



Pilot Study Injection Work Plan

Former TRW Union Springs Facility

PREPARED FOR
ZF Active Safety and Electronics
US LLC

DATE
January 20266

BCP SITE NUMBER
C706019



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ACRONYMS AND ABBREVIATIONS

Acronym	Description
AOC	area of concern
bgs	below ground surface
BPT	bioremediation pilot test
cDCE	cis-1,2-dichloroethene
Cells/mL	cells per milliliter
CVOC	chlorinated volatile organic compounds
DCE	dichloroethene
ERM	ERM Consulting & Engineering, Inc.
HGU	Hydrogeologic unit
mg/L	milligrams per liter
NYSDEC	New York State Department of Environmental Conservation
PCE	tetrachloroethene
PRB	permeable reactive barrier
Site	Former TRW Union Springs Facility, 107 Salem Street in Union Springs, New York
TCE	trichloroethene
tDCE	Trans-1,2-dichloroethene
TOC	total organic carbon

Acronym	Description
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound
ZF	ZF Active Safety and Electronics US LLC
µg/L	micrograms per liter

ENGINEERING CERTIFICATION

I, Stephen Mirabello, PE certify that I am currently a New York State registered professional engineer and that this Pilot Study Injection Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).

X

Stephen Mirabello
Project Engineer



1. INTRODUCTION

ERM Consulting & Engineering, Inc. (ERM) has prepared this Pilot Study Injection Work Plan on behalf of ZF Active Safety and Electronics US LLC (ZF; formerly TRW Automotive U.S. LLC). ZF completion of the monitoring phase of the Bioremediation Pilot Test (BPT), the results were compiled and presented in the Bioremediation Pilot Test Report, submitted to the New York State Department of Environmental Conservation (NYSDEC) in July 2025 (ERM, 2025A). The BPT monitoring was designed to evaluate the performance of a wood-mulch permeable reactive barrier (PRB) to treat chlorinated volatile organic compounds (CVOCs) in groundwater at the Former TRW Union Springs Facility located at 107 Salem Street in Union Springs, New York (**Figure 1**; the “Site”). During the BPT, ERM determined that elevated sulfate concentrations in groundwater were inhibiting complete biodegradation of CVOCs. To resolve this, in 2023 and 2024, ERM conducted a subsequent in-situ microcosm study via a push-pull test to lower sulfate concentrations in groundwater. Sodium lactate as a carbon substrate was injected (“push”) into MW-509 and sodium lactate with nanoscale magnetite (a form of iron) into MW-510. Subsequent groundwater sampling (“pull”) was analyzed to assess if dissolved sulfate concentrations could be reduced sufficiently to allow for complete biodegradation of CVOCs. This work plan describes the proposed next steps for a broader injection pilot test primarily within the South Field Area of Concern (AOC).

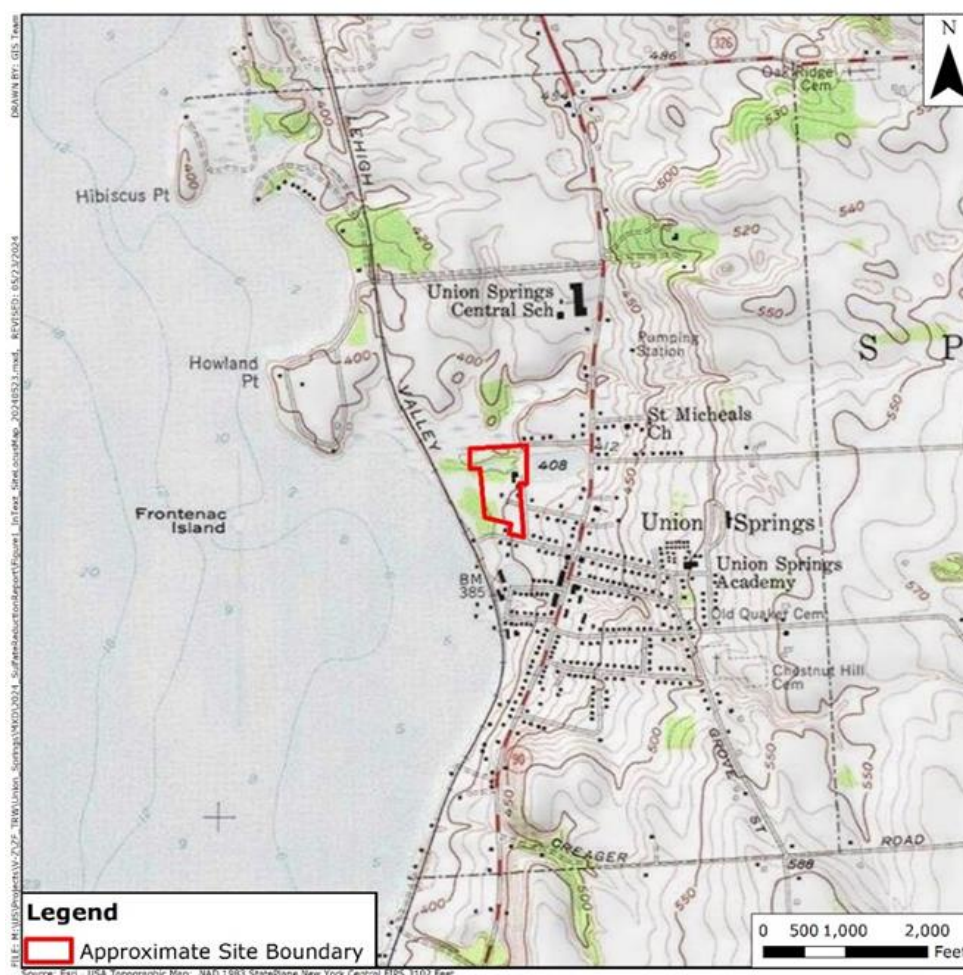


FIGURE 1 SITE LOCATION

1.1 SHALLOW HYDROGEOLOGY

The shallow hydrogeologic units (HGU-1) consists of a heterogeneous fill material resultant of historical Site operations, alternating silt, sands, and sandy silt to a depth of 18 feet below surface grade. The water table generally ranges from 5 to 10 feet bgs in monitoring wells screened within HGU-1.

The proposed injection is focused on further evaluating the use of in-situ microbial reductive dechlorination to treat CVOC mass present in groundwater to a depth of approximately 18 feet bgs (i.e., within HGU-1). Groundwater flow within the upper HGU in the vicinity of the injection area occurs primarily within relatively higher-permeability groundwater transport zones, primarily in the horizontal direction. The presence of upward vertical hydraulic gradients and underlying relatively low-permeability HGUs minimizes downward groundwater migration at the Site.

In the proposed injection area between the mill pond and Howland Street, groundwater generally migrates in a west-southwesterly direction toward the buried and open portions of the former canal. There is a divide in groundwater north of Howland Street which results from low-permeable silts and clays and an engineered phytoremediation pilot test plantation which, combined, minimize groundwater flow north toward unnamed stream 1 (ERM 2025B). Figure 2 below presents the static groundwater contour across the HGU-1 monitoring well network in the northern portion of the Site.

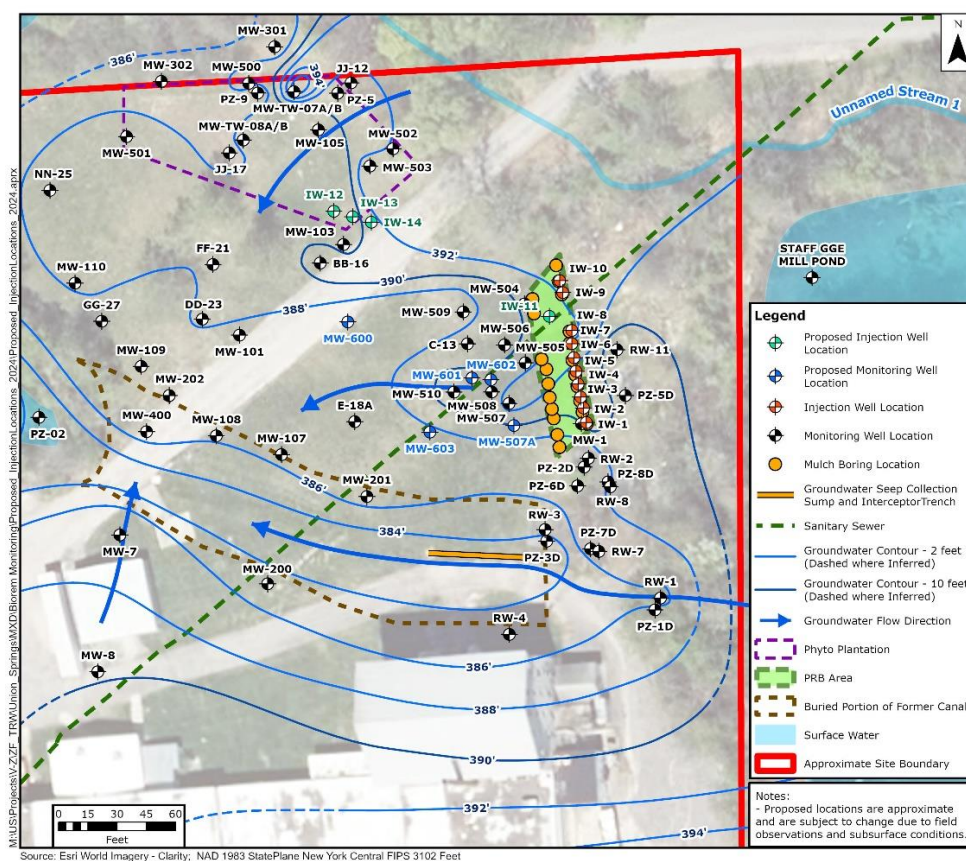


FIGURE 2 HGU-1 GROUNDWATER CONTOUR

2. SUMMARY OF INJECTION ACTIVITIES

ERM proposes to conduct a larger scale injection utilizing a combination of injection wells and additional direct-push applications throughout the South Field AOC. The reductive dechlorination observed in the microcosm study (ERM 2025) suggests that it is possible to stimulate the microbial populations and develop conditions that are conducive to establishing a self-sustaining microbial population.

2.1 INJECTION GOALS AND OBJECTIVES

The proposed pilot test will target HGU-1 within South Field AOC and will cover approximately 8,000 square feet, using a combination of injection wells and direct-push injection methods. The goal is to target the injection in the hydraulically upgradient portion of South Field AOC to further demonstrate in-situ conditions can be established to allow dehalorespiring bacteria to out-compete sulfate reducing bacteria on a larger scale. The effects will be monitored within the injection area and within the monitoring well network downgradient within the South Field AOC.

2.2 IMPLEMENTATION DETAILS

Three injection wells (IW-12 through IW-14) and one monitoring well (MW-600) will be installed proximal to MW-103. These injection wells are located on a groundwater flow divide between the North Field and South Field AOC. Being on a groundwater divide, it is unclear if injections in the South Field AOC would reach the MW-103 area. IW-12 through IW-14 will be laid out to ensure delivery of amendment to the MW-103 area and downgradient to the southwest. Based on previous boring logs in the area, the injection wells would be 4-inch diameter wells screened at 12-17 feet below ground surface. MW-600 is to be a 2-inch well screened at a similar depth as the three injection wells in the area. The exact screen setting of each well will be determined during the drilling effort.

Three 2-inch monitoring wells (MW-601, MW-602, MW-603) and 4-inch one injection well (IW-11) will be installed near the sanitary sewer that transects the South Field AOC to evaluate the degree of injectate that follows the bedding of the pipe. The invert of the sanitary pipe is approximately 8 feet bgs, with depth to groundwater in the BPT monitoring well network averaging a depth of 6 feet bgs, suggesting the pipe bedding may be a preferential flow path for the upper portion of HGU-1 (6 to 10 feet bgs). MW-601 and MW-602 will be installed as a couplet screened within the bedding of the pipe and below the bedding, respectively. MW-603 will be installed within the bedding downgradient of the couplet and inject area to evaluate potential migration down the bedding. IW-11 will be constructed for the purpose of injecting directly into the bedding. The direct-push injections will be initiated south of the sanitary sewer and these wells will be utilized to evaluate potential short circuiting along the pipe bedding.

One monitoring well, MW-507A, will be installed immediately next to MW-507 screened 7-12 feet below ground surface to better match the shallower screen intervals for the remaining monitoring network in the BPT. MW-507 was installed below a clay layer in a fine to coarse sandy layer. MW-507A will be set above the clay layer. The proposed locations are presented on [Figure 3](#).

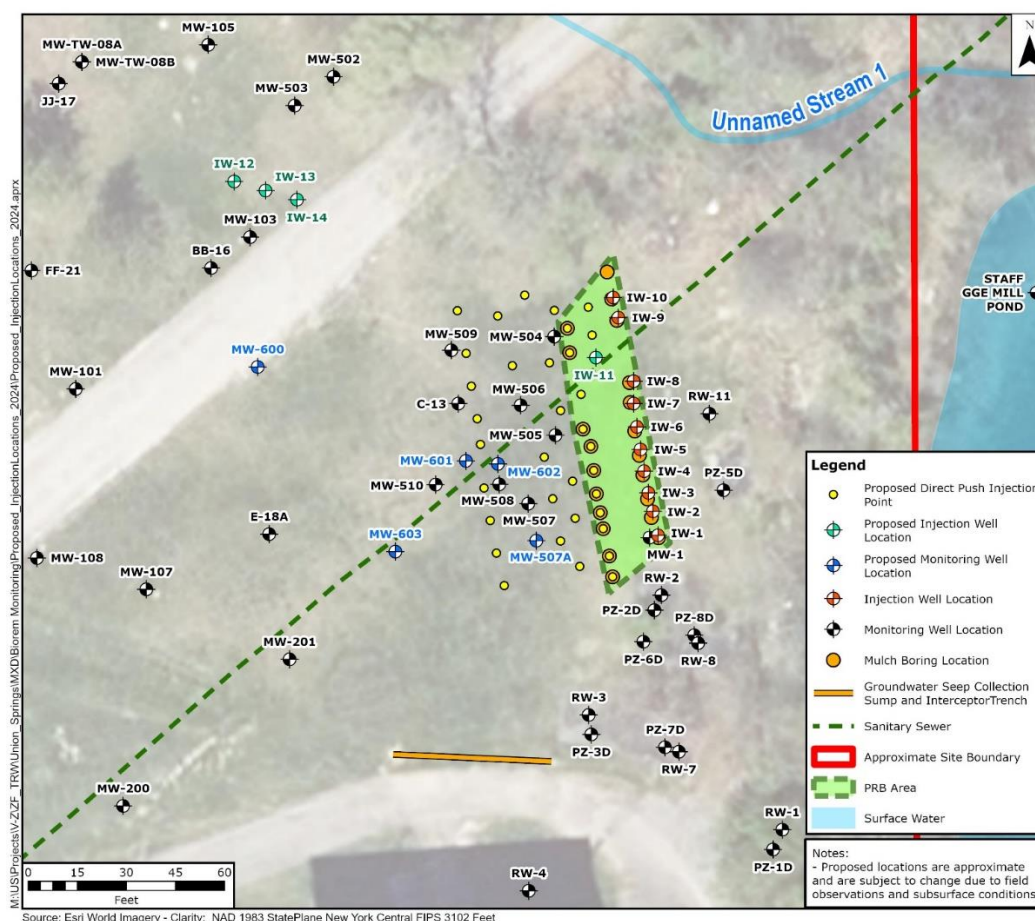


FIGURE 3 PROPOSED INJECTION PLAN

The target pilot treatment interval is vertically less than 20 feet bgs and is the hydraulically upgradient portion of HGU-1 within the South Field AOC. Based on the results of the BPT, a dual-substrate phased approach was selected for implementation to counteract difficulties experienced with prior injections. ERM will initially inject the area with a highly soluble carbon amendment (sodium lactate) and iron (e.g., nanoscale magnetite, iron chloride, or ZVI) in the newly installed and permeable reactive barrier (IW-1 through -10) injection wells. Conditions will be monitored to verify the groundwater conditions before a second injection of a slow-release carbon source, such as emulsified vegetable oil or equivalent and bioaugmentation culture (SDC-9) in the direct-push locations. Material Safety Data Sheets for the proposed amendments are included as Appendix A. This approach will provide an initial carbon influx to prime the South Field AOC, lower sulfate concentrations, scavenge dissolved oxygen, and establish reducing conditions in advance of bioaugmentation. In addition, the direct-push injections will utilize multiple injection depths and elevated injection pressures to enhance reagent delivery into the relatively fine-grained soils.

ERM will inject approximately 250 to 450 gallons of carbon substrate into each location. Potable water will be sourced from the Union Springs Public Works. Sodium ascorbate will be used as needed to remove dissolved oxygen from the injection water. The iron added to the injection solution will act to reduce competition from sulfate reducing bacteria already present

in the ecosystem. The addition of a bioaugmentation inoculum to the injection well locations will serve to expedite the growth of the microbial population to promote complete dechlorination of CVOCs in groundwater.

The total number of injection points may be adjusted as conditions warrant to ensure complete delivery of the target dose of amendment. Future injections may be performed on an as-needed basis to establish a self-sustaining microbial population, collect additional data, and further evaluate this remedial strategy.

2.3 INJECTION MONITORING

ERM will complete a baseline sampling event including the newly installed wells and monitoring well network within the BPT area will be sampled prior to injection. Groundwater will be monitored monthly for the first quarter and then quarterly for a year (15 total months) using the monitoring well network established in the pilot test area as described in the Bioremediation Pilot Test Report (ERM 2025A). The new monitoring wells installed during this effort (MW-601, MW-602, and MW-603) will be added to the network. ERM will monitor key indicators of reductive dechlorination, sulfate concentration, and overall groundwater geochemistry. The parameters to be measured include:

- Sulfate and other primary groundwater geochemical cations (calcium, magnesium, sodium, potassium) and anions (carbonate, bicarbonate, chloride);
- Full Target Compound List (TCL) volatile organic compounds (VOCs) and dissolved gases (focusing on Trichloroethylene (TCE), 1,2-Dichloroethane (DCE), Vinyl Chloride (VC), and ethene);
- Total Organic Carbon (TOC)
- Sulfide; and
- pH, dissolved oxygen, and oxidation-reduction potential to evaluate the system's geochemical conditions.

2.4 SCHEDULE

This pilot injection is anticipated to begin following regulatory approval and is contingent on winter weather conditions. The anticipated schedule is presented below. The schedule may be modified based on conditions such as adverse weather, other Site activities, changes to in situ geochemical conditions evaluated through groundwater monitoring, and contractor/equipment availability. The NYSDEC will be notified approximately 5 days in advance of any subsurface field or monitoring activities at the Site.

Activity	Timeframe
Regulatory approval of Work Plan	February 2026
Drilling Program	March 2026
Baseline Monitoring (Event 1)	April 2026
Injection Program	April 2026
Monitoring Event 2	May 2026
Monitoring Event 3	June 2026
Monitoring Event 4	September 2026
Monitoring Event 5	December 2026
Monitoring Event 6	March 2027
Monitoring Event 7	June 2027

3. REPORTING

The sampling schedule and monitoring parameters, and monitoring locations included in the monitoring network will be updated in quarterly progress reports to NYSDEC and in the Alternatives Analysis Report. Each monitoring event will include sampling from the wells downgradient of the injection points. The monitoring duration may be altered based on a review of preliminary data collected. The results of these injections and the monitoring program will provide critical insights for a final remedial strategy in the South field AOC.

3.1 PROPOSED NEXT STEPS

The results of the proposed pilot injection test in the South Field AOC, together with the outcomes of the proposed downgradient Canal IRM, will be used to develop and propose a holistic site management strategy to be protective of human health and the environment. This strategy, which would be proposed as the final remedy, would include considerations for additional, broader-scale injection programs, monitored natural attenuation, and ongoing monitoring of the downgradient ZVI PRB prior to discharge to the open canal, along with incorporating enforceable institutional controls to ensure long-term effectiveness and protection of potential on-Site and downgradient receptors.

4. GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

Enhanced bioremediation through the injection of carbon substrates (and additional amendments) aligns with the NYSDEC DER-31 Green Remediation policy by supporting sustainable cleanup strategies that minimize the environmental footprint of remedial actions. This technique facilitates the in-situ biological degradation of contaminants by providing essential nutrients and bioaugmentation to indigenous microbial communities, accelerating their activity, and promoting degradation of hazardous compounds.

One of the primary advantages of enhanced bioremediation is its ability to operate with lower energy demands compared to more intensive remediation methods. Unlike pump-and-treat systems or thermal treatments, bioremediation leverages passive and naturally occurring processes, requiring minimal mechanical intervention. In addition to energy efficiency, the injection of carbon substrates reduces the need for extensive excavation and transportation of contaminated materials, leading to diminished waste generation and fewer emissions from heavy equipment.

The use of enhanced bioremediation as part of a green remediation strategy is particularly advantageous for long-term site management. By addressing contaminants hydraulically upgradient and fostering degradation, this approach reduces the operational lifespan of treatment systems, thereby lowering ongoing energy and maintenance costs.

5. REFERENCES

ERM, 2025A. *Bioremediation Pilot Test Report*. 107 Salem Street, Union Springs, New York.
ERM Project Number 0585868. July 2025

ERM, 2025B. *Phytoremediation Pilot Test Report*. 107 Salem Street, Union Springs, New York.
ERM Project Number 0585868. July 2025

APPENDIX A: MATERIAL SAFETY DATA SHEET



“Injection Ready” 60% QRS-SL™ Plus Sodium Lactate

Quick Release Substrate with NutriPlus™ a Proprietary Nutrient Package For Aquifer Remediation and Conditioning

SAFETY DATA SHEET

Effective Date: 1/1/2020

1. Product Identification

Synonyms: Quick Release Substrate Plus (QRS™-SL Plus); Sodium Lactate; Propanoic acid, 2-Hydroxy Monosodium salt; L-Lactic Acid, Sodium Salt

Recommended Use: Treatment of groundwater contaminated with chlorinated solvents and other anaerobically degradable compounds.

Supplier: Terra Systems, Inc.
130 Hickman Road, Suite 1
Claymont, Delaware 19703
Telephone (302) 798-9553
Fax (302) 798-9554
www.terrasystems.net

2. Hazards Identification

Emergency Overview

Caution: May cause eye irritation.

Health Rating: 1 - Slight

Flammability Rating: 0 - None

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Protective Equipment: Goggles; Proper Gloves

Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation: Not expected to be a health hazard

Ingestion: Not expected to be a health hazard via ingestion

Skin Contact: No adverse effects expected

Eye Contact: May cause irritation, possible reddening

Chronic Exposure: No information found

Terra Systems, Inc.
130 Hickman Road, Suite 1, Claymont, Delaware 19703
Contact: Michael Free, VP, Sales and Marketing
Office: 302-798-9553; Cell: 484-889-2214 Email: mfree@terrasystems.net



Terra Systems

INCORPORATED



Aggravation of Pre-existing Conditions:

No information found

3. Composition/Information on Ingredients

Ingredient	CAS#	Percent	Hazardous
Sodium Lactate	72-17-3	60	Yes
Organic Nutrients, Inorganic Nutrients and Surfactants	Mixture	1-5	No
Water	7732-18-5	35-39	No

Molecular Weight:

No available

Chemical Formula:

Not available

The organic, inorganic nutrients and surfactant mixture is a trade secret and consists of ingredients of unknown acute toxicity.

4. First Aid Measures

Inhalation:

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

5. Fire Fighting Measures

Fire:

Flash point: 110 C (230 F). Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode.



6. Accidental Release Measures

Clean-up personnel may require protective clothing. Absorb in sand, paper towels, “Oil Dry”, or other inert material. Scoop up and containerize for disposal. Flush trace residues to sewer with soap and water. Containerized waste may be sent to an approved waste disposal facility.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Avoid long storage times. Containers of this material may be hazardous when empty since they do retain product residues (vapors, liquid). Observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:	None established.
Ventilation System:	Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved):	Not expected to require personal respirator usage.
Skin Protection:	Wear protective gloves and clean body-covering clothing.
Eye Protection:	Use chemical safety goggles and/or a full face shield where splashing is possible. Provide readily accessible eye wash stations and safety showers.
Slips, Trips, and Falls:	Material is slippery when spilled. Clean up with sand, paper towels, or other inert material.

9. Physical and Chemical Properties

Appearance:	Colorless to yellow liquid.
Odor:	Odorless
Solubility:	100% soluble in water.
Specific Gravity (water=1):	1.32. (11.01 pounds per gallon)
pH:	6.5-8.5
% Volatiles by volume	
@ 21C (70F):	No information found.
Boiling Point:	110 C (230 F)
Melting Point:	17 C (63 F)
Flash Point (F):	No information found
Autoignition Temperature:	No information found
Decomposition Temperature:	No information found.
Vapor Density (Air=1):	0.7
Vapor Pressure (mm Hg):	14 @ 20 C (68 F)
Evaporation Rate (BuAc=1):	No information found
Viscosity @23 C (73 F):	100 centipoises

Terra Systems, Inc.
130 Hickman Road, Suite 1, Claymont, Delaware 19703
Contact: Michael Free, VP, Sales and Marketing
Office: 302-798-9553; Cell: 484-889-2214 Email: mfree@terrasystems.net



**Partition Coefficient
(octanol/water):**

No information found

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.
Reactivity: Not reactive under ordinary conditions.
Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizers, acids.
Conditions to Avoid: Incompatibles. Isolate from heat and open flame.

11. Toxicological Information

Oral rat LD50: 2000 mg/Kg. Irritation Data for Sodium Lactate: (Std Draize, rabbit, eye): 100 mg - mild.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		
	Known	Anticipated	IARC Category
Sodium Lactate (72-17-3)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate: Mobile with water and readily biodegradable
Environmental Toxicity: Ecological injuries are not known or expected under normal use; (No effect on Daphnia @ 10g/L)
Degradability: This product is completely biodegradable under both aerobic and anaerobic conditions.
Soil Mobility: This compound will move with groundwater until the adsorbed onto the soil. Degradation products may be mobile.
Bioaccumulation Potential: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.



14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Sodium Lactate (72-17-3)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	--Canada--	Korea	DSL	NDSL	Phil.
Sodium Lactate (72-17-3)	Yes	Yes	No	Yes	
Water (7732-18-5)	Yes	Yes	No	Yes	

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302- RQ	TPQ	-----SARA 313----- List	Chemical Catg.
Sodium Lactate (72-17-3)	No	No	No	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	-RCRA- CERCLA	-TSCA- 261.33	8(d)
Sodium Lactate (72-17-3)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)



16. Other Information

NFPA Ratings:	Health: 1 Flammability: 0 Reactivity: 0
Date Prepared:	March 28, 2014
Revision Information:	SDS Section(s) changed since last revision of document include: None.
Disclaimer:	Terra Systems, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. TERRA SYSTEMS, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, TERRA SYSTEMS, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
Prepared by:	Terra Systems, Inc.
Phone Number:	(302) 798-9553 (U.S.A.)



**Patented *Injection Ready* 60% SRS[®]-STA
Small Droplet Emulsified Vegetable Oil (EVO)
Substrate for Maximum Radius of Influence In
Heterogeneous Formations
United States Patent #RE40,448
SAFETY DATA SHEET**

1. Product Identification

Synonyms:	60% Small Droplet Slow Release Substrate (SRS [®] -STA) Emulsified Vegetable Oil Substrate (EVO)
Recommended Use:	Treatment of groundwater contaminated with chlorinated solvents and other anaerobically degradable compounds.
Supplier:	Terra Systems, Inc. 130 Hickman Road, Suite 1 Claymont, Delaware 19703 Telephone (302) 798-9553 Fax (302) 798-9554 www.terrasystems.net

2. Hazards Identification

Emergency Overview

Caution:	May cause eye irritation.
Health Rating:	1 - Slight
Flammability Rating:	1 - Slight
Reactivity Rating:	1 - Slight
Contact Rating:	1 - Slight
Protective Equipment:	Goggles; Proper Gloves
Storage Color Code:	Green (General Storage)
Potential Health Effects	
Inhalation:	Not expected to be a health hazard. If heated, may produce vapors or mists that irritate the mucous membranes and cause irritation, dizziness, and nausea. Remove to fresh air.
Ingestion:	Not expected to be a health hazard via ingestion. Large doses may produce abdominal spasms or diarrhea.
Skin Contact:	No adverse effects expected. May cause irritation or sensitization in sensitive individuals.
Eye Contact:	May cause mild irritation, possible reddening.
Chronic Exposure:	No information found.
Aggravation of Pre-existing Conditions:	No information found.



3. Composition/Information on Ingredients

Ingredient	Synonyms	CAS #	Percent	Hazardous
Soy bean oil	Soya oil	8001-22-7	60%	No
Emulsifiers, shear thinning agent and proprietary nutrient package containing nitrogen, phosphorus and vitamin B ₁₂		Mixture	7.5 - 10%	No
Sodium lactate	2-hydroxypropionic acid sodium salt	72-17-3	5.5%	Yes
Water		7732-18-5	Difference	No

The emulsifiers and nutrient package mixture is a trade secret and consists of ingredients of unknown acute toxicity.

4. First Aid Measures

Inhalation:	Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:	If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact:	Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:	Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

5. Fire Fighting Measures

Fire:	Flash point: >200 C (>392 F). Not considered to be a fire hazard. Isolate from heat and open flame.
Explosion:	Not considered to be an explosion hazard. Closed containers may explode if exposed to extreme heat.
Fire Extinguishing Media:	Dry chemical, foam, or carbon dioxide. Water spray may be ineffective on fire but can protect fire-fighters and cool closed containers. Use fog nozzles if water is used.
Special Information:	In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode.



6. Accidental Release Measures

Clean-up personnel may require protective clothing. Absorb in sand, paper towels, “Oil Dry”, or other inert material. Scoop up and containerize for disposal. Flush trace residues to sewer with soap and water. Containerized waste may be sent to an approved waste disposal facility.

7. Handling and Storage

Store in a cool, dry, ventilated area. Do not store in sunlight or above 32 C (90 F). Keep container tightly closed and upright when not in use to prevent leakage. Observe all warnings and precautions listed for the product. Protect against physical damage.

If container begins to bulge, open cap slowly to release carbon dioxide from biological activity on the SRS[®]-STA and call TSI.

Containers of this material are not hazardous when empty since they do not contain vapors or harmful substances; if drum or tote is observed to bulge, keep cap off as pressurization can occur on empty container with caps in place unless container is thoroughly rinsed.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:	None established.
Ventilation System:	Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved):	Not expected to require personal respirator usage.
Skin Protection:	Wear protective gloves and clean body-covering clothing.
Eye Protection:	Use chemical safety goggles and/or a full-face shield where splashing is possible. Provide readily accessible eye wash stations and safety showers.
Slips, Trips, and Falls:	Material is slippery when spilled. Clean up with sand, paper towels, “Oil Dry”, or other inert material.

9. Physical and Chemical Properties

Appearance:	White liquid.
Odor:	Vegetable oil.
Solubility:	Miscible in water.
Specific Gravity (water=1):	0.95-0.98. 8.09 pounds per gallon.
pH:	6-7 (40% aqueous solution)
% Volatiles by volume @ 21C (70F):	Negligible.
Boiling Point:	≥ 100C (≥ 212F)
Melting Point:	No information found.
Flash Point (F):	No information found.
Autoignition Temperature:	No information found.
Decomposition Temperature:	No information found.
Vapor Density (Air=1):	No information found.
Vapor Pressure (mm Hg):	< 1.0 @ 20C (68F).



Evaporation Rate (BuAc=1):	No information found.
Viscosity @23 C (73 F):	213 centipoises (1.2 centipoises diluted 1:10)
Partition Coefficient (octanol/water):	No information found.

10. Stability and Reactivity

Stability:	Stable under ordinary conditions of use and storage.
Reactivity:	Not reactive under ordinary conditions.
Hazardous Decomposition Products:	Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:	Will not occur.
Incompatibilities:	Strong oxidizers, acids.
Conditions to Avoid:	Incompatibles. Isolate from heat and open flame.

11. Toxicological Information

Soybean Oil:	No information found on toxicology. It is not a carcinogen listed by IARC, NTP, NIOSH, OSHA, or ACGIH.
Emulsifier/Nutrient Mixture:	No information found on toxicology. It is not a carcinogen listed by IARC, NTP, NIOSH, OSHA, or ACGIH.
Sodium Lactate:	Oral rat LD50: 2,000 mg/kg. 100 mg caused mild irritation to rabbit eye in Draize test. This compound is not listed as a carcinogen by IARC, NTP, NIOSH, OSHA, or ACGIH.
SRS-STA:	The toxicity of the mixture has not been measured.

12. Ecological Information

Environmental Fate:	No information found.
Environmental Toxicity:	No information found.
Degradability:	This product is completely biodegradable under both aerobic and anaerobic conditions.
Soil Mobility:	This compound will move with groundwater until the adsorbed onto the soil. Degradation products may be mobile.
Bioaccumulation Potential:	No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.



15. Regulatory Information

OSHA STATUS: This product is not hazardous under the criteria of the Federal OSHA hazard Communication Standard 29 CFR 1910.1200. However, thermal processing and decomposition fumes from this product may be hazardous as noted in Section 10.

TSCA STATUS: No component of this product is listed on the TSCA inventory.

CERCLA (Comprehensive Response Compensation, and Liability Act): Not reportable.

SARA TITLE III (Superfund Amendments and Reauthorization Act)

Section 312 Extremely Hazardous Substances: None

Section 311/312 Hazard Categories: Non-hazardous Under Section 311/312

Section 313 Toxic Chemicals: None

RCRA STATUS: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

CALIFORNIA PROPOSITION 65: The following statement is made in order to comply with the California safe Drinking Water and Toxic Enforcement Act of 1986. The product contains no chemicals known to the State of California to cause cancer.

16. Other Information

NFPA Ratings:

Health: **1** Flammability: **1** Reactivity: **1**

Date Prepared:

September 11, 2019

Revision Information:

SDS Section(s) changed since last revision of document include: Updated Section 3 Composition/Information on Ingredients.

Disclaimer:

Terra Systems, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. TERRA SYSTEMS, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE



INFORMATION REFERS. ACCORDINGLY, TERRA SYSTEMS, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by:
Phone Number:

Terra Systems, Inc.
(302) 798-9553 (U.S.A.)

SAFETY DATA SHEET

Version 1
Revision Date 14.09.2019
according to Regulation (EC) No. 1907/2006
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name: **Iron oxide(II,III), magnetic nanoparticles dispersion**

Product Number:

Brand: **Particular Materials – Excellence in Nanoparticles**

REACH No.: A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Particular Materials S.r.l.
Via Risorgimento 1,
I-35024 BOVOLENTA
Telephone: +39 049 4906797
E-mail address: we.are@particularmaterials.com

1.4 Emergency telephone number

Emergency Phone 800-789-767 (CHEMTREC Italia)
+39-02-4555-7031 (CHEMTREC chiamate internazionali)
+39 02-6610-1029 (Centro Antiveleni Niguarda Ca' Granda - Milano)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Mixtures

Synonyms	: Magnetic iron oxide nanocrystals
Formula	: Fe ₃ O ₄
Molecular weight	: 231,53 g/mol

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Iron oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid breathing vapours, mist or gas. For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SAFETY DATA SHEET

Version 1
Revision Date 14.09.2019
according to Regulation (EC) No. 1907/2006
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

8.2 Exposure controls

Appropriate engineering controls General industrial hygiene practice.

Personal protective equipment

Eyeface protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

The selected protective gloves have to satisfy the specifications of Regulation (EU)

2016/425 and the standard EN 374 derived from it.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection not required. For nuisance exposures use type OV/AG (US) or type ABEK (EU EN 14387) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid
	Colour: black

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according to Regulation (EC) No. 1907/2006
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

- | | |
|---|-------------------|
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | > 110 °C |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Iron oxides

Other decomposition products - No data available

In the event of fire: see section 5

SAFETY DATA SHEET

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according to Regulation (EC) No. 1907/2006
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

SECTION 12: Ecological information

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

No data available

SAFETY DATA SHEET

Version 1
Revision Date 14.09.2019
according to Regulation (EC) No. 1907/2006
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number

ADR/RID: - IMDG: -

IATA: -

14.2 UN proper shipping name ADR/RID: Not dangerous goods

IMDG: Not dangerous goods

IATA: Not dangerous goods

14.3 Transport hazard class(es)

ADR/RID: - IMDG: -

IATA: -

14.4 Packaging group

ADR/RID: - IMDG: -

IATA: -

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no

IATA: no

14.6 Special precautions for user No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Particular Materials and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product.



SODIUM ASCORBATE SAFETY DATA SHEET

1. Product Identification

Synonyms: Sodium Salt of Vitamin C
Recommended Use: Additive for treatment of water to remove dissolved oxygen.
CAS#: 134-03-2
Supplier: Terra Systems, Inc.
130 Hickman Road, Suite 1
Claymont, Delaware 19703
Telephone (302) 798-9553
Fax (302) 798-9554
www.terrasystems.net

2. Hazards Identification

Emergency Overview

Caution: May cause eye or skin irritation.
Health Rating: 2 - Moderate
Flammability Rating: 1 - Slight
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Protective Equipment: Goggles; Proper Gloves
Storage Color Code: Green (General Storage)
Potential Health Effects
Inhalation: Not expected to be a health hazard.
Ingestion: Hazard via ingestion.
Skin Contact: May cause irritation or sensitization in sensitive individuals.
Eye Contact: May cause mild irritation.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

3. Composition/Information on Ingredients

Ingredient	Synonyms	CAS #	Percent	Hazardous
Sodium Ascorbate	Sodium Salt of Vitamin C	134-03-2	100	No

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4. First Aid Measures

Inhalation:	Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:	If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact:	Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:	Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

5. Fire Fighting Measures

Fire:	Flash point and auto ignition: not available. May be combustible at high temperature. Isolate from heat and open flame.
Explosion:	Slightly explosive in presence of open flames and sparks. Non-flammable in presence of shocks.
Fire Extinguishing Media:	Dry chemical powder for small fires. Water spray, fog, or foam may be effective for large fires. Do not use water jet. .
Special Information:	In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode. Fine dust dispersed in air at sufficient concentrations with an ignition source is a potential dust explosion hazard.

6. Accidental Release Measures

Clean-up personnel may require protective clothing. Scoop up and containerize for disposal. Flush trace residues to sewer with soap and water. Containerized waste may be sent to an approved waste disposal facility.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Containers of this material may pose a fire risk due to dusts. Keep container tightly closed and upright when not in use to prevent leakage. Sensitive to light. Store in light-resistant containers.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:	None established.
Ventilation System:	Use ventilation to keep exposure below exposure limits.
Personal Respirators (NIOSH)	

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Approved): Use dust respirator usage.
Skin Protection: Wear protective gloves and clean body-covering clothing.
Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Provide readily accessible eye wash stations and safety showers.

9. Physical and Chemical Properties

Appearance: White to yellowish granular or crystalline solid
Molecular Weight: 198.11 g/mole
Odor: Odorless.
Solubility: 620 g/L solubility in water at 25 C.
Specific Gravity (water=1): 1.66 (water = 1).
pH: Not available
% Volatiles by volume
@ 21C (70F): Negligible.
Boiling Point: No information found.
Melting Point: No information found.
Flash Point (F): No information found.
Autoignition Temperature: No information found.
Decomposition Temperature: Decomposition temperature 200 C (392 F)
Vapor Density (Air=1): No information found.
Vapor Pressure (mm Hg): Not applicable.
Evaporation Rate (BuAc=1): Not applicable.
Partition Coefficient
(octanol/water): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.
Reactivity: Not reactive under ordinary conditions.
Hazardous Decomposition
Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizers, reducing agents, acids, alkalis.
Conditions to Avoid: Incompatibles. Isolate from heat and open flame.

11. Toxicological Information

Routes of Entry Inhalation and ingestion.
Toxicity to Animals: Acute oral toxicity (LD50): 16300 mg/kg Rat.
Chronic Effects on Humans: Carcinogenic effects – classified 4 (no evidence) by NTP and none by OSHA. Mutagenic effects – mutagenic to mammalian somatic cells. May cause damage to kidneys, gastrointestinal tract, and upper respiratory tract. May affect genetic material (mutagenic) based on animal test data. No human data found

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Other Toxic Effects:

(Registry of Toxic Effects of Chemicals). May cause cancer based on animal test data. No human data found (Registry of Toxic Effects of Chemicals).

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant) or inhalation.

12. Ecological Information

Environmental Fate: No information found.

Environmental Toxicity: No information found.

Degradability: This product is inherently biodegradable under both aerobic and anaerobic conditions.

Soil Mobility: No information found.

Bioaccumulation Potential: Does not bioaccumulate.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

OSHA STATUS: This product is not hazardous under the criteria of the Federal OSHA hazard Communication Standard 29 CFR 1910.1200. However, thermal processing and decomposition fumes from this product may be hazardous as noted in Section 10.

TSCA STATUS: No component of this product is listed on the TSCA inventory.

CERCLA (Comprehensive Response Compensation, and Liability Act): Not reportable.

SARA TITLE III (Superfund Amendments and Reauthorization Act)

Section 312 Extremely Hazardous Substances: None

Section 311/312 Hazard Categories: Non-hazardous Under Section 311/312

Section 313 Toxic Chemicals: None

RCRA STATUS: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

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CALIFORNIA PROPOSITION 65: The following statement is made in order to comply with the California safe Drinking Water and Toxic Enforcement Act of 1986. The product contains no chemicals known to the State of California to cause cancer.

16. Other Information

NFPA Ratings:

Health: **2** Flammability: **1** Reactivity: **0**

Date Prepared:

February 3, 2015

Revision Information:

SDS Section(s) changed since last revision of document include: None.

Disclaimer:

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Prepared by:

Terra Systems, Inc.

Phone Number:

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SODIUM BICARBONATE

Safety Data Sheet

1. Product Identification

Synonyms: Sodium Hydrogen Carbonate, Baking Soda
CAS No: 144-55-8
Chemical Formula: NaHCO_3
Recommended Use: Food ingredient, pharmaceutical, water treatment
Supplier: Terra Systems, Inc.
130 Hickman Road, Suite 1
Claymont, Delaware 19703
Telephone (302) 798-9553
Fax (302) 798-9554
www.terrasystems.net

2. Hazards Identification

Emergency Overview

Caution: None
Health Rating: 0 - None
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 0 - None
Protective Equipment: Goggles; Proper Gloves
Storage Color Code: Green (General Storage)
Potential Health Effects
Inhalation:

Not expected to be a health hazard. If heated, may produce vapors or mists that irritate the mucous membranes and cause irritation, dizziness, and nausea. Remove to fresh air. Possible irritant.

Ingestion:

Not expected to be a health hazard via ingestion. Material is practically non-toxic. Small amounts (1-2 tablespoonfuls) swallowed during normal handling operations are not likely to cause injury as long as the stomach is not overly full; swallowing larger amounts may cause injury.

Skin Contact:

Not a skin irritant.

Eye Contact:

Not an eye irritant.

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Chronic Exposure:

Based on published studies on its effects in animals and humans, sodium bicarbonate is not teratogenic or genotoxic. Only known subchronic effect is that of a marked systemic alkalosis. Not classified as carcinogenic by NTP, IARC, OSHA, ACGIH or NIOSH.

Aggravation of Pre-existing Conditions:

No information found.

3. Composition/Information on Ingredients

Ingredient	Synonyms	CAS #	Percent	Hazardous
Sodium Bicarbonate	Baking soda	144-5-8	100	No

White crystalline powder; no odor.

4. First Aid Measures

Inhalation:	Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:	If large amounts were swallowed, do not induce vomiting. Give water to drink if person is conscious and get medical advice.
Skin Contact:	Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:	Check for and remove contacts. Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.
Note to Physician:	Large doses may produce systemic alkalosis and expansion in extracellular fluid volume with edema.

5. Fire Fighting Measures

Fire:	Not combustible. Not considered to be a fire hazard. Isolate from heat and open flame.
Explosion:	Not considered to be an explosion hazard.
Fire Extinguishing Media:	Use extinguishing media suitable against surrounding fire or the cause of the fire.
Special Information:	Carbon Dioxide may be generated making necessary the use of a self-contained breathing apparatus (SCBA) and full protective equipment (Bunker Gear). Carbon dioxide is an asphyxiant at levels over 5% w/w. Sodium oxide, another thermal decomposition product existing at temperatures above

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1564°F is a respiratory, eye, and skin irritant. Avoid inhalation, eye and skin contact with sodium oxide dusts

6. Accidental Release Measures

Scoop up into dry, clean containers. Wash away small uncontaminated amounts of residue with water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material are not hazardous when empty since they do vapors or harmful substances; observe all warnings and precautions listed for the product. Do not store above 49 C (120 F). Keep container tightly closed and upright when not in use to prevent leakage.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:	None established.
Ventilation System:	Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved):	Dust mask required if total dust level exceeds 10 mg/m ³ .
Skin Protection:	Wear protective gloves and clean body-covering clothing.
Eye Protection:	Use chemical safety glasses when handling bulk material or when dusts can be generated. Provide readily accessible eye wash stations and safety showers.

9. Physical and Chemical Properties

Appearance:	White crystalline.
Molecular Weight:	84.02
Odor:	None.
Solubility:	86 g/L at 20 C.
Bulk Density:	9.94 g/cm ³ or 62 pounds/ft ³
pH:	8.2 (1% aqueous solution)
% Volatiles by volume @ 21C (70F):	Negligible.
Boiling Point:	Not applicable.
Melting Point:	Not applicable.
Flash Point (F):	Not applicable.
Autoignition Temperature:	Not flammable, will not support combustion.
Decomposition Temperature:	50 C.
Vapor Density (Air=1):	No information found.

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Vapor Pressure (mm Hg):	Not applicable.
Evaporation Rate (BuAc=1):	No information found.
Partition Coefficient (octanol/water):	No information found.

10. Stability and Reactivity

Stability:	Stable under ordinary conditions of use and storage.
Reactivity:	Not reactive under ordinary conditions. Reacts with acids to yield carbon dioxide.

Hazardous Decomposition

Products:	Carbon dioxide may form when heated to decomposition at >100 C. If heated to >850 C, yields sodium oxide which should inhalation, eye and skin contact should be avoided.
------------------	---

Hazardous Polymerization:	Will not occur.
----------------------------------	-----------------

Incompatibilities:	Strong acids.
---------------------------	---------------

Conditions to Avoid:	Incompatibles. Isolate from heat and open flame.
-----------------------------	--

11. Toxicological Information

Toxic Dose:	4,220 mg/kg (oral rat).
Inhalation:	High concentrations of dust may cause transient irritation to upper respiratory tract.
Ingestion:	Ingestion of small amounts is unlikely to cause any adverse effects. Ingestion of (excessive amounts) may cause vomiting, nausea, convulsions
Skin:	Repeated or prolonged contact may cause mild irritation and/or drying (defatting) of skin.
Eyes:	The material was minimally irritating to unwashed eyes and practically non-irritating to washed eyes (rabbits).

12. Ecological Information

Environmental Fate:	No information found.
Environmental Toxicity:	4,100 mg/L EC50 Daphnids. 7.100 mg/L LC50 Bluegills. 7,700 mg/L: LCt0 Rainbow trout.
Persistence:	This product is expected to persist in the environment. It is inorganic and not subject to biodegradation.
Soil Mobility:	This compound will move with groundwater until it reacts with acid.
Bioaccumulation Potential:	This product is not expected to bioaccumulate

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13. Disposal Considerations

Bury in a secured landfill in accordance with all local, state and federal environmental regulations. Empty containers may be incinerated or discarded as general trash.

14. Transport Information

Not regulated.

15. Regulatory Information

CLEAN AIR ACT SECTION 611: Material neither contains nor is it manufactured with ozone depleting substances (ODS).

FEDERAL WATER POLLUTION CONTROL ACT (40 CFR 401.15): Material contains no intentionally added or detectable (contaminant) levels of EPA priority toxic pollutants.

FOOD AND DRUG ADMINISTRATION: Generally Recognized As Safe (GRAS) direct food additive (21 CFR 184.1736).

US DEPARTMENT OF AGRICULTURE: List of Proprietary Substances - Permitted Use Codes 3A, J1, A1, G1, and L1.

CERCLA REPORTABLE QUANTITY: None

OSHA: Not hazardous under 29 CFR 1910.1200

RCRA: Not a hazardous material or a hazardous waste by listing or characteristic.

SARA TITLE III:

Section 302, Extremely Hazardous Substances: None

Section 311/312, Hazardous Categories: Non-hazardous

Section 313, Toxic Chemicals: None

Sodium Bicarbonate is reported in the EPA TSCA Inventory List.

Contains no VOCs.

NSF STANDARD 60: Corrosion and Scale Control in Potable Water. Max use 200 mg/l.

16. Other Information

NFPA Ratings:

Health: **0** Flammability: **0** Reactivity: **0**

Date Prepared:

July 18, 2014

Revision Information:

SDS Section(s) changed since last revision of document include: None.

Disclaimer:

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