CES Certified Environmental Services, Inc.

1401 Erie Blvd. East
Syracuse, NY 13210
Phone 315-478-2374
Fax 315-478-2107

EX-SITU BIOREMEDIATION PLAN FOR PARISH ENERGY FUELS 1289 ARSENAL STREET SOILS AT ROUTE 342 SUNOCO FACILITY

PREPARED FOR:

MR. DAVID CHAPMAN
PARISH ENERGY FUELS
AND THE
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILLS MANAGEMENT

PREPARED BY:

CERTIFIED ENVIRONMENTAL SERVICES, INC.
1401 ERIE BOULEVARD EAST
SYRACUSE, NEW YORK 13214

October 27, 1994

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1.0 INTRODUCTION

During October of 1994 Parish Energy Fuels, Inc. (Parish Energy) removed seven underground storage tanks from their property located at 1289 Arsenal Street, Watertown, New York. Five of these seven underground storage tanks are currently registered with the NYSDEC, registration certificate ID #6-136077. These registered tanks include 4 - 8000 gallon gasoline and 1 - 4000 gallon gasoline. Also removed from the property was one underground 500 gallon fuel oil storage tank as well as one one-thousand gallon heating fuel oil storage tank. These tanks were removed from a single excavation pit which was located in the vicinity of the northwest corner of the property.

These seven storage tanks and associated piping, as well as a gasoline pump island, have been removed from the property as part of a complete renovation project which also included the demolition of the old gas station office building/garage. Once the excavation of contaminated soils from the previous tank farm area, and demolition of the old gas station office building has been completed, the owner, intends on building another gas station/convenience store on the property.

The seven underground storage tanks, associated piping, and pump island were removed from the property in accordance with normally accepted protocol that is typically recognized by the environmental remediation up industry. CES field personnel have been on site for the duration of the tank removal project and have aided in field screening activities and sample collection. Those procedures followed for field screening and sampling are recognized by the NYSDEC and highlighted within their "STARS" guidance series. In general, a Photoionization Detector (PID) meter was used to determine volatile vapor levels remaining in the soils. All soils which were detected to exhibit a total volatile vapor level greater than 10 - 20 ppm have been designated for removal. Soils which exhibit any petroleum related nuisance characteristics have been designated for removal. Given the gross extent of the petroleum contamination, it is anticipated that the project will conclude with a generally acceptable remediation of the soils underlying the storage tanks and pump island areas, as compared to the NYSDEC "STARS" TCLP acceptable guidance values. This will be reported to the NYSDEC in a separate tank closure report and will be accompanied by analytical data.

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1.0 *INTRODUCTION (Continued)*

It has been estimated that a total of approximately 3,000 cubic yards or 4,000 tons of petroleum contaminated soils will be excavated from the ground as a result of the removal of these seven storage tanks. The excavated contaminated material, from the bottom and sides of the tank farm area, and pump island, have been temporarily staged on and covered with plastic in the southeast corner of the lot. Some soil, approximately 400 tons, has been removed from the site to allow for additional work area. These soils were hauled to the Solid Waste Management Facility in Rodman New York. Once approval has been granted by the New York State Department of Environmental Conservation (NYSDEC), Parish Energy will arrange to transport the impacted soils to their Route 342 facility where the enclosed plan will be initiated. Town of Pamelia has already granted approval to transport these soils, see Appendix "E". All soils will be transported to this Route 342 site by an approved Part 364 licensed hauler.

It is imperative to the completion of this storage tank removal project that the 3000 cubic yards of contaminated soils be properly dealt with. At this stage in the project, two options for the proper handling of the staged contaminated soils have been considered. These options include either hauling the material to a landfill or performing ex-situ bioremediation. The fundamental deciding factors between these two options include effectiveness, monetary considerations, time constraints, and long term environmental well being.

The property owner especially feels that, for this project, ex-situ bioremediation is by far the better route to cleanup the ex-situ soils. Both landfilling and bioremediation are proven methods of effectively cleaning up a property, however the long term liability and monetary costs weigh heavy and in this case funding limitations certainly enhance these monetary considerations. The table below illustrates the comparative costs associated with each of the two options.

BIOREMEDIATION VS. LANDFILL	
Costs = $15/Ton	Landfill Costs = $55/Ton
* Total Costs = $60,000	Total Costs = $220,000
Bioremediation Yields Total Net Savings = **$160,000**	

* Costs are estimates only and depend upon length of project, total tons of soil, and contractor fees

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1.0 *INTRODUCTION (Continued)*

Please note that this cost estimate has been calculated figuring 4,000 tons of material which needs to be either bioremediated or landfilled. The landfill option cost includes transportation and tipping-in fees at the Solid Waste Management Facility in Rodman, New York. The bioremediation cost estimate includes all work associated with the successful in-place remediation of the staged stockpile of contaminated material which is currently located at the Arsenal Street site and if approved will be transported to the Route 342 site.

For this specific project, time considerations are not imperative and do not pull the weight of a deciding factor. From start to finish, the proposed bioremediation plan will take approximately six to eight months. The designers of the biological cell, BioSolutions, Inc., guarantee successful completion within two years, with the average project duration of three to four months. The expanded time estimate for this project is due to the anticipated winter deep freeze cycle which will occur from approximately January until March. On the other hand, landfilling the contaminated material provides, in not more than one month, a quick alternative to the Arsenal Street remediation project completion.

Overall environmental well being should somewhat figure into the decision making selection process. From the preservation/environmental standpoint, bioremediation is by far the favorable selection. Landfills provide an indispensable service for some complex remediation projects which involve constraints which inhibit the bioremediation option, so in this sense, landfilling has become a necessary evil in todays society. However for this particular project, bioremediation provides a means of naturally remediating the soil. Bioremediation provides a safe natural solution which does not leave behind any harmful residues or byproducts, thus eliminating the potential for future impact.

For the reasons described above, the owner of the property, Parish Energy, has decided to, with approval from NYSDEC Region #6 Watertown office, move forward with the ex-situ bioremediation of the contaminated material.

2.0 *SCOPE OF SERVICES*

Certified Environmental Services, Inc. (CES), an environmental laboratory and consulting company was retained by Parish Energy to assist with the supervision of the remediation project, including: coordination of the earthwork contractor as well as the supplier of the biological microbes which are the basis of the project design. Also, CES maintained the responsibility to complete future sampling, analyses and reporting portion of the project, as well as, act on behalf of Parish Energy as the liaison between Parish Energy, the NYSDEC, and BioSolutions.

After careful consideration, Parish Energy has decided to work with a well respected bioremediation firm; specifically, Osprey Biotechnics, Inc. of Sarasota, Florida. Osprey Biotechnics is locally represented by a microbial company called BioSolutions, Inc. Please find in the appendices a statement of qualifications for BioSolutions, Inc., MSDS sheets for the applicable products, and a nonpathogenic assurance brochure of Osprey Biotechnics products. BioSolutions, Inc. will supply all of the required bioremediation products and treatment steps for the remediation of approximately 3000 cubic yards of petroleum impacted soil.

Dave Rose Construction (DRC), an earthwork contractor, has been retained by Parish Energy to provide all earth moving services. These services include: all site preparation and grading, construction of biological cell (staging area), relocation of contaminated material, screening of soil, periodic tilling of biological cell, as well as final placement of material upon successful completion of bioremediation activities.

3.0 OBJECTIVE

The objective of this project is to successfully deal with the contaminated soils which are currently stockpiled at the Arsenal Street site. More specifically, it is proposed herein that these fuel oil contaminated soils undergo the process of ex-situ bioremediation at the Parish Energy facility on Route 342 in Jefferson County. The proposed ex-situ bioremediation method will be conducted in a land treatment fashion. Land treatment typically involves the spreading of these contaminated soils into a thin layer of approximately thirty inches on an impermeable lined ground containment surface. Microorganisms, commonly called "microbes", will be inoculated into the ex-situ soils and employed to digest and therefore degrade the petroleum hydrocarbon contamination. These microbes are indigenous and continuously undergo the aerobic process of digestion.

3.0 *OBJECTIVE (Continued)*

This digestion process breaks down petroleum hydrocarbons and produces, in safe levels, the byproducts of hydrogen and oxygen. This method of hydrocarbon degradation is a cost effective proven method of cleaning contaminated sites. The rate of Bioremediation of the contaminants will be enhanced through the addition of nutrients, aeration, moisture, pH adjustment, and tilling. The recommended bioremediation product is Munox, manufactured by Osprey Biotechnics. The Munox microorganisms have demonstrated the capability to effectively degrade the specific type of petroleum hydrocarbon contaminants which are know to exist within the contaminated stockpile.

4.0 SITE ACTIVITIES

The Bioremediation technique, remedial design, application procedure, system maintenance and monitoring are described in detail in the following work plan. Please find below an overall project description, including key elements, followed with actual job tasks.

DESCRIPTION OF BIOREMEDIATION TECHNIQUE:

Land treatment bioremediation involves spreading contaminated soil in a thin layer, approximately two and one-half feet, on a impermeable lined ground surface. Bioremediation of contaminants are enhanced by addition of hydrocarbon degrading microorganisms, nutrients, aeration, moisture, pH adjustment, and tilling.

4.0 SITE ACTIVITIES (Continued)

Remedial design includes:

(1) Site selection for cell construction

(2) Site grading to produce at least a 2% slope, if a natural slope does not exist

(3) Excavating a sump pit at the low end of the cell footprint to facilitate the appropriate collection of leachate to allow for appropriate disposal if necessary

(4) Construction of berms approximately 2' in height, with sand or haybales, on the outside edges of the cell to prevent migration of soil and water from the cell outside or on to the treatment cell

(5) Removing sticks, rocks, etc. that may puncture liner by screening

(6) Lining cell and berms with a 60 ml HDPE liner to mitigate soil and leachate from impacting native soil and groundwater. The liner will be anchored on the outside periphery of the cell with soil and or hay bails

(7) Spreading clean sand on to liner in a 6" layer to protect from tears when tilling

(8) Covering the sand buffer layer with hay or straw

(9) Spreading hydrocarbon-laden soil over sand at a depth of approximately 30"

(10) Augmenting soil with Munox, a microbial inoculum provided by BioSolutions

(11) Amending soil with Munoxate a Nutrient Supplement provided by BioSolutions

(12) Tilling the soil to distribute microorganisms and nutrients, and to increase aeration

4.0 *SITE ACTIVITIES (Continued)*

(13) Collecting initial samples for performance and maintenance monitoring parameters

(14) Covering the cell with a layer of 6-mil reinforced polyethylene and securing with sand or hay. This will lessen excessive moisture in the cell and minimize leachate management problems

TASK 1 - CELL CONSTRUCTION/SYSTEM START-UP

A bio-cell will be constructed to remediate the impacted soil (see Appendix A). The area, approximately 60 yards x 60 yards suitable for the bio-cell is located as shown on the site sketch. This area will be surveyed to determine surface elevation and slope direction. If a natural slope does not exist, the site will be graded with a slope of at least 2%. After grading, a sump pit will be excavated and lined at the low end to facilitate the collection of leachate. Sticks, rocks, and other objects that may puncture liner will be removed from the surface of the cell footprint.

With hay and/or "clean" soil, berms will then be constructed approximately 2' in height on the perimeter of the cell to prevent migration of soil and water outside or on to the treatment cell. In accordance with NYSDEC specifications, a 60 ml HDPE liner will then be placed over the cell and berms to mitigate soil and leachate from impacting native soil and groundwater. The liner will be anchored on the outside periphery of the cell and "clean" sand will be spread onto the liner to a total height of 6" to protect from tears when tilling. A layer of hay or straw will cover the sand to serve as an indicator when clean soil is approached during tilling.

After the cell preparation, the impacted soil, approximately 4000 tons, will then be relocated to the treatment site and spread over the sand at height of 30". Once the soils have been placed in the cell, Munox microbial inoculant will be applied by BioSolutions to augment the contaminated soil with hydrocarbon degrading microorganisms. Additionally, Munoxate, a Nutrient Supplement will be applied by BioSolutions as well.

4.0 *SITE ACTIVITIES (Continued)*

After microbial augmentation and nutrient amendment, the soil will be tilled to increase aeration. If the soil matrix appear to be excessive clay, bulking material such as paper pulp, wood chips or manure may be added to facilitate soil oxygen transfer.

After tilling, samples for baseline TPH, total semi-volatile hydrocarbon contaminate concentration and initial nutrient maintenance parameters will be collected. After collection, the cell will be covered with a layer of 6-mil reinforced polyethylene and secured. This will abate excessive moisture in the treatment soil and minimize leachate management problems.

TASK 2 - BIOAUGUMENTATION AND NUTRIENT AMENDMENTS

Application of Nutrients

Munoxate will be applied after augmenting soil with microbes as a separate step. Nutrients will be solubilized in a clean vessel with potable water. Enough water will be used to solubilize nutrients and to ensure adequate coverage. After adding water to the powdered supplement they will be mixed for at least 15 minutes before application.

Application of Microorganisms

Munox will be sprayed directly onto soil with water. Munox will be pumped directly from a container via water hose and sprayed by hand onto the soil.

When spraying, several passes over the soil will be made to ensure adequate product coverage while making sure that the product does not leach out. Soil will be tilled thoroughly to ensure microbes come into contact with the contaminants.

Osprey Biotechnics has agreed to provide field support and will be assisting BioSolutions with the inoculation procedure.

TASK 3 - SYSTEM MAINTENANCE AND MONITORING

Periodic sampling is necessary to monitor the performance of the bioremediation process. The results of soil analyses can provide valuable information about the efficiency of the system and can indicate where and when adjustments are necessary. During operation of the bioremediation system, analytical laboratory samples will be periodically collected by CES personnel from the cell area and submitted for analysis of Total Petroleum Hydrocarbons, volatile and semi-volatile hydrocarbon content for evaluation of the rate and extent of biodegradation.

A regular schedule of maintenance and monitoring will be established including:

(A) Tilling soil a minimum of once a month unless soil is frozen

(B) Monitoring soil moisture at least once a month and applying water when soil moisture is inadequate, unless soil is frozen

(C) Monitoring soil ph and applying lime when the ph is below optimum; or elemental sulfur if pH is too high, unless soil is frozen

(D) Monitoring nutrients and applying Nutrient Supplement when needed

(E) Analyzing volatile and semi-volatile compounds every 30 to 60 days to monitor treatment, unless soils are frozen.

(F) Analyze soils for nutrients, ammonia, nitrite and nitrates, every 30 days unless frozen

TILLING

The soil to be treated will be tilled a minimum of once a month, unless frozen. Tilling mixes the soil to increase homogeneity, increase aeration, and distribute any nutrient additions. Frequent tilling will provide and maintain oxygen to sustain maximum biological activity. Tilling will likely be completed by use of a four wheel drive farm tractor pulling appropriate tilling equipment that can be controlled to penetrate to a depth no more than 24".

4.0 *SITE ACTIVITIES (Continued)*

SOIL MOISTURE

Soil moisture will be monitored a minimum of once a month unless the soil is frozen. Soil moisture affects microbial locomotion, solute diffusion, substrate supply, and the removal of metabolic by-products. When soil moisture falls below optimum conditions (25%), water will be supplied. Water collected in the leachate sump (if available) will be used for reapplication of moisture by using a submersible sump pump and hose. The treatment cell will be covered minimizing the chances of excessive moisture (85%) that can limit the gaseous supply of oxygen.

pH Monitoring

Soil pH will be monitored once a month unless the soil is frozen. Most studies have demonstrated that pH between 6.0 and 8.0 are optimal for the microbial degradation of petroleum hydrocarbons in soil. If soil pH falls below 6.0, agricultural lime (calcium carbonate) will be introduced to the soil and re-tilled to increase and maintain a neutral pH value. If soil pH is above 8.0, elemental sulfur will be used for adjustment. After addition, the soil must be tilled to ensure that lime becomes thoroughly homogenized wit the soil.

Nutrient Monitoring

Nutrient monitoring will be performed at monthly intervals unless the soil is frozen. When nutrient levels approach minimum levels required to sustain bacterial growth, they will be added to the system. Addition of nutrients and water will be performed as dictated by nutrient monitoring. Nutrients will be added to the soil when the total inorganic content (NH_3-N and NO_3-N) falls below 50 mg/kg. After addition, the soil will be tilled to ensure contact between the nutrients and the contaminants in the soil.

4.0 ***SITE ACTIVITIES*** *(Continued)*

Maintenance Schedule

Event	Schedule
Soil Tilling	Minimum 1/Month and immediately after each nutrient or pH addition
Soil Moisture Monitoring	1/Month
Nutrient Monitoring (Quadrant Composites)	1/Month
pH Monitoring (Quadrant Composites)	
TPH Monitoring (Quadrant Composites)	

Sampling & Analyses

Sampling and analyses of the soils within four quadrant composite samples for only Total Petroleum Hydrocarbons 310.13 (TPH) on a monthly basis will be adopted. Once the 310.13 TPH number reaches a less than 100 ppm concentration, then the particular cell in question will be reevaluated utilizing the two composite (East and West quadrants) approach for TCLP EPA 8021, EPA 8270 and NYSDOH 310.13. Once the East and West quadrant composite soils reach the agreed upon detection limits which considers the soils to be reusable on this site, then that soil will be resampled in accordance with sampling parameters specified in "STARS". If in compliance, these soils will be considered clean.

Should a less than 100 ppm TPH still render other components too high for reuse, then the monthly TPH test will again be employed until the level reaches 50 ppm. Once the 50 ppm TPH is reached the actual components of concern will be analyzed for. At this point the composite will be re-evaluated for acceptability of all related "STARS" components.

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5.0 EXPECTATIONS

It is anticipated, given the appropriate time, that these soils will successfully bioremediate. Once the monthly sampling analysis indicates compliance with thresholds established by NYSDEC "STARS" memorandum, these soils will, with approval of NYSDEC, be spread over this parcel, likely in the area which the bioremediation process actually took place.

A final report will be issued once the entire program is drawn to a close. This report will include the step by step process, a time line graph showing soil bioremediation based on TPH levels, and final analytical results supporting "STARS" compliance.

SUBMITTED BY:

CERTIFIED ENVIRONMENTAL SERVICES, INC.

Patrick A. Leone, Jr.
President

Eric E. Murdock
Project Manager

ACCEPTANCE:

New York State Department of Environmental Conservation:

_____
(Signature)

_____
(Print Name)

_____
(Date)

Parish Energy Fuels:

_____
(Signature)

_____
(Print Name)

_____
(Date)

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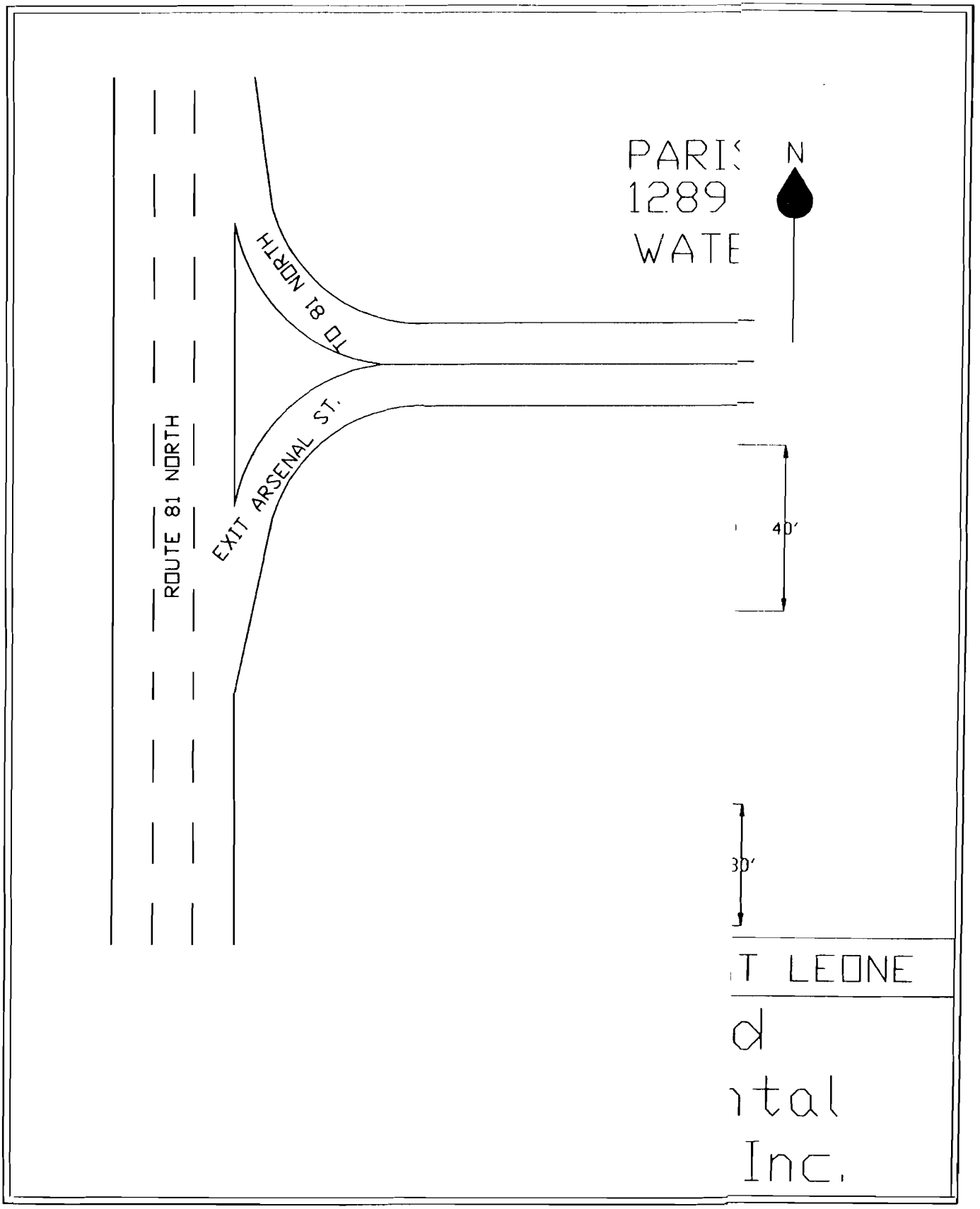
APPENDIX A

SITE SKETCHES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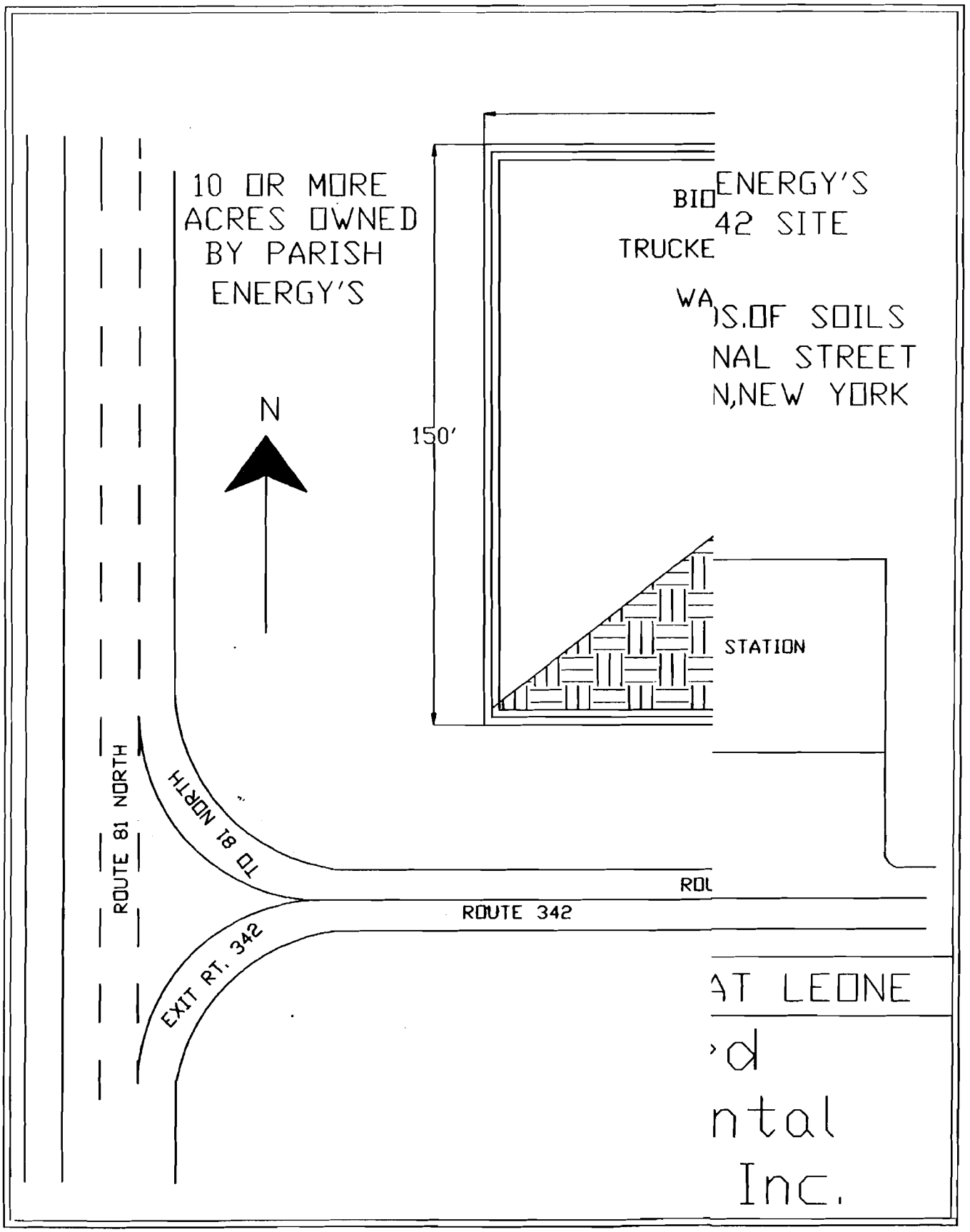
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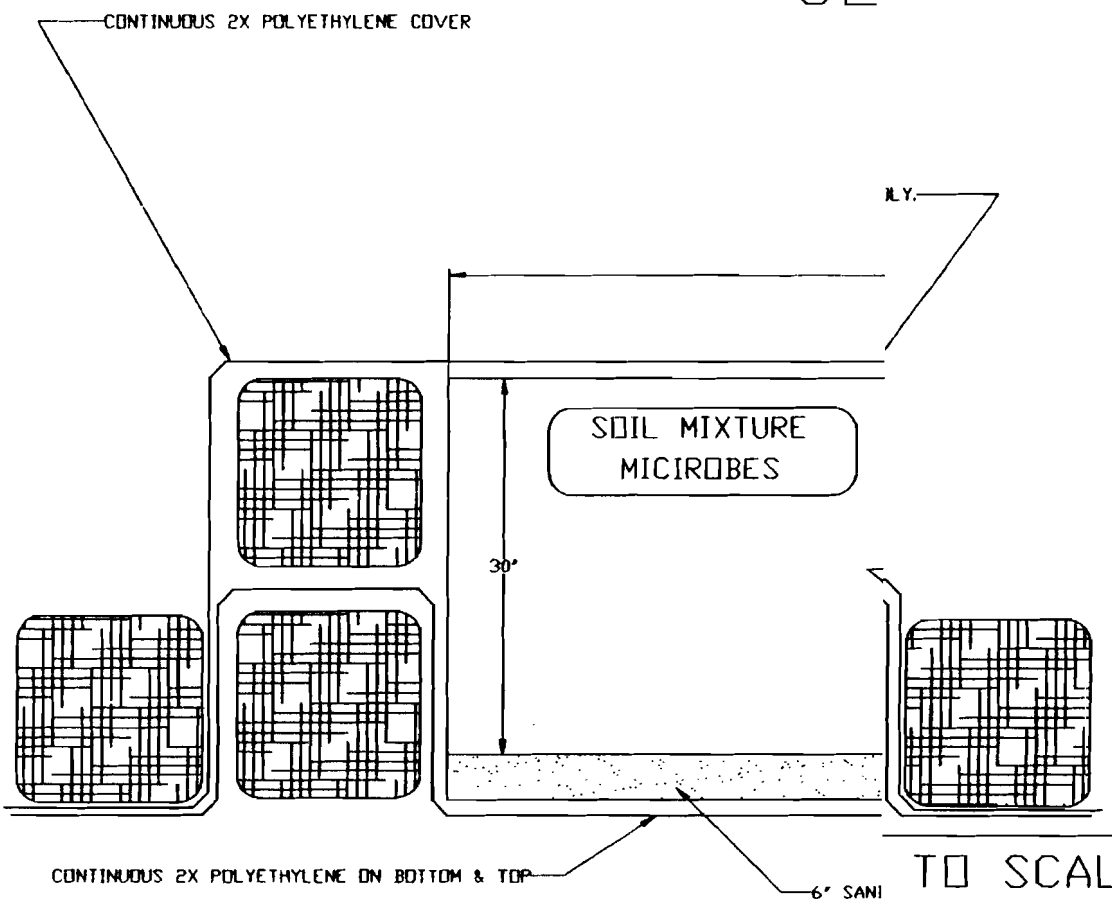

TO SCALE

NOTES:

1)Continuous 2x Poly. BOTTOM,SIDES
2)6" SAND TYP. ON BOTTOM
3)SOIL MIXTURE MICIROBES

PAT LEONE

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APPENDIX B

Material Safety Data Sheets (MSDS)

MATERIAL SAFETY DATA SHEET

Prepared 1/23/92

N.A. = DOES NOT APPLY
N.K. = NOT KNOWN

SECTION I IDENTIFICATION

Manufacturer's Name	Emergency Telephone Number
OSPREY BIOTECHNICS, INC	813/755-7770

Address (Number, Street, City, State, and Zip Code)
2530B Trailmate Drive, Sarasota, FL 34243

Chemical Name and Synonyms
BACTERIAL INOCULANT FOR WASTEWATER

Trade Name and Synonyms
MUNOX®

Chemical Family	N.A.	CAS NUMBER:	N.A.
Formula	N.A.		

SECTION II - HAZARDOUS INGREDIENTS

MATERIAL OR COMPONENT	CAS NUMBER	%
PROPRIETARY BLEND OF INORGANIC SALTS		MORE THAN ONE %

SECTION III - PHYSICAL DATA

Boiling Point (°F)	N.A.
Specific Gravity 2.26	2.26
Vapor Pressure (mm Hg.)	
Percent Volatile by Volume (%)	N.A.
Vapor Density (AIR=1) 2.9	2.9
Evaporation Rate	N.K.
Solubility in-Water	SOLUBLE

Appearance and Odor
White to off white powder.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)		N.A.		
Flammable limits	Lev	N.A.	Uel	N.A.
Extinguishing Media		WATER, FOG, FOAM		
Special Fire Fighting Procedures		None		

Unusual Fire and Explosion Hazards:
Stable below 1000°F. Use NIOSH/MSHA approved pressure self-contained breathing apparatus when material is involved in fire.

SECTION V - HEALTH HAZARD DATA

TOXICOLOGY

Acute Studies:

- Rat oral LD_{50} is greater than 5 g/kg of body weight; as evidenced by no observed mortality after rats were dosed with 5 g/kg at a concentration of 500 mg MUNOX/ml of water and a dose volume of 10 ml/kg of body weight.

- Rabbit dermal LD_{50} is greater than 2 g/kg of body weight; as evidenced by no observed mortality after rabbits were exposed to the test material applied to abraded and non-abraded occluded skin for 24 hours. No severe dermal effects were reported at the dose site.

- Eye irritation in rabbits was reported as slight. Highest observed scores out of a possible score of 110 were:

  1 hour-12; 24 hours-0; 48 hours-4; 72 hours-4; 4 days-2; 7 days-2; 10 days-2; 14 days-2.

- Rat inhalation of the test material at an average analytical exposure concentration of 1.2 mg/l of MUNOX (nominal concentration of 37 mg/l) for 6 hours produced no mortality. Approximately 40 percent of the dust was less than 10 microns in size.

Chronic Health Hazards:

Although chronic studies using MUNOX are not available, inhalation of this product should be prevented, due to its respirable nature and unknown long term effects.

SPECIAL NOTES:

Not for human or animal consumption.

EMERGENCY FIRST AID PROCEDURES

EYES: Flush eyes with sterile water until irritation subsides or stops.

SKIN: Wash with soap and water.

INHALATION: Although not an acute hazard as tested in rats, product is respirable and chronic effects are unknown. Upon prolonged or repeated respiratory contact, see a physician.

INGESTION: Low order of toxicity. Upon ingestion, induce vomiting and contact a physician.

SECTION VI - REACTIVITY DATA

Stability Unstable_____
Stable X

Incompatibility (Materials to Avoid) N.K.

Hazardous Decomposition Products: This product does not undergo spontaneous decomposition. Typical combustion products are carbon, carbon dioxide, nitrogen and water.

Hazardous Polymerization May occur_____
Will not occur X

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled.
No hazard. Wash away with water.

Waste Disposal Method.
Use normal solid waste methods in conformance with pertinent federal, state and local regulations.

SECTION VIII - SPECIAL PROTECTION FORMATION

Respiratory Protection (Specify Type) Paper or Cloth mask

Ventilation: Material should be handled in a manner that will minimize dusting.

Protective Gloves N.A.
Eye Protection Goggles
Other Protective Equipment N.A.

SECTION IX - SPECIAL PRECAUTIONS

This product is not intended for human or animal consumption.

FOR ADDITIONAL INFORMATION

Contact: Peter A Vandenbergh, Ph.D., Vice President Science
OSPREY BIOTECHNICS,INC.
During Business Hours, Eastern Time Zone 813/755-7770

-NOTICE-

The information given and the recommendations made herein apply to our porduct(s) alone and not in combination with any other product(s). Such information and recommendations are based on our research and on data from other reliable sources and are believed to be accurate but no guaranty of their accuracy is made. In every case we urge and recommend that purchasers before using any product make their own tests to verify this data under their own operating conditions and to determine to their own satisfaction whether the product is suitable for their particular purposes. THE PRODUCT(S) DISCUSSED HEREIN ARE SOLD WITHOUT ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.

-END-

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OSPREY Biotechnics
6650 Trailmate Drive | Post Office Box 758
Sarasota, Fl 34243 | Oneco, Fl 34264
Phone (813) 755-7770 Fax (813) 755-0626

MATERIAL SAFETY DATA SHEET

EMERGENCY PHONE 1-800-552-7795

Date: May 18, 1991

I. IDENTIFICATION

PRODUCT NAME: Munoxate
CHEMICAL NAME: Proprietary blend
CHEMICAL FAMILY: Inorganic salts, yeast fermentation products, and pteroylglutamic acid
FORMULA: Active 85%, Inert 15%

II. NORMAL HANDLING PROCEDURES

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Avoid contact with eyes, skin or clothing. Do not take internally. Upon contact with skin or eyes, wash off with water. Avoid breathing dust. Protect against physical damage. Store in a cool, dry place. Separate from combustibles, organics or other readily oxidizable materials. Avoid storage on wood floors. Immediately remove and dispose of any spilled material. Wear NIOSH/MSHA approved dust respirator if excessive dusting occurs.

PROTECTIVE EQUIPMENT:

EYES: Goggles

GLOVES: Impervious

OTHER: Coverall and impervious boots

VENTILATION REQUIREMENTS:

Local mechanical exhaust ventilation recommended.

III. HAZARDOUS INGREDIENTS

BASIC MATERIAL: Contains no hazardous substances (as listed in 40 CFR 302)
Major Active Ingredient - nitrate containing salts

OSHA PEL: None established

LC50: No data

SIGNIFICANT EFFECTS: Dizziness, abdominal cramps, vomiting. May cause eye, skin and mucous membrane irritation.

IV. PHYSICAL DATA

FLASH POINT: No data

MELTING POINT: 306° C

OSHA CLASSIFICATION: Oxidizer

SPECIFIC GRAVITY: 2.26

VAPOR DENSITY: 2.9

SOLUBILITY: Soluble in water

V. FIRE AND EXPLOSION HAZARD DATA

FLAMMABLE EXPLOSIVE LIMIT: No data

EXTINGUISHING MEDIA: Flood with water in early stages. Nitrates may fuse or melt in large fires and water may result in scattering of molten material. Avoid water on molten salt.

SPECIAL FIRE HAZXARD AND FIRE FIGHTING PROCEDURES: Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus when any materall is involved in fire.

VI. HEALTH HAZARD DATA

THRECHOLD LIMIT VALUE: Not established.

SYMPTOMS OF OVER EXPOSURE: Dizziness, abdominal cramps, vomiting, headache, mental imparlment, cyanosis. May cause eye, skin and mucous membrane irritation.

EMERGENCY FIRST-AID PROECURES:

SKIN: Flush with water. If an irritation devleops, call a physician

EYES: Flush with water for 15 minutes, call a physician.

INGESTION: Drink water. Induce vomiting by sticking finger down throat. Call a physician.

INHALATION: Move to fresh air and call a physician

VII. REACTIVITY DATA

STABILITY: Stable below 1000° F

CONDITIONS TO AVOID: Temperatures above 1000° F

INCOMPATIBILITIES: Organic materials, cyanides, reducing materials

HAZARDOUS DECOMPOSITON PRODUCTS: Oxides of nitrogen

VIII. SPILL OR LEAK PROCEDURES (CONTROL PROCEDURES)

ACTION FOR MATERAL RELEASE OR SPILL: Remove all sources of ignition. Wear NIOS/MSHA approved dust respirator. Follow OSHA regulations for respirator use (see 29 CFR 1910.134). Wear goggles, coveralls, impervious gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return material to original container. Place in a fresh container and isolate outside or in a well-ventilated area. Do not seal the container. Wash all contaiminated clothing before reuse. In the event of a large spill, call the emergency telephone number shown on the from of this sheet.

WASTE DISPOSAL METHOD: Dispose of contaminated product, empty containers and materials used for cleaning up spills or leaks in a manner approved for this material. Consult appropriate Federal, State and local regulatory agencies to ascertain proper disposal procedures.

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APPENDIX C

Nonpathogenic Assurance Brochure

United States Department of Agriculture

Food Safety and Inspection Service

Regulatory Programs
Building 306, BARC-East
Beltsville, MD 20705

September 27, 1991

Dr. John E. Hill
Osprey Biotechnics
Post Office Box 758
Oneco, FL 34264

Dear Dr. Hill:

This is in reply to your request for compound authorization received on September 13, 1991 for your product Munox.

This product is acceptable for use in sewage and/or drain lines of official establishments operating under the Federal meat, poultry, shell egg grading, and egg products inspection programs. This laboratory must be provided with records of salmonellae analysis for each new lot of this enzymatic cleaner prepared for use in such establishments. Analysis must be conducted by a qualified microbiological laboratory.

If the above condition is not fulfilled, or, if future analysis shows the presence of salmonellae and/or other pathogenic microorganisms, authorization will be cancelled.

Acceptance of compounds by this Department is in no way to be construed as an endorsement of the compounds or of any claims made for them.

If any change is made in the labeling information or formulation, the authorization for use in official plants becomes void immediately.

Sincerely,

John M. Damare, Chief
Product Safety Branch
Food Ingredient Assessment Division

CES

APPENDIX D

BioSolutions, Inc. Corporate Qualifications Package

BIOSOLUTIONS

Biological Remediation of Hydrocarbons

BIOSOLUTIONS SPECIALIZES IN:

THE USE OF BIOLOGICAL MICROBES FOR COMMERCIAL AND INDUSTRIAL APPLICATIONS. WE STAND BEHIND ALL PRODUCTS AND SERVICES WE PROVIDE. OUR HANDS-ON APPROACH MAKES EVERY JOB A SUCCESS.

BIOLOGICAL REMEDIATION OF HYDROCARBONS:

A PROVEN COST EFFECTIVE SOLUTION TO CLEANING CONTAMINATED SITES. STATIC AND ACTIVE METHODS. STANDARD APPLICATION TECHNIQUES SUCH AS: TILLING/DISKING, STATIC PILE, MULCHING, BELTSVILLE AND IN-SITU SYSTEMS. ON AND OFF SITE CAPABILITIES AS WELL AS TURNKEY SOLUTIONS.

BIOLOGICAL SUPPLIES AND CLEANING SERVICES

APPROVED NEW NON EMULSIFING PRODUCTS THAT COMPLETELY CLEAN HYDROCARBONS OFF ANY SURFACE. THE PRODUCTS FLOAT ON WATER AND LEAVE NON SKID COATING. MORE EFFECTIVE AND EASIER THAN CONVENTIONAL PRODUCTS. WE OFFER COMPLETE CLEANING SERVICES.

BIOLOGICAL GREASE REMOVAL SERVICE:

NATURAL BIOLOGICAL DIGESTION OF GREASE FROM TRAPS AND PIPES. A SIMPLE, SAFE, DEPENDABLE METHOD THAT ELIMINATES CLOGGED DRAINS. EXPENSIVE PLUMBING CAN ELIMINATE HAULING. FULL SERVICE CAPABILITIES THAT CUTS OPERATING COST, ENDS DOWNTIME AND KEEPS YOU IN CONTROL.

2604 Elmwood Ave. Rochester, NY 14618

(716) 234-9899

Company Profile

BioSolutions is a biological remediation service company that was incorporated in 1994

By definition , bioremediation is the correction or cure of an adverse condition through the use of living organisms . BioSolutions markets our services to commercial and industrial accounts in the Northeast .

BioSolutions only undertakes activities involved with microbes .

BioSolutions wants to be your microbial expert .

Environmental Products and Services

Things are changing in our world at a never before seen pace . The technology advances of the 1990 's will change the way we live . One of the rapidly expanding technologies is the field of Biotechnology . The genetic engineering of microbes with respect to the human body has changed the way we treat disease . Naturally occurring microbes in the environment are the next frontier of microbial technology . The environment has been neglected for hundreds of years . The use of living organisms to completely eliminate waste makes to much sense not to be utilized . BioSolutions has the technical expertise and experience to help you take advantage of the latest bioremediation technology .

MUNOX

ENVIRONMENTAL BACTERIA INOCULANT SYSTEM FOR COMMERCE & INDUSTRY

Natural Biological Digestion

Proven Safe & Effective

Ready to Use

OSPREY Biotechnics

MUNOX®

MUNOX: A Safe, Sensible Way to Eliminate Stubborn Industrial & Commercial Wastes

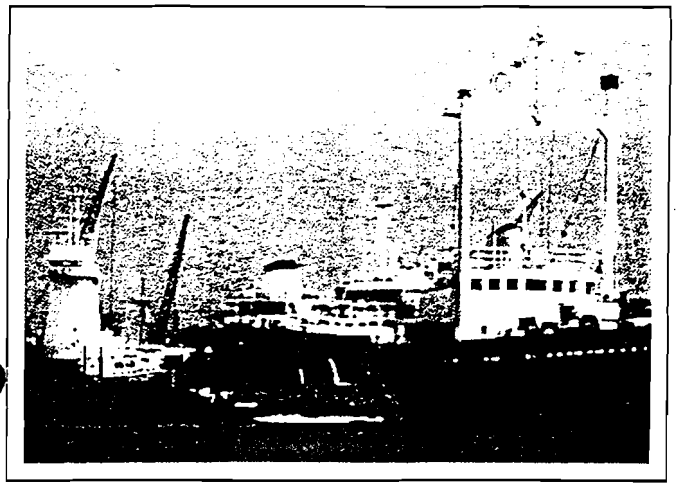
Environmental pressure on industry to provide safe solutions to the problem of elimination of wastewater pollutants is enormous. Concern by both the public and private sectors demands that business and industry find a way to use our nation's natural resources and yet return them quickly to the environment, free of chemical contaminants. As we approach the 21st century, we no longer have the luxury of allowing nature to maintain its own order and pace in wastewater degradation. As business and industry use more chemicals, oils and solvents, we must speed up the natural process of degradation and quickly and safely return our natural resources to the environment.

Coupled with these environmental issues, is the need for business and industry to reduce operation expenses, improve efficiency and increase profit margins. If a business is to survive, it must balance the concerns of the environment with the need to operate a profitable business. The use of the Munox system for wastewater treatment can accomplish both; Munox can positively impact the speed and efficiency of the degradation process and can do so at a reasonable cost.

MUNOX: An All Natural Product

Munox is a specific strain of bacteria which has been designed to degrade a wide variety of problem organics from industrial sources. Our advanced production technology of selective mating and blending of safe bacteria in our laboratory by skilled microbiologists results in a superior natural product. Munox is comprised of patented bacteria that are naturally occurring and contain no pathogens. Since all of the bacteria were isolated from natural sources, there is no artificial mutation or genetic engineering involved.

Munox is prepared, "freeze-dried" and stored frozen before shipment. This unique manufacturing process holds the culture in suspended animation and assures that Munox is at 100% strength levels at time of application.



MUNOX: Applications

Since 1982, Munox has been used successfully to degrade problem waste materials generated during industrial production. The Munox inoculant contains billions of live bacteria specifically selected to degrade a wide variety of problem organics. Munox products are differentiated by product number (i.e. Munox 112 and Munox 212) indicating a particular mix of bacteria intended to treat certain specific wastes. Munox has a proven record of success in a wide range of applications:

INDUSTRIAL WASTE:

- Carpet and Textile Manufacturing
- Pulp and Paper Mills
- Citrus Processing
- Chemical Manufacturers
- Manufacturing Plants
- Transportation Facilities

RESTAURANTS AND INSTITUTIONS

- Commercial Kitchens
- Fast Food Restaurants
- Food Processing Plants
- Drainfields

BIOREMEDIATION

- Crude Oil Spills
- Chemical and Solvent Leaks
- Fuel Oil Leaks
- Creosote Contamination

OSPREY BIOTECHNICS: Leaders in Industrial Biotechnology.

Munox is a product manufactured and distributed by Osprey Biotechnics, a company owned and operated by experts in the field of industrial microbiology. Key members of our management team have the technical expertise that comes with years of working at the leading edge of development and production of microbial products.

MUNOX and OSPREY BIOTECHNICS Offers These Benefits:

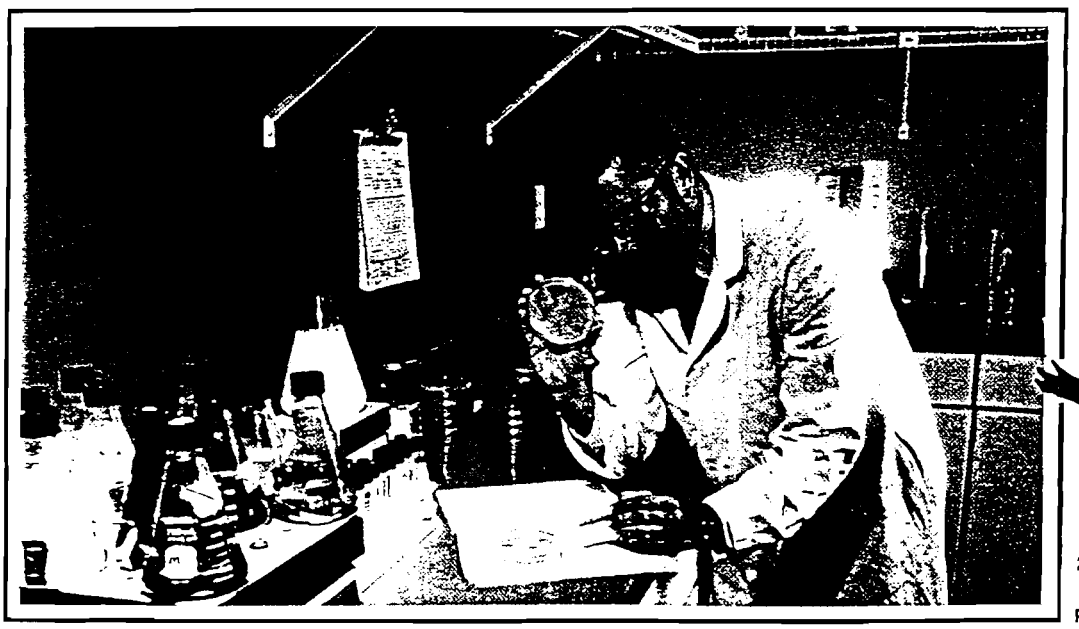
1. **A Quality Product**
   Selective mating and blending result in a consistently superior product.

2. **100% Effective**
   Freezed dried and held in a state of suspended animation until application, means **Munox** is at 100% strength when used.

3. **Safety Assured**
   Our bacteria are patented and contain no pathogens.

4. **Ready to Use**
   Requires no pre-mixing or soaking. Packaged in light-weight, moisture-proof containers. No messy, difficult to store. bottles, drums or cans.

5. **Technical Expertise**
   Degreed microbiologists that are experienced in both the laboratory and the field, trained and ready to work with you to solve the toughest environmental problem.



OSPREY Biotechnics

2530 B Trailmate Drive | Post Office Box 758
Sarasota, FL 34243 | Oneco, FL 34264
Phone (813) 755-7770 Fax (813) 755-0626

CES

APPENDIX E

Town of Pamelia Approval To Transport Soils

CES Certified Environmental Services, Inc.

1401 Erie Blvd. East
Syracuse, NY 13210
Phone 315-478-2374
Fax 315-478-2107

October 21, 1994

Mr. Larry Longway, Supervisor
Town of Pamelia
RD #4 Box 26
Pamelia, NY 13601

Re: Parish Energy relocation and bioremediation of petroleum contaminated soil, Town of Pamelia, Jefferson County, NY

File: 1601181

Dear Mr. Longway:

On behalf of Parish Energy Fuels, Inc. (Parish Energy), Certified Environmental Services, Inc. (CES) would like to inform you that Parish Energy intends to transport approximately three-thousand (3,000) cubic yards of virgin petroleum contaminated soils from their Arsenal Street location in Watertown to their Route 342 facility. These petroleum contaminated soils resulted from recent excavation activities associated with the removal of Petroleum Bulk Storage (PBS) tanks from Parish Energy's property located at 1289 Arsenal Street in Watertown, New York.

As previously discussed with you and Mr. David Chapman, these soils are being relocated because Parish Energy feels their ten (10) acre facility located on Route 342 is a better location for the tentatively planned bioremediation of these contaminated soils. Prior to initiating actual bioremediation efforts, Parish Energy will submit a formal plan to the New York State Department of Environmental Conservation (NYSDEC) for approval. Once approved, a copy of this plan will be made available for the Town's files.

CES

Mr. Larry Longway
Re: Parish Energy Fuels, Inc.

October 21, 1994

Should you have any questions regarding this matter, or if we can be of assistance in any other way, please do not hesitate to contact Mr. David Chapman at (315) 625-7211 or me at (315) 478-2374.

Sincerely,

CERTIFIED ENVIRONMENTAL SERVICES, INC.

Patrick A. Leone, Jr.
President

ACCEPTANCE:

Town of Pamelia:

Larry Longway
(Signature)

Larry Longway
(Print Name)

10-21-94
(Date)

Parish Energy Fuels:

David A Chapman
(Signature)

David A. Chapman
(Print Name)

10/21/94
(Date)

CES

APPENDIX F

BioSolutions Scope of Services to Parish Energy

BIOSOLUTIONS
Biological Remediation of Hydrocarbons

October 18 , 1994

Parish Energy Fuels
42 North R.R Street
Parih NY , 13131

SUBJECT: Preliminary Work Plan for Landfarm Bioremediation of Arsenal Rd. Hydrocarbon contamination .

Dear Sir:

BioSolutions Inc. is pleased to provide you with this preliminary work plan and proposal to provide Osprey Biotechnics Inc. products and services for biotreatment landfarming of 3000 cubic yards of hydrocarbon-laden soil after screening of rocks and debris . The proposal includes the preliminary work plan and the scope of products and services offered by BioSolutions , including the basis of compensation.

Following are the Basis of Compensation and the Terms of Conditions for our services and products for your project.

Basis of Compensation

BioSolutions Inc. proposes to provide the following products and services for the lump sum of $ per cu.yd.:

Products

Munox Microbial Products
Munoxate Nutrient

2604 Elmwood Ave. Rochester, NY 14618
(716) 234-9899

Services

Work Plan Development , Monitoring
Site Visits, Training, Guidance
Trouble Shooting Consultation
Actual Inoculation and nutrient addition

Terms and Conditions

Osprey Biotechnics bacteria and techniques have proven to be extremely successful for the proposed method of biotreatment given the soil contaminant constituent matrix. If the work plan that was prepared for your site is followed as outlined, the product will work. It is essential that each element and task of the plan to be followed. Lack of plan commitment will impact the effectiveness of our product and thus successful remediation of the impacted soils . If after two years we have not closed the site BioSolutions will provide all material to reinoculate at no charge .

We appreciate the opportunity to serve you on this project. If you are in concurrence with our proposal, please indicate so by your signature below. Upon reviewing your authorization, we would prepare the products for shipment, and schedule to meet with you.

_____

Authority Signature

_____

Date

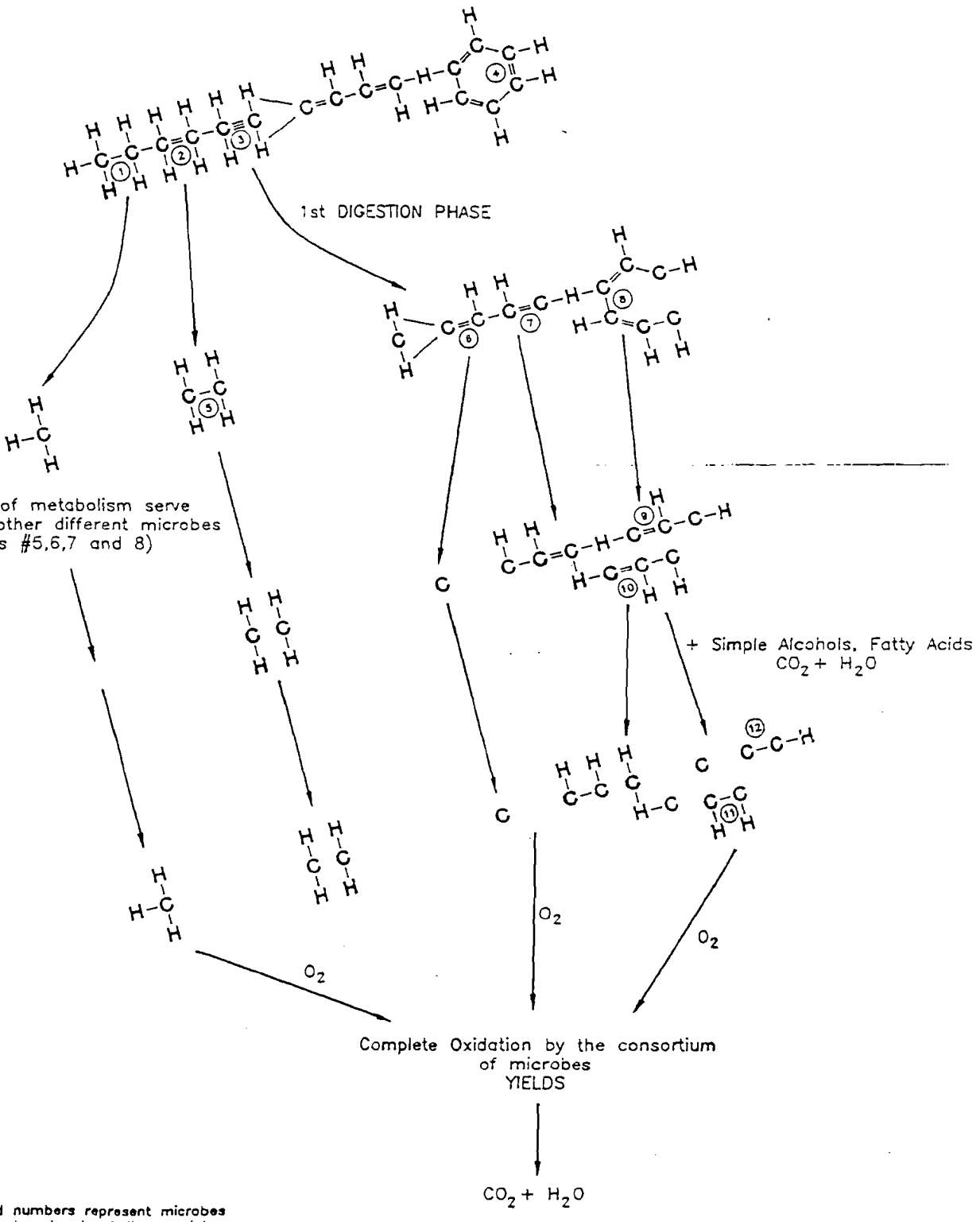
Sincerely

Ty Hookway

President

BIOSOLUTIONS

Biological Remediation of Hydrocarbons



NOTE: The circled numbers represent microbes breaking carbon bonds at these points.

CES

APPENDIX B

Material Safety Data Sheets (MSDS)

MATERIAL SAFETY DATA SHEET

Prepared 1/23/92
Supersedes:

N.A. = DOES NOT APPLY
N.K. = NOT KNOWN

SECTION I IDENTIFICATION

Manufacturer's Name
OSPREY BIOTECHNICS, INC

Emergency Telephone Number
813/755-7770

Address (Number, Street, City, State, and Zip Code)
2530B Trailmate Drive, Sarasota, FL 34243

Chemical Name and Synonyms
BACTERIAL INOCULANT FOR WASTEWATER

Trade Name and Synonyms
MUNOX®

Chemical Family N.A. CAS NUMBER: N.A.
Formula N.A.

SECTION II - HAZARDOUS INGREDIENTS

MATERIAL OR COMPONENT	CAS NUMBER	%
PROPRIETARY BLEND OF INORGANIC SALTS		MORE THAN ONE %

SECTION III - PHYSICAL DATA

Boiling Point (°F)	N.A.
Specific Gravity 2.26	2.26
Vapor Pressure (mm Hg.)	
Percent Volatile by Volume (%)	N.A.
Vapor Density (AIR=1) 2.9	2.9
Evaporation Rate	N.K.
Solubility in-Water	SOLUBLE

Appearance and Odor
White to off white powder