedial Project Manager
U.S. EPA/SEMD 61 Forsyth St. SW Atlanta, GA 30303
Jefferies.Jasmin@epa.gov

Or

Brenda Bonner, Community Involvement Coordinator
U.S. EPA/SEMD 61 Forsyth St. SW Atlanta, GA 30303
Bonner.Brenda@epa.gov

GLOSSARY

1,4-Dioxane: historically used as a stabilizer additive in chlorinated solvents, is highly mobile in groundwater andpasses through saturated soils relatively quickly because of a high-water solubility and low affinity for sorption to soil organic matter.

Administrative Record: Material documenting EPA's selection of cleanup remedies at Superfund Sites, a copy ofwhich is placed in the information repository near the Site.

Applicable or Relevant and Appropriate Requirements(ARARs): Refers to Federal and State requirements a selected remedy must attain which vary from site to site.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): Also known as Superfund, is a federal law passed in 1980 and modified in 1986 by the Superfund Amendment and Reauthorization Act (SARA); the act created a trust fund,to investigate and cleanup abandoned or uncontrolled hazardous waste sites. The law authorizes the federal government to respond directly to releases of hazardous substances that may endanger public health or the environment. EPA is responsible for managing the Superfund.

Chlorinated Volatile Organic Compounds (CVOCs):are manmade compounds that were used as solvents for many years in cleaning and degreasing products and equipment.

Contaminants of Concern (COCs): Chemical constituentsassociated with a Superfund Site that have been released into the environment and pose a risk to human health.

Enhanced Reductive Dechlorination (ERD): Chemicalconstituents associated with a Superfund Site that have been released into the environment and pose a risk to human health.

Feasibility Study (FS): Study conducted after the Remedial Investigation to determine what alternatives ortechnologies could be applicable to clean up the site- specific COCs.

Five-Year Review (**FYR**): an EPA review of a remedy thattakes place every five years following the start of a CERCLA response action.

Groundwater: The supply of fresh water found beneath the Earth's surface (usually in aquifers) which is often usedfor drinking water.

Hazardous waste: A waste may be considered hazardous if it exhibits certain hazardous properties/"characteristics"or if it is included on a specific list of wastes EPA has determined are hazardous ("listing" a waste as hazardous).The lists include the F-list (wastes from common manufacturing and industrial processes), K-list (wastes from specific industries), and P- and U-lists (wastes fromcommercial chemical products)

Information Repository: A library or other location wheredocuments and data related to a Superfund project are placed to allow public access to the material.

Institutional Controls (ICs): Restriction that prevents an owner inappropriately developing a property. The restriction is designed to prevent harm to workers or thegeneral public and maintain the integrity of the remedy.
Karst Activity: A landscape where the dissolution of soluble rock (i.e., limestone, marble, gypsum) which creates sinkholes, caves, springs, or other characteristic features.

Maximum Contaminant Levels (MCLs): Standards that are set by the United States Environmental Protection Agency (EPA) for drinking water quality in Title 40 of the Code of Federal Regulations. A Maximum Contaminant Level (MCL) is the legal threshold limit on the amount of ahazardous substance that is allowed in drinking water underthe Safe Drinking Water Act.

National Contingency Plan (NCP): The Federal Regulation that guides the Superfund program. The NCPwas revised in February 1990.

Operation and Maintenance (O&M): Activities conducted at sites after cleanup remedies have been constructed to ensure that they continue functioning properly.

Paleosink: A buried karst feature (i.e., cover collapse sinkholes, solution sinkholes) that was formed under different conditions than the current geologic setting.

Proposed Plan: A Superfund public participation fact sheet which summarizes the preferred cleanup strategy fora Superfund Site.

Record of Decision (ROD): A public document describingEPA's rationale for selection of a Superfund remedy.
Remedial Action Objectives (RAOs): The overall goals thatthe site cleanup is expected to achieve.

Remedial Investigation / Feasibility Study (RI/FS): A two-part investigation conducted to fully assess the natureand extent of a release, or threat of release, of hazardous substances, pollutants, or contaminants, and to identify alternatives for cleanup. The Remedial Investigation gathers the necessary data to support the corresponding Feasibility Study.

Responsiveness Summary: A summary of oral and writtencomments received by EPA during a comment period on key EPA documents, and EPA's responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns for EPA decision-makers.

Superfund: The common name used for the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the federal law thatmandates cleanup of abandoned hazardous waste sites.

Vadose Zone: The part of the Earth between the land surface and top of the water table.

TABLES

TABLE 1: GROUNDWATER COC CLEANUP GOALS

COC	1992 ROD ARARs (µg/L)	Current Groundwater Standards (µg/L)	Standards Changed?
1,1-DCA	2,400[a]	70[d]	More Stringent
1,1-DCE	7[b]	7[e]	None
Cis-1,2-DCE	70[b]	70[e]	None
TCE	3[b]	3[f]	None
PCE	3[b]	3[f]	None
Vinyl chloride	1[b]	1[f]	None
1,1,1-Trichloroethane	200[a]	200[e]	None
1,1,2-Trichloroethane	5[a]	5[e]	None
Di (2-ethylhexyl) phthalate	4[a]	6[e]	Less Stringent
Dichlorodifluoromethane	1,400[b]	1,400[d]	None
Trichlorofluoromethane	2,400[b]	2,100[d]	More Stringent
1,4-Dioxane	--[c]	3.2[d]	New

Notes:

a. State MCL listed in the 1992 ROD.

b. Federal MCL listed in the 1992 ROD.

c. 1,4-Dioxane was not identified as a COC in the 1992 ROD but the EPA and FDEP required that the PRP include it as a potential COC starting in the third quarter of 2010.

d. Current ARAR value based on Florida GCTLs, available at: https://floridadep.gov/sites/default/files/62-777-TechRprt-Table1-Groundwater-CTLs_Feb2005.xlsx (accessed 09/23/19).

e. Current ARAR value based on federal MCLs (40 CFR 141-143). National primary and secondary drinking water MCLs are available at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations (accessed 9/23/2019).

f. Current ARAR value based on state MCLs listed in FDEP drinking water standards, monitoring and reporting (62 FAC 550.828). Florida state drinking water volatile organic compound levels are available at: https://www.flrules.org/gateway/notice_Files.asp?ID=17870715 (accessed 9/23/2019).

TABLE 2: 1,4-DIOXANE CONCENTRATIONS AND GENERAL TRENDS IN NEWER WELLS

Contaminant	Southern YTA (µg/L)		Southwest and Downgradient of YTA (µg/L)			
1,4-Dioxane	IT20S	12U (9/2019)	IT22S	230 (9/2019)	IT22LS	180 (9/2019)
		5.4J(3/2019)		780J (3/2019)		130J (3/2019)
		70J (9/2018)		410 (9/2018)		220 (9/2018)
		15J (3/2017)		640 (3/2018)		Not sampled
		12J (9/2017)		660J (9/2017)		93 (9/2017)
		9.3J (3/2017)	Well not yet installed		Well not yet installed	
		5.6J (10/2016)				

Notes:
U - Below detection. Detection limit listed.
J – Estimated value.
Source: Semi-Annual Monitoring Report 3rd Quarter 2019. Prepared by MES Group, LLC. December 2019.

TABLE 3: SCREENING-LEVEL RISK EVALUATION OF 1,4-DIOXANE IN SITE GROUNDWATER

September 2019 1,4-Dioxane Concentration (µg/L)	Well	Tap Water RSL[a] (µg/L)		Cancer Risk[b]	Noncancer HQ[c]
		1×10^{-6} Risk	HQ=1		
230	IT-22S	0.46	57	**5×10^{-4}**	**4**
180	IT-22LS			**4×10^{-4}**	**3**
22	IT-1D			**5×10^{-5}**	0.4
21	RW-1			**5×10^{-5}**	0.4
18	IT-1I			**4×10^{-5}**	0.3
14	RW-3R			**3×10^{-5}**	0.2
14	IT-16D			**3×10^{-5}**	0.2
6	IT-21LS			**1×10^{-5}**	0.1
5.7	IT-20I			**1×10^{-5}**	0.1
4.4	IT-19I			**1×10^{-5}**	0.1
3.5	IT-1S			**8×10^{-6}**	0.1

Notes:

a. Current EPA RSLs, dated November 2019, are available at http://www2.epa.gov/risk/risk-based-screening-table-generic-tables (accessed 11/22/2019).

b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk: cancer risk = (detected concentration ÷ cancer-based RSL) × 10^{-6}.

c. The noncancer HQ was calculated using the following equation: HQ = detected concentration ÷ noncancer-based RSL.

Bold = cleanup goal exceeds EPA's upper bound of the cancer risk range of 1 x 10^{-4} cancer risk or a noncancer HQ of 1 and FDEP's target risk level of 1 x 10^{-6} or the noncancer HQ of 1.

TABLE 4: SUMMARY OF IMPLEMENTED INSTITUTIONAL CONTROLS (ICs)

Media That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	11-1N-09-3486-001-000 11-1N-09-3487-003-000 11-1N-09-3488-001-01A 11-1N-09-3488-002-001 11-1N-09-3488-002-000 11-1N-09-3488-002-002	Restrict groundwater use and prevent installation of any type of well.	County Ordinance 92-5 restricts installation of wells within city limits.
					City Ordinance 2001-6 restricts water well installation, excavation and construction on site.
					County Ordinance 99-108 requires new commercial or residential facilities to connect to a city or county water supply if located within 200 feet of a connection.
					Declaration of Restrictive Covenants, May 31, 2019.
Soil	Yes	Yes	11-1N-09-3486-001-000 11-1N-09-3487-003-000 11-1N-09-3488-001-01A 11-1N-09-3488-002-001	Restrict land use to industrial uses and restrict activities that would impact the integrity of the cap.	City Ordinance 2001-6 restricts water well installation, excavation and construction on site.
					Declaration of Restrictive Covenants, May 31, 2019

FIGURES

FIGURE 1: INSTITUTIONAL CONTROL MAP

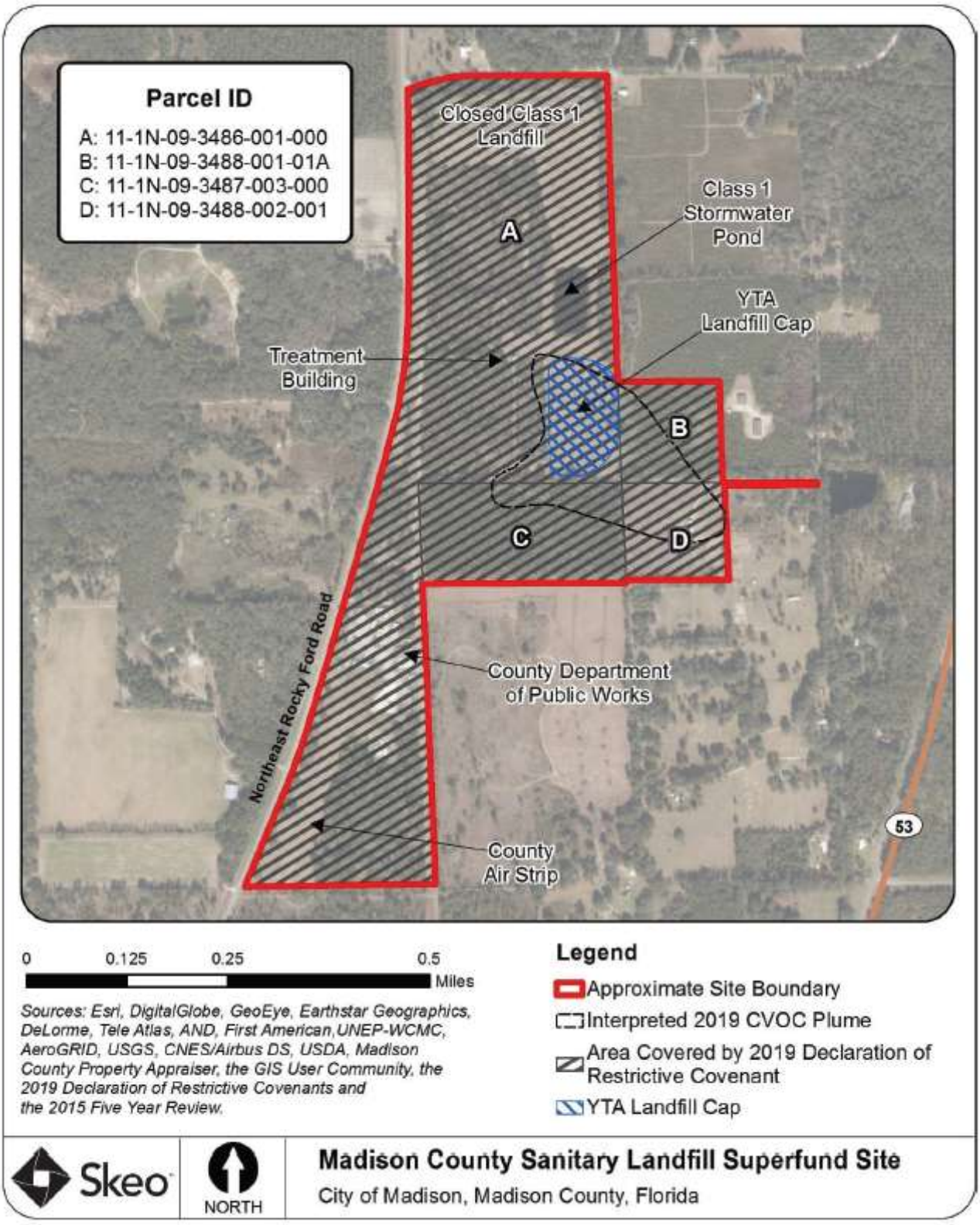


FIGURE 2: SITE MAP

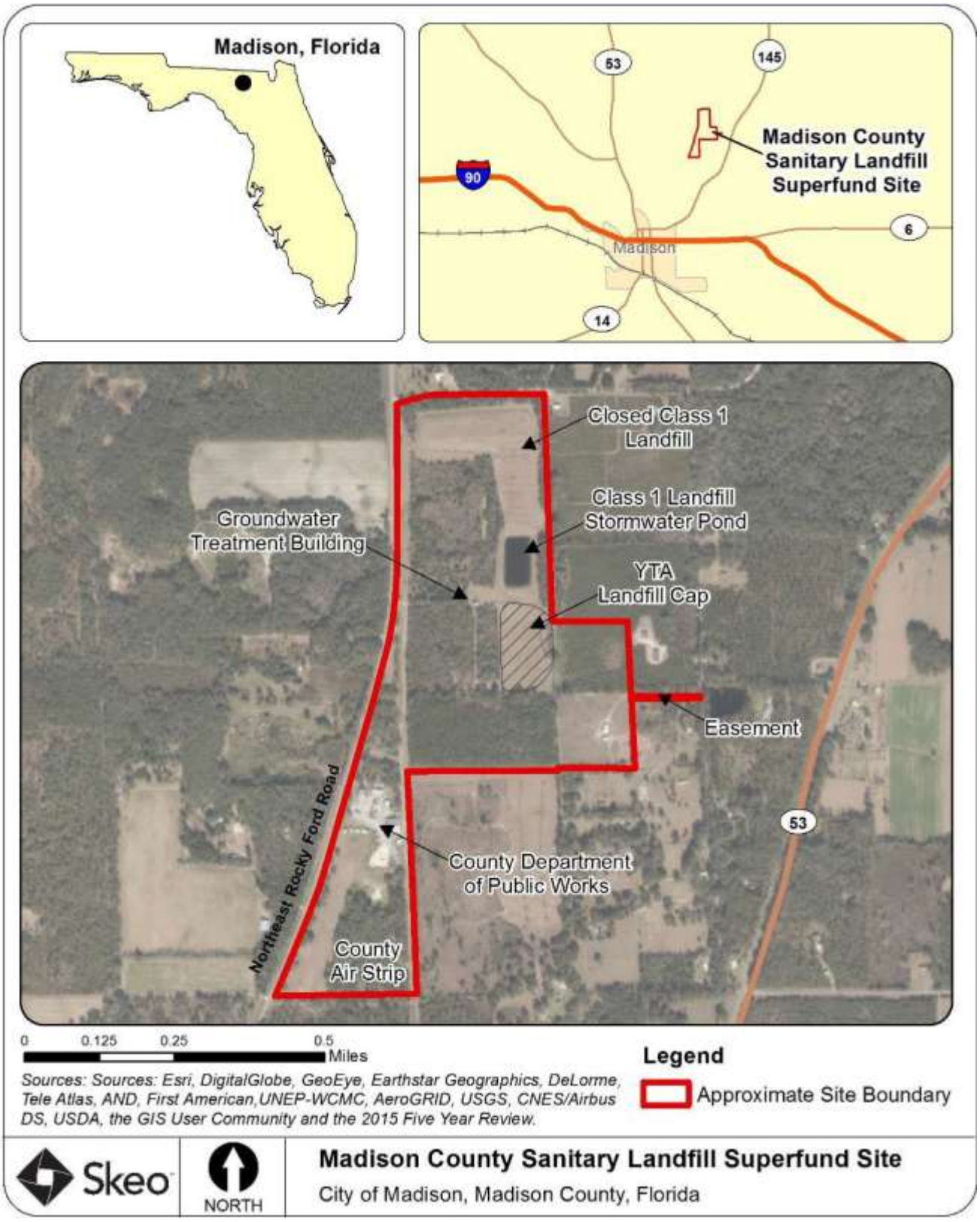


FIGURE 3: CURRENT MONITORING WELL NETWORK

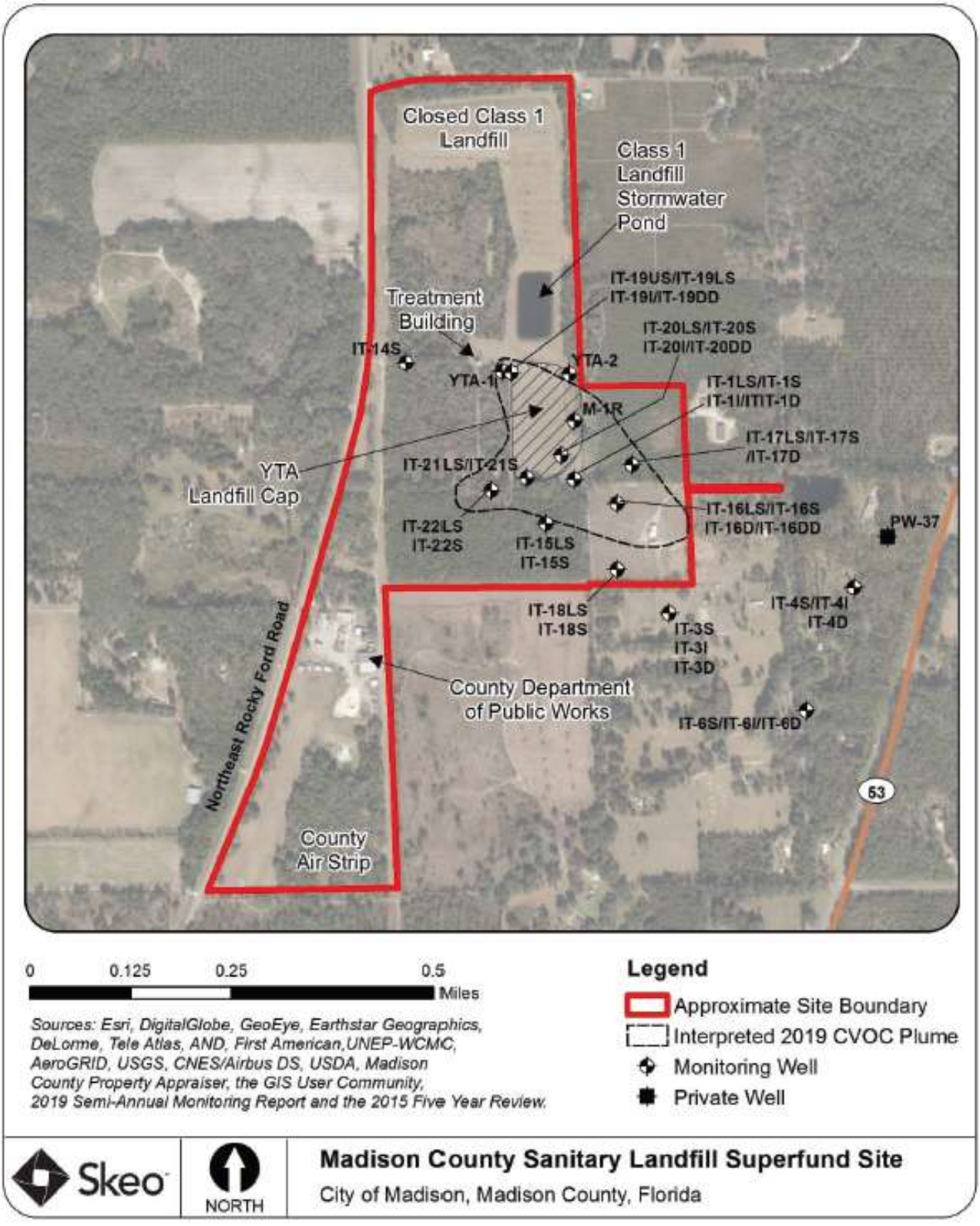
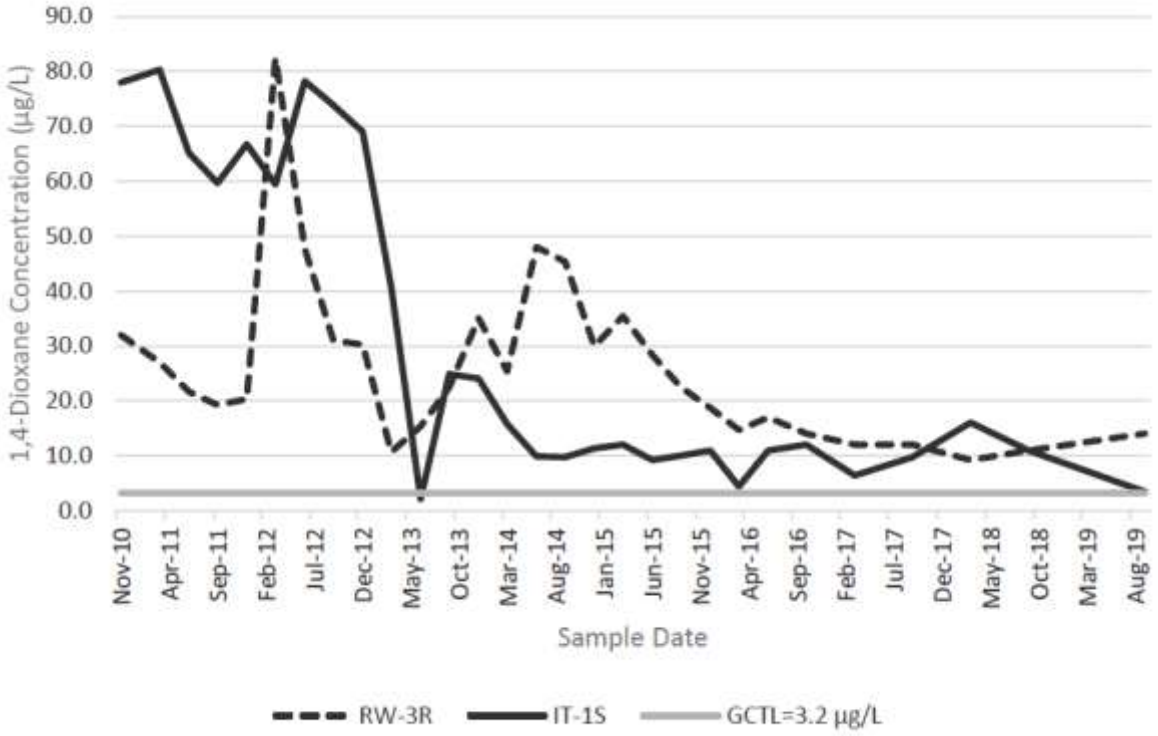


FIGURE 4: 1,4-DIOXANE TRENDS IN THE YTA IN OLDER WELLS



USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for groundwater at the Madison County Sanitary Landfill Site is important in helping EPA to select a remedy for the Site. Use the space below to write your comments, then fold and mail. A response to your comment will be included in the Responsiveness Summary.

Name_____

Address_____ City____State__Zip___

Place Stamp Here

Jasmin Jefferies, Remedial Project Manager
U. S. EPA, Region 4
Superfund Remedial Branch
Superfund Division
61 Forsyth St., SW
Atlanta, GA 30303

Pre-Recorded Proposed Plan Presentation
Wednesday, December 15, 2021
Available by 9 AM
www.epa.gov/superfund/madison-county-sanitary-landfill

To obtain additional information about the pre-recorded presentation, or if you have questions or concerns related to the site orcleanup activities, please contact:

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