BEFORE THE POLLUTION CONTROL BOARD
OF THE STATE OF ILLINOIS

PAUL JOHNSON INC.,	)	
	)	
Petitioner,	)	
	)	
v.	)	
	)	**PCB No.** 05-109
ILLINOIS ENVIRONMENTAL	)	
PROTECTION AGENCY and	)	
CITY OF WATERMAN, ILLINOIS,	)	
	)	
Respondent.	)	
	)	

NOTICE OF FILING

To: Tom Difasio
Director of Public Works
Village of Waterman

Lynn Dunaway
Illinois Environmental Protection Agency
Public Water Supplies - Field Operation Headquarters

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Pollution Control Board the **Petition For Community Well Setback Exception** of Paul Johnson Inc., a copy of which is herewith served upon you.

Respectfully submitted,

BAKER & McKENZIE

December 10, 2004

Richard M. Saines
BAKER & McKENZIE
130 East Randolph Drive, Suite 3500
Chicago, Illinois 60601
(312) 861-8000

THIS FILING IS SUBMITTED ON RECYCLED PAPER

CERTIFICATE OF SERVICE

I, Richard M. Saines, certify that I have served the attached **Petition For Community Well Setback Exception**, by first-class mail, upon the following persons:

Tom Difasio
Director of Public Works
Village of Waterman
215 Adams Street
Waterman, IL 60556
(815) 264-3652

Lynn Dunaway
Illinois Environmental Protection Agency
Public Water Supplies - Field Operation Headquarters
1021 North Grand Ave., East
P.O. Box 19276
Springfield, IL 62794-9276
(217) 782-1020

BAKER & McKENZIE

BEFORE THE POLLUTION CONTROL BOARD
OF THE STATE OF ILLINOIS

PAUL JOHNSON INC.,	)	
	)	
Petitioner,	)	
	)	
v.	)	**PCB No.** 05-109
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY and CITY OF WATERMAN, ILLINOIS,	)	
	)	
Respondent.	)	

PETITION FOR COMMUNITY WELL SETBACK EXCEPTION

NOW COMES the Petitioner, Paul Johnson Inc. ("PJI"), by and through its attorneys, Baker & McKenzie, and pursuant to Section 14.2(c) of the Illinois Environmental Protection Act ("Act") and Part 106 of the Board's Procedural Rules (35 Ill. Adm. Code § 106.300, *et seq.*), hereby petitions the Illinois Pollution Control Board ("Board"), to grant PJI an exception from the community water supply well setback requirements in Section 14.2 of the Act. In support of its Petition, PJI states as follows:

I. BACKGROUND

PJI is seeking this waiver from the setback requirements in Section 14.2 of the Act to enable PJI to remediate existing shallow groundwater contamination. The shallow groundwater located within the setback zone of the Waterman, Illinois community water supply well is contaminated with hydrocarbons, most likely residues from former underground storage tanks ("USTs") used to store fuel for vehicles. The preferred clean up method is the use of direct push technology (*i.e.* Geoprobe) to inject microbes, nutrients, and oxygen release compound ("ORC") directly into the plume of impacted groundwater (referred to herein as "in-situ bioremediation"). Upon completion of each injection, the open hole is backfilled with granular bentonite and

hydrated, thereby eliminating the risk of future pathways of contamination into the shallow groundwater zone. The location of the Site is shown on Figure 1 in Attachment A.

Section 14.2 of the Act prohibits the installation of any "new potential route" within 200 feet of an existing municipal water well. 415 ILCS 5/14.2. The use of direct push technology to inject microbes, nutrients, and ORC into the plume of impacted groundwater technically falls within the definition of "new potential route". 415 ILCS 5/3.350. Section 14.2 allows for sources to petition the Illinois Pollution Control Board and the Illinois EPA for an exception from this setback requirement under appropriate circumstances. As discussed in this petition, PJI meets all of the requirements for granting the exception from the set back requirements of Section 14.2 of the Act.

A. The Reasons for and Basis of the Requested Exception

The need for the set back exception arises from broadly worded statutory definitions that technically include the current remediation activities within the definition of "new potential route." Most "injection wells" are considered pathways of contamination, either intentionally as a disposal route, or unintentionally as an easy migration pathway. Both concerns are inapplicable in this case. PJI seeks to use in-situ bioremediation to clean up an existing contaminated groundwater source rather than allow this contaminated groundwater to remain in the shallow aquifer. The use of in-situ bioremediation is the most cost effective and technically feasible alternative in this case. In addition, the shallow contaminated groundwater that is the subject of ongoing remediation efforts is not hydraulically connected to the deep aquifer from which the community water supply well draws its water. Thus, there is no significant risk of cross-contamination of the community water supply by use of in-situ bioremediation. As a

result, pursuant to Section 14.2(c), the Board should grant the requested exception as set forth in detail below.

B. Nature of the PJI's Operations

1. PJI's Former and Current Operations.

PJI formerly operated a truck maintenance and leasing operation in Waterman, Illinois. As part of those operations, PJI owned and operated several USTs used for storing fuel for the trucks. PJI, upon removal of the USTs, discovered that they had leaked. PJI subsequently entered into the Leaking Underground Storage Tank ("LUST") program with Illinois EPA under which it is currently conducting soil and groundwater remediation activities in pursuit of a No Further Remediation ("NFR") letter from Illinois EPA. These clean up efforts have included removal of approximately 4,730 cubic yards of impacted soil, 83 gallons of free phase hydrocarbon, application of 800 pounds of ORC to the base of the excavation and installation of 22 monitoring wells. During the process of the ongoing remediation activities, PJI learned that a portion of the current shallow groundwater contamination is within approximately 150 feet of the existing community water supply well for Waterman, Illinois. PJI's environmental consultants, Clayton Group Services, Inc. ("Clayton"), have recently installed additional borings to determine the extent of the shallow groundwater plume. The plume extends to an area not yet treated with ORC, and located within the setback zone of the Waterman community supply well.

With the exception of the above-mentioned ongoing clean up efforts, PJI no longer conducts any operations. Mr. Paul Johnson, the sole shareholder of PJI, passed away in February of 2002. Since then, PJI has remained in existence and adequately funded for the purpose of completing the necessary clean up of the site and obtaining an NFR from Illinois EPA. Once PJI obtains an NFR, the remaining assets of the corporation will be distributed to the intended beneficiaries of Mr. Johnson's estate.

2. PJI's Control Equipment.

Prior to treating the hydrocarbons, a series of injections are completed around the perimeter of the hydrocarbon plume. The purpose of the perimeter injections is to form a hydraulic barrier that prevents the lateral migration of the contaminant plume during treatment. Furthermore, the upon reaching a depth of approximately 14 feet below ground surface, the ORC, microbes and nutrients are injected in a horizontal pattern to treat the surrounding area and control the depth of the injection. Upon completion of each injection, the open hole is backfilled with granular bentonite and hydrated, thereby eliminating the risk of future pathways of contamination into the shallow groundwater zone.

The shallow groundwater zone is separated from the deeper aquifer from which the community water supply well draws its water by a shale unit at a depth of approximately 40 feet below ground surface. The disconnection between the shallow groundwater zone and the deeper aquifer is evident in the lack of influence continued pumping of the community well has on the shallow groundwater zone (*i.e.* cone of depression). If connected, the shallow groundwater should move towards the well. Instead, the groundwater flow direction is to the northeast and away from the municipal well. Further discussion of the geology below the Site is provided in Section V of this Petition.

II. COMPLIANCE WITH THE SETBACK REQUIREMENTS WOULD IMPOSE AN ARBITRARY AND UNREASONABLE HARDSHIP (35 IAC 106.310(A))

The Board should grant an exception in this case because preventing PJI from utilizing in-situ bioremediation to remediate the contaminated shallow aquifer would delay the cleanup of the shallow aquifer and add significant and unnecessary costs. The other remediation alternatives are discussed in more detail in Section IV of this Petition, but with each of them, their respective negatives outweigh their respective benefits.

There are three primary factors that make adherence to the setback requirements arbitrary and unreasonable in this case. First, the use of in-situ bioremediation within the setback area is intended to improve the water quality. The area is already contaminated with hydrocarbons, and the sooner remedial activities are undertaken, the sooner the shallow groundwater will be cleaned up.

Second, in-situ bioremediation would only be utilized for the shallow groundwater zone, which is not hydraulically connected to the deeper aquifer from which the Waterman community supply well draws its water. Accordingly, the injection wells at issue will not affect the groundwater zone utilized by the community supply well. Evidence that the two water bearing zones are not connected is presented in more detail below, but the fact that the existing hydrocarbon contamination has not reached the deeper aquifer (as demonstrated by the community water testing) supports this important fact. The 2003 Consumer Confidence Report for the Village of Waterman is included in Attachment B.

Third, Mr. Paul Johnson, the sole shareholder of PJI, passed away in February of 2002, and the Estate has continued to maintain PJI for the purpose of funding the ongoing environmental remediation. The longer it takes to complete the remediation and obtain an NFR, the longer PJI's assets remain undistributed to the intended beneficiaries of Mr. Johnson's Estate. PJI has and will continue to maintain adequate resources to fund the completion of remediation and obtain an NFR, but it does not want to prolong or delay this process unnecessarily. Because PJI is in the LUST program and entitled to reimbursement for approved remediation expenses, it is likely that significant funds will be available for distribution to the beneficiaries once the remediation is complete. As such, any delay in obtaining an NFR prevents the beneficiaries from receiving these Estate assets.

Because the most cost efficient and expedient remediation technology is the use of in-situ bioremediation to remediate the shallow aquifer, adherence to the prohibition on locating "injection wells" within a minimum setback of a community supply well would be arbitrary and unreasonable under these circumstances.

III. IN-SITU BIOREMEDIATION IS THE BEST AVAILABLE CONTROL TECHNOLOGY ECONOMICALLY ACHIEVABLE (35 IAC 106.310(B))

PJI is seeking the exception to the setback requirements to enable it to clean up existing contamination located within the setback area of a community supply well. Thus, the regulatory criterion mandating the best available control technology economically achievable to minimize the likelihood of contamination of the potable water supply well should be analyzed more broadly. In essence, the key inquiry in this case involves selecting a remediation technology that will be most effective in cleaning up the existing contamination and not, by itself, increase the risk of exacerbating such contamination. This inquiry must also consider the "economic achievability" of any potential technology. When these factors are considered under the circumstances of this case, in-situ bioremediation is the best available technology economically achievable.

Clayton has evaluated several potential alternatives to in-situ bioremediation. Each one of the potential alternatives is described below. The potential alternatives include: (1) installing a traditional "pump and treat" system; (2) attempting to use Electric Resistive Heating ("ERH"), an emerging technology described in more detail below; or (3) relocating the community supply well to an area free of existing contamination. As shown in this section, each of these alternatives presents technical, practical and financial obstacles that eliminate them as the preferred approach.

A. Pump & Treat

The effective removal and subsequent treatment of groundwater from the contaminated shallow aquifer is limited in this case due to the low permeability of the soils (10^{-5} cm/sec) and the adsorption of the contaminants to the matrix of the aquifer that hinder the ability to meet the Class I Groundwater Remedial Objectives for the contaminants of concern. The in-situ hydraulic conductivity testing of monitoring wells completed in the unconsolidated overburden indicate that the hydraulic conductivity of the unconsolidated overburden ranges from 2.57×10^{-5} cm/sec to 6.29×10^{-5} cm/sec. The average hydraulic conductivity of the unconsolidated overburden is 4.36×10^{-5} cm/sec. Thus, pump and treat technology is not recommended based upon its technical feasibility. Moreover, the estimated cost to design and install the pump & treat system is $100,000 to $150,000, with long-term operation and maintain costs of approximately $400,000 - $500,000 over 20 years.

B. Electrical Resistive Heating (ERH)

ERH is an emerging in-situ remediation technology that uses the heat generated by the resistance off the soil to the flow of electrical current (through electrodes installed into the subsurface) to raise subsurface temperatures and force the contaminant into the vapor phase. A vapor recovery system is then used to remove the vapor from the subsurface. ERH can be used to remediate tight clays (10^{-6} cm/sec or less), used around buried utilities, under buildings. ERH is in use in certain sites with volatile organic compound ("VOC") contamination. To date, it has not been utilized to remediate residual hydrocarbon contamination in a shallow aquifer. The estimated cost to complete the PJI site utilizing ERH is between $600,000 and $700,000 with an estimated completion time of one to two years. Accordingly, given its high cost and the fact that

this would be the first installation of ERH to remediate hydrocarbon contaminated groundwater, ERH is not the preferred alternative.

C. Replacement and Relocation of Municipal Well

The cost to move the municipal well is currently unknown but estimated to be between $750,000 and $1,000,000. Unknown factors that need to be addressed prior to a final estimated price include the number of test borings/pump tests to determine the sustainable yield of the aquifer, distance required to conneet the new well to the existing water supply network, and the need to purchase the parcel on which to locate the well, as well as securing easements or condemning property to locate the pipeline. Furthermore, following replacement of the well, PJI will still be required to either minimize remediation under TACO or complete remediation through in-situ bioremediation, ERH, or another form of alternative technology in order to obtain closure of this incident. This alternative is cost prohibitive and uncertain.

D. In-Situ Bioremediation

In-Situ bioremediation uses direct push technology to deliver the microbes and nutrients directly to the areas of contamination. By delivering the microbes, oxygen and nutrients directly, remediation of the site is not hindered by the low permeability of the aquifer or dependent on the migration of the groundwater to transport the nutrients and oxygen to the contaminants. The estimated cost to complete the remediation of the PJI site utilizing in-situ bioremediation is approximately $210,000 and will take approximately one year to complete.

In-situ bioremediation is the best alternative for remediation of the PJI site. It will work, it is safe, and it is the most cost effective. The treatment will consist of multiple injection points via direct push equipment with an injection point designed to inject in a horizontal pattern outward from the injection point. Each injection point will first undergo a pre-injection pathway

development consisting of a 10 second blast of 175 psi air stream. Following the pre-injection pathway development, approximately 100 gallons of bio-slurry and 10 gallons of liquid hetertrophs (hydrocarbon degrading bacteria) will be injected into the subsurface.

Following the bio-slurry injection, additional injections will be completed to provide both ORC and a mixture of nutrients and dilute hydrogen peroxide to accelerate degradation. The ORC injections are completed in the same manor as the bio-slurry injections.

PJI is proposing the injection of in-situ bioremediation into the saturated zone in the area within the setback zone of the municipal well. The treatment will consist ORC injection points each consisting of approximately 15 pounds of ORC and 50 gallons of water. The bio-slurry injection points will consist of approximately 9.6 gallons of bio-slurry and approximately 100 gallons of water.

To provide hydraulic control of the contaminated shallow groundwater, Clayton will strategically place ORC injection points along the east, west, and south edge of the excavation. Further discussion of the technology and material safety data sheets for the microbes, nutrients and ORC are provided in Attachment C.

IV. THE MAXIMUM FEASIBLE ALTERNATIVE SETBACK WILL BE UTILIZED (35 IAC 106.310(C))

The data collected to date demonstrates that the contaminated shallow groundwater exists in a plume located underneath the PJI site. The closest edge of the plume to the community supply well is approximately 60 feet southeast of the municipal well. Direct push technology allows PJI to maintain hydraulic control of the contaminated shallow groundwater while delivering microbes, nutrients and ORC directly to the contaminated shallow groundwater. Since PJI is able to treat only the impacted shallow groundwater, PJI is making every effort to

minimize the number of injections within the setback of the municipal well. PJI will work closely with Illinois EPA in finalizing the precise locations of each ORC injection well.

V. IN-SITU BIOREMEDIATION INJECTIONS WILL NOT HARM THE COMMUNITY WATER SUPPLY (35 IAC 106.310(D))

The use of in-situ bioremediation in this case is the appropriate remediation technology because it will work without harming the community water supply. The key hydrogeologic features of this site, discussed in detail below, demonstrate that in-situ bioremediation is a safe technology for use in this case in part because the natural features of the site provide a barrier between the shallow and deep groundwater zones. The shallow groundwater zone underlying the PJI site is not hydrogeologically connected to the deeper aquifer from which the community water supply well draws its water. PJI has not observed any influence on the shallow groundwater beneath the Site (*i.e.* cone of depression) by the continued pumping of the municipal well. Instead, the groundwater flow direction is to the northeast and away from the municipal well as shown on Figure 2 in Attachment A.

Soil borings completed at the site by Clayton indicate that the site is underlain by approximately 12 feet of silty clay. The silty clay is underlain by approximately two feet of medium to fine-grained sand (14 to 16 feet bgs). The sand is underlain by approximately 8 to 10 feet of silty clay (16 to 24 feet bgs). Below the silty clay, silty sand was encountered to the termination of the soil boring (24 to 29 feet bgs). Shallow groundwater at the Site was identified within an unconfined silt and silty clay unit at a depth of approximately 10 feet below ground surface.

The well log for community municipal well #2 (located approximately 150 feet northwest of the Site) indicates that the unconsolidated overburden extends to a depth of approximately 40 feet bgs and is underlain by a "shale" unit with a thickness of approximately 17 feet. Beneath

the shale unit is a gravel unit with a thickness of approximately 23 feet underlain by a second shale unit with a thickness of approximately 42 feet. The second shale unit extends to the top of limestone at a depth of approximately 122 feet bgs. According to the well log, Well #2 is cased from the ground surface to bedrock (124 ft bgs) and is completed at a depth of 400 feet bgs. The presence of two shale units between the unconsolidated overburden and bedrock is evidence that the shallow groundwater in the unconsolidated overburden and the bedrock aquifer used by the Village of Waterman are not hydraulically connected. A Geological Cross Section based on the municipal well logs is shown on Figure 3 in Attachment A. The well logs used in the Cross Section are included in Attachment D.

VI. PROOF OF NOTICE TO AFFECTED POTABLE WELL SUPPLY OWNERS

PJI has caused written notice and a copy of this Petition to be sent to the following affected potable well supply owners: Village of Waterman, 215 Adams Street, Waterman, Illinois, C/O Tom Difasio, Director of Public Works. The above notified person was selected based upon a survey conducted by Clayton to identify all potable water supply owners within the setback area of the proposed ORC injection wells pursuant to 35 IAC 106.302(b), 35 IAC 101 and Section 14.2(c) of the Act.

VII. REQUEST FOR EXPEDITED HEARING

The intended beneficiaries of Paul Johnson's Estate will not receive the remaining assets of PJI until it is appropriate to disburse such assets. Obtaining the requested waiver from the setback requirements is a key step in furthering the ongoing remediation process toward completion. The parties request a hearing on this petition as soon as the Board can reasonably schedule it.

WHEREFORE, for the foregoing reasons, PJI respectfully requests the Board to grant an exception from the setback requirements contained in Section 14.2 of the Act.

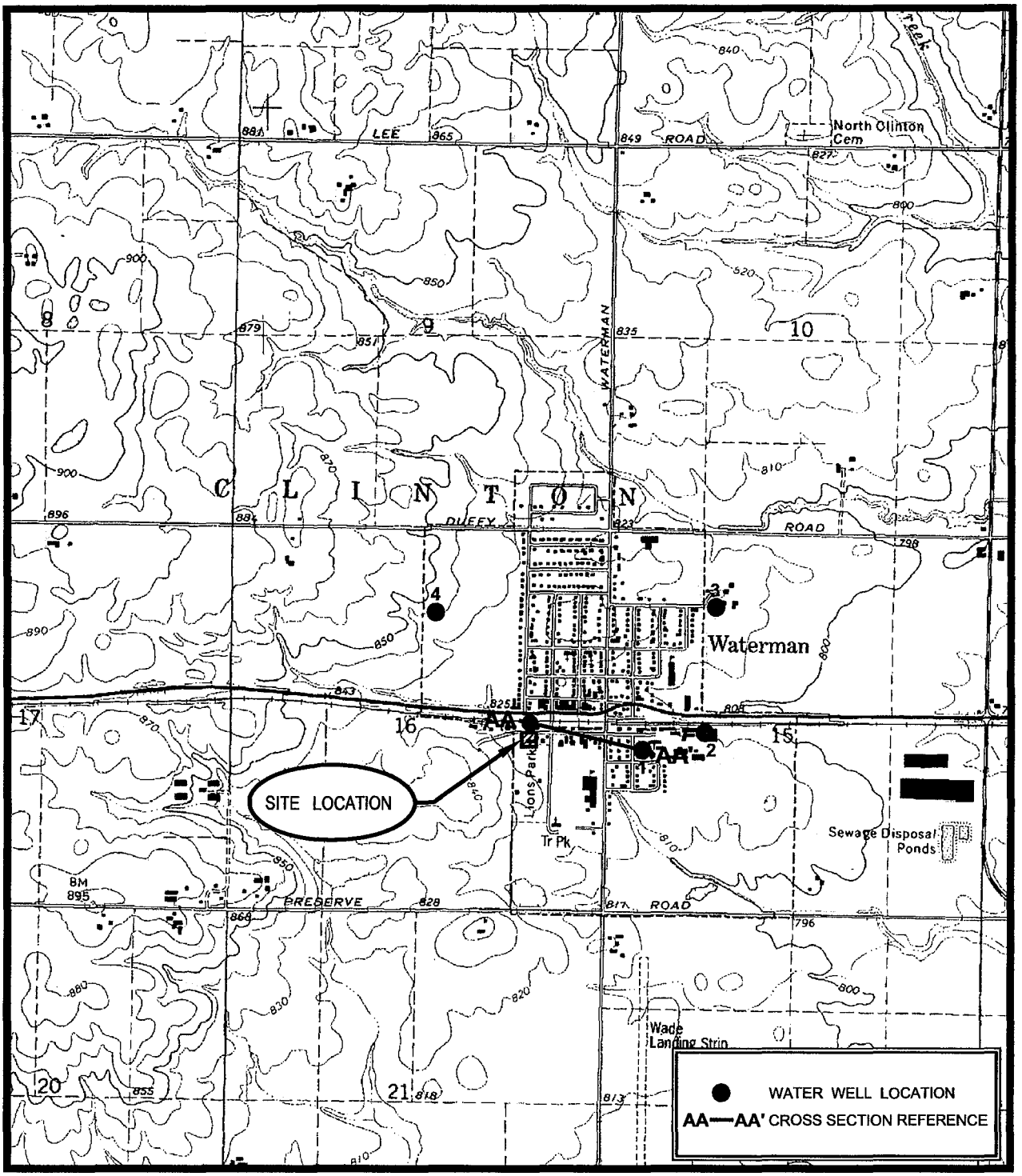
PAUL JOHNSON INC.

By _____
One of Its Attorneys

Richard M. Saines
BAKER & McKENZIE
130 East Randolph Drive
Suite 3500
Chicago, Illinois 60601
(312) 861-8000

CHIDMS1/453326.3

Exhibit A



Scale 1:24000

0 1/2 1 MILE

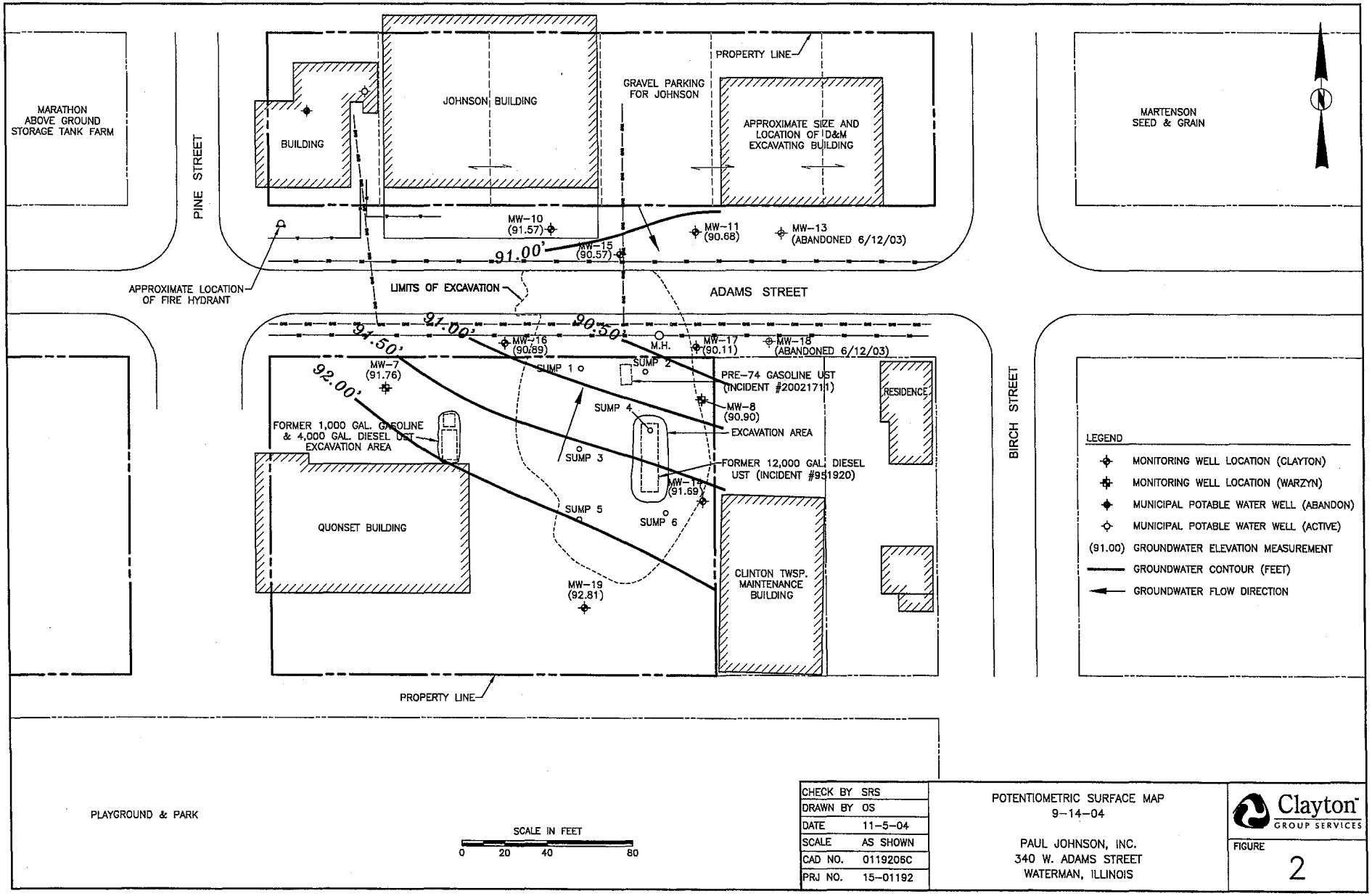
1000 0 1000 2000 3000 FEET

QUADRANGLE LOCATION

FIGURE 1

SITE LOCATION MAP
PAUL JOHNSON, INC.
340 WEST ADAMS
WATERMAN, ILLINOIS

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAPS, WATERMAN, ILLINOIS)



CHECK BY	SRS
DRAWN BY	OS
DATE	11-5-04
SCALE	AS SHOWN
CAD NO.	0119206C
PRJ NO.	15-01192

POTENTIOMETRIC SURFACE MAP
9-14-04

PAUL JOHNSON, INC.
340 W. ADAMS STREET
WATERMAN, ILLINOIS

Clayton GROUP SERVICES

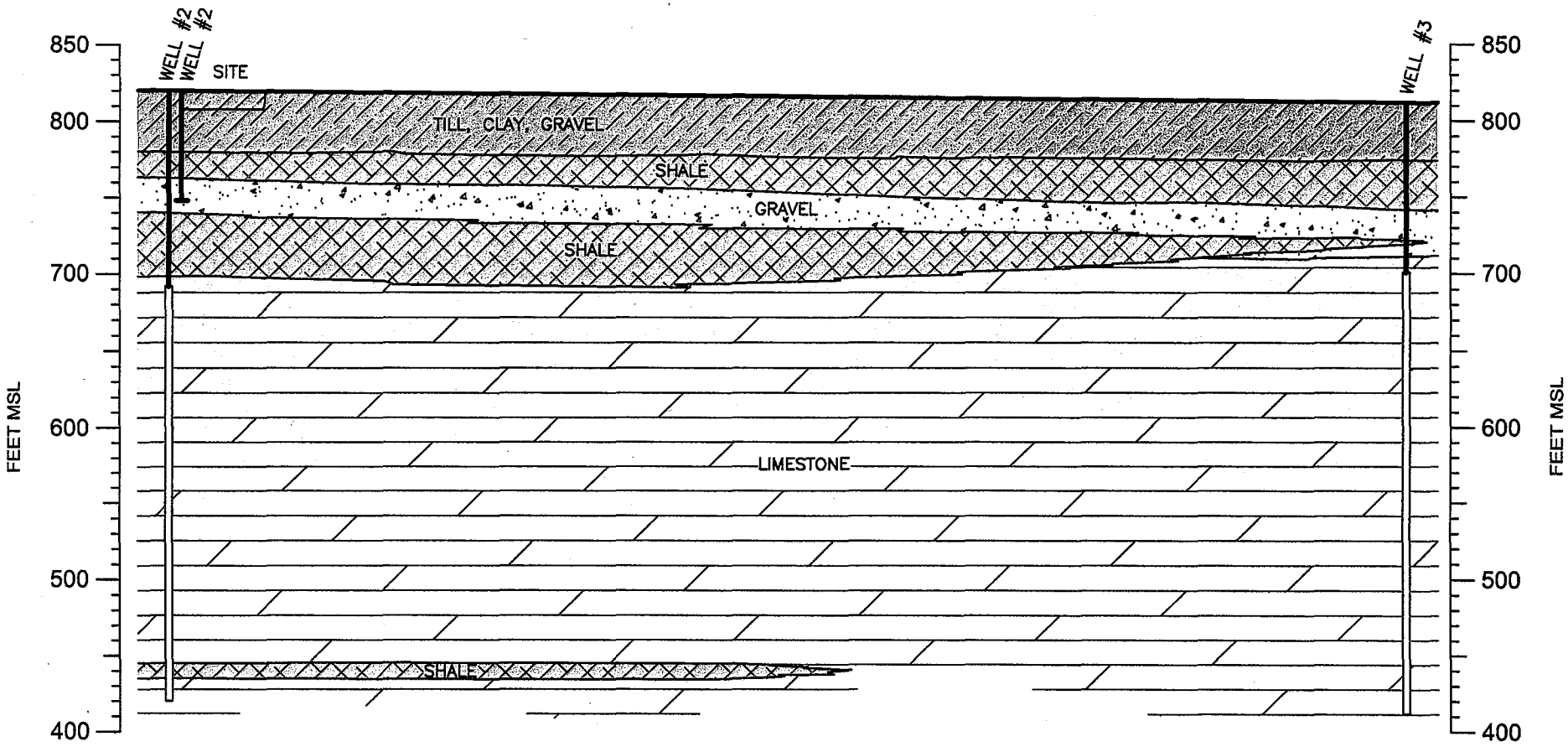
FIGURE
2

NORTH

AA

SOUTH

AA'



NOTES:

1. VERTICAL EXAGGERATION X2
   HORIZONTAL SCALE: 1"=200'
   VERTICAL SCALE: 1"=100'

2. CROSS SECTIONS ARE BASED ON BEST PROFESSIONAL JUDGMENT USING AVAILABLE DATA. THE THICKNESS AND EXTENT OF THE LITHOLOGIC UNITS ARE APPROXIMATED AND GEOLOGIC CONTACTS BETWEEN BORING LOCATIONS ARE INFERRED.

CHK BY	SRS
DWN BY	OS/BCP
DATE	9-16-04
SCALE	AS SHOWN
CAD NO.	0119206B
PRJ NO.	15-01192.06

CROSS SECTION AA – AA'

PAUL JOHNSON, INC.
WATERMAN, ILLINOIS

Clayton GROUP SERVICES

FIGURE
3

Exhibit B

11/4/2004

Annual Drinking Water Quality Report

WATERMAN

IL0370600

Annual Water Quality Report

For the period of January 1 to December 31, 2003.

This report is intended to provide you with important information about your drinking water and the efforts made by the WATERMAN water system to provide safe drinking water. The source of drinking water used by WATERMAN is Ground .
For more information regarding this report, contact:
Name: _____
Phone: _____
Este informe contiene información muy importante sobre el agua que usted bebe. Tradúzcalo ó hable con alguien que lo entienda bien.

Source of Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds,reservoirs, springs, and groundwater wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pickup substances resulting from the presence of animals or from human activity.
Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at (800) 426-4791.

Contaminants that may be present in source water include:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants,septic systems, agricultural livestock operations and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial, or domestic wastewater discharges, oil and gas production,mining, or farming.

Pesticides and herbicides, which may come from a variety of sources such as agriculture,urban storm water runoff, and residential uses.
Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health. Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

Source Water Assessment Availabilty.

When available, a Source Water Assessment summary is included below for your convenience.

To determine Waterman's susceptibility to groundwater contamination, information obtained during a Well Site Survey performed by the Illinois Rural Water Association on June 23, 1998 was reviewed. Based on this information, numerous potential sources of contamination were identified within proximity of this water supply's wells.

The Illinois EPA does not consider the source water susceptible to contamination. This determination is based on a number of criteria including: monitoring conducted at the wells; monitoring conducted at the entry point to the distribution system; and the available hydrogeologic data on the wells.The Illinois Environmental Protection Act provides minimum protection zones of 200 feet for Waterman's community water supply wells. These minimum protection zones are regulated by the Illinois EPA.

To further minimize the risk to the community water supply's groundwater source, the Illinois EPA recommends that three additional activities be assessed. First, the community may wish to enact a "maximum setback zone" ordinance. These ordinances are authorized by the Illinois Environmental Protection Act and allow county and municipal officials the opportunity to provide additional protection up to 1,000 feet from their wells. Second, the water supply staff may wish to revisit their contingency planning documents. Contingency planning documents are a primary means to ensure that, through emergency preparedness, a water supply will minimize their risk of being without safe and adequate water. Finally, the water supply staff is encouraged to review their cross connection control program to ensure it remains current and viable. Cross connections to either the water treatment plant (for example, at bulk water loading stations) or in the distribution system may negate all source water protection initiatives provided by the community.

Regulated Contaminants Detected in 2003 (collected in 2003 unless noted)

Lead and Copper
Definitions:
Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Action Level Goal(AGL): The level of a contaminant in drinking water below which there is no known or expected risk to health. ALG's allow for a margin of safety.

Lead MCLG	Lead Action Level (AL)	Lead 90th Percentile	# Sites Over Lead AL	Copper MCLG	Coper Action Level (AL)	Copper 90th Percentile	#Sites Over Copper AL	Likely Source of Contamination
0 ppb	15 ppb	<5	0	1.3 ppm	1.3 ppm	1.1	1	Corrosion of household plumbing systems; Erosion of natural deposits

Water Quality Test Results
Definitions: The following tables contain scientific terms and measures, some of which may require explanation.
Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the Maxium Contaminant Level Goal as feasible using the best available treatment technology.
Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health.MCLG's allow for a margin of safety.
mg/l: milligrams per litre or parts per million - or one ounce in 7,350 gallons of water.
ug/l: micrograms per litre or parts per billion - or one ounce in 7,350,000 gallons of water.
na: not applicable.
Avg: Regulatory compliance with some MCLs are based on running annual average of monthly samples.
Maximum Residual Disinfectant Level (MRDL): The highest level of disinfectant allowed in drinking water.
Maximum Residual Disinfectant Level (MRDLG): The level of disinfectant in drinking water below which there is no known or expected risk to health.MRDLG's allow for a margin of safety.

Regulated Contaminants	Highest Level	Range of Levels Detected	Unit of Measur-ement	MCLG	MCL	Violation?	Likely Source of Contamination
Disinfectants & Disinfection By-Products							
Total Haloacetic Acids (HAA5)	2.5	2.5-2.5	ppb		60*	No	By-product of drinking water chlorination
TTHMs [Total Trihalomethanes]	1.2	1.2-1.2	ppb	n/a	80*	No	By-product of drinking water chlorination
Inorganic Contaminants							
Arsenic	40	8.9-40	ppb	n/a	10	No	Erosion of natural deposits; Runoff from orchards; Runoff from electronics production wastes
Barium	0.23	0.1-0.23	ppm	2	2	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Fluoride	1.05	0.98-1.05	ppm	4	4	No	Erosion of natural deposits; Water additive which promotes strong teeth; Fertilizer discharge
Radioactive Contaminants							
Alpha Emitters 10/30/2001	4	2-4	pCi/L	0	15	No	Erosion of natural deposits
State Regulated Contaminants							
Iron	10000	320-10000	ppb	n/a	1000	No	Erosion from naturally occurring deposits
Manganese	70	20-70	ppb	n/a	150	No	Erosion of naturally occurring deposits
Sodium	51	16-51	ppm	n/a	n/a	No	Erosion of naturally occuring deposits; used in water softener regeneration

There is not a state of federal MCL for sodium. Monitoring is required to provide information to consumers and health officials that are concerned about sodium intake due to dietary precautions. If you are on a sodium-restricted diet, you should consult a physician about this level of sodium in the water.

*MCL Statement: The maximum contaminent level (MCL) for TTHM and HAA5 is 80 ppb and 60 ppb respectively and is currently only applicable to surface water supplies that serve 10,000 or more people. These MCLs will become effective 01/01/2004 for all groundwater supplies and surface supplies serving less than 10,000 people. Until 01/01/2004, surface water supplies serving less than 10,000 people, any size water supply that purchase from a surface water source , and groundwater supplies serving more than 10,000 people must meet a state imposed TTHM MCL of 100 ppm. Some people who drink water containing trihalomethanes in excess of the MCL over many years experience problems with their livers, kidneys, or central nervous systems, and may have increased risk of getting cancer.

EPA has reviewed the drinking water standard for arsenic because of special concerns that it may not be stringent enough. Arsenic is a naturally-occurring mineral known to cause cancer in humans at high concentrations.

Exhibit C

Proposal to Perform In-Situ Bioremediation of Soil and Groundwater

to

Clayton Group Services

For

Paul Johnson Property
Waterman, Illinois

June 2003

Innovative Environmental Technologies, Inc.

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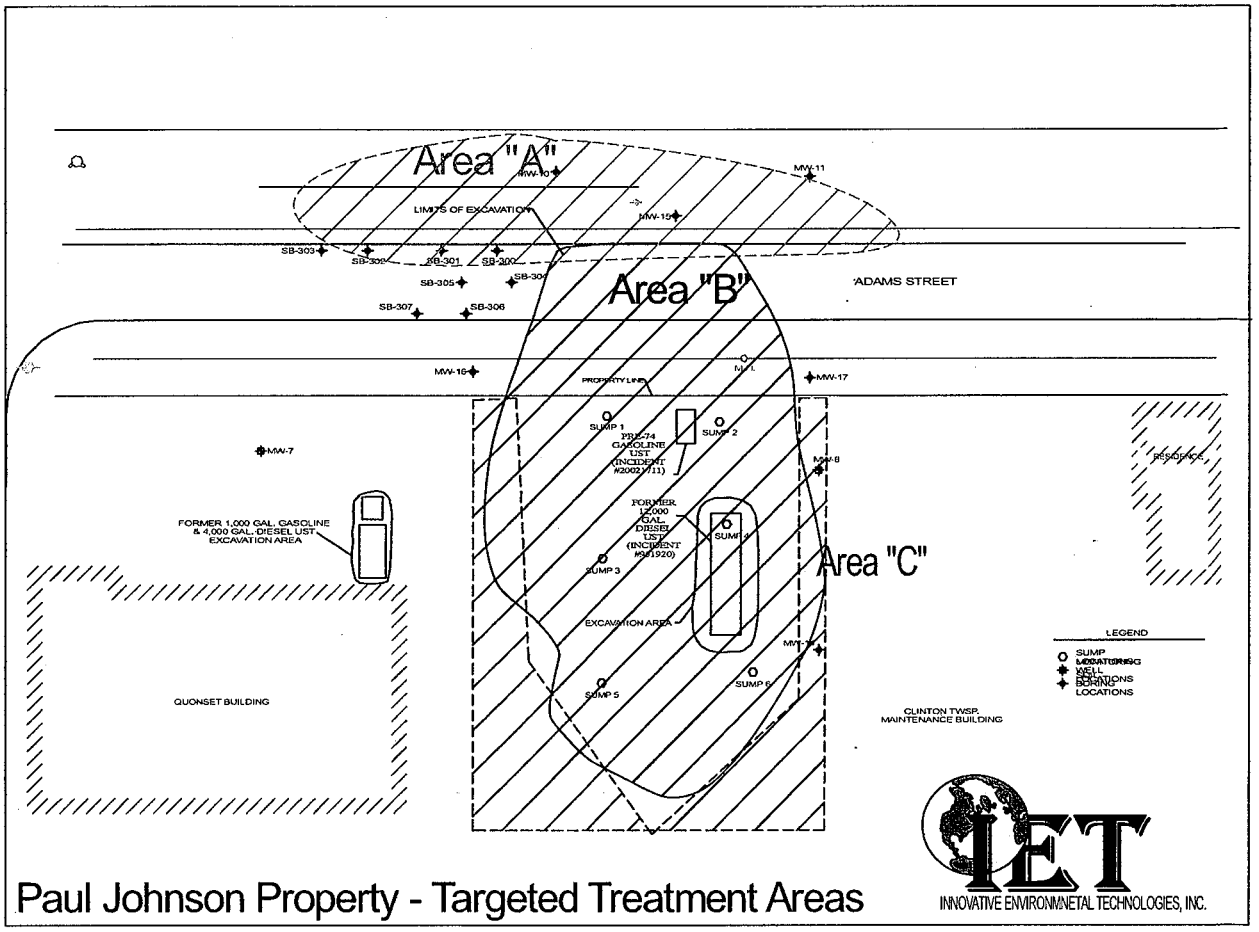
INTRODUCTION

Project Summary:

Innovative Environmental Technologies has reviewed the field data collected by Clayton Group Services including well logs, soil and groundwater sample data from The Paul Johnson Property Waterman, Illinois. The targeted constituents would appear to be suitable for accelerated attenuation via biological mineralization. Innovative Envioronmnetal Technologies, Inc. Has delineated, broadly, three areas, (Areas "A", "B" and "C").



IET has structured a program, which will allow for significant removal over a two-year period, with accelerated attenuation enhanced by the biomass established during the active phases.

Data Evaluation:

The recommendations made herein by Innovative Environmental Technologies, Inc. incorporate the field data and remedial experience such that accelerated attenuation may occur outside of the source area and active remediation may occur within the source area.

The results of the field enumeration analyses indicate that the environment is not toxic and is suitable for the proposed remedial action. The results indicate that there is little selective activity based on source area samples from:

	Selective Pseud. Count	**Total Hetero Count**
MW-15	<100 CFU/ml	12,600 CFM/mL
MW-16	<100 CFU/ml	4,700 CFM/ml
Sump-4	800 CFU/mL	6,000 CFU/mL

The population dynamics at the site indicated, that, although there is no toxicity present, there exists significant competition for nutrients and terminal electron acceptors by non-aromatic degrading species. The relatively low target compound concentration compared to the background BOD/COD indicates that simple stimulation without augmentation will not result in prefential target compound mineralization.

General Site Plan Discussion:

If, the remedial plan were to consist solely of oxygen enrichment, greater consumption of the resources would occur by the non-aromatic degrading, gram positive population sub-set. The lab evaluation and the plating process indicate whether there exists bacteria at the site, it does not evaluate the activity of that population. It is important to recognize that the plating process allows for the dormant cultures to become active. It is difficult to judge the in-situ conditions, where competition for resources is present. The capabilities of the dormant Pseudomonas to become vegetative and utilize resources consumed by the competing gram-positive population will significantly vary from laboratory enumerations. It is most probable that the nutrient and terminal acceptor limiting conditions have existed at the site for some period of time. As a consequence the total plate count represents spored gram-positive organisms.

The pHs of 6.9 to 6.6 indicate that the historical processes have been slightly anerobic, however, given the low substrate seen in the monitoring wells, the anerobic processes have not ggeneratedsignificant depression in the pH to warrant the application of a pH control prograkm. Had the pHs been depressed the IET proposal would integrates calcium peroxide as an oxygen release source within portions of the plume. Calcium peroxide revert to calcium hydroxide during the release process, allowing for elevated pH via the reversion to calcium hydroxide during the oxygen release process. better pH control. The results for the essential nutrients, nitrogen and o-PO_4, further substainiate the remedial approach proposed which consists of essential nutrients, vegetative cultures (pseudomonads),

and terminal electron acceptors (oxygen release compounds in as calcium and magnesium peroxide and dilute hydrogen peroxide).

Innovative Environmental Technologies, Inc. (IET) has utilized dilute hydrogen peroxide within the bioslurry component to meet the SCOD demand. This demand will come from primarily the inorganic sources such as iron and manganese. Further the sequestration of bioavailable o-PO4 by the non-oxidized cationic species shall be addressed by the integration of additional o-PO4 within the bioslurry. The agency's request for copper, zinc and lead analysis can only be assumed to be an outgrowth of cationic sump feature which is addressed both by the H2O2, o-PO4 and biosequestion that will occur within the IET program.

The remedial program recommended by IET integrates vegative pseudomonas so as to compete effectively with the ingenious gram positive, general BOD degrading population. Further, the incorporation of the vegative BTEX degrading pseudomonas allows for effective bio-film formation in the vadose zone during the critical "mounding" stage of the process. It is during this phase that abundant oxygen and nutrients are present with the vegetative cultures in the capillary area. Without the incorporation of the cultures, stimulation with oxygen and nutrients will drive the population ratios in the saturated zone further toward the non-BTEX degrading gram positive strains and in the vadose zone entirely allow for gram positive bio-film formation.

Innovative Environmental has evaluated the site data. The ammonia, pH, o-PO4, iron and biological enumerations all indicate that the proposed remedial plan is suitable for the site. IET has the terminal electron acceptor demand based on the sorbed and dissolved fractions. Sorption can be defined as the interaction of a contaminant with a solid. More specifically, the term can be further divided into adsorption and absorption. The former refers to an excess contamination concentration at the surface of a solid while the latter implies a more or less uniform penetration of the solid by the contaminant. Unfortunately, in this environment and most environmental settings, there is no information concerning the specific nature of the interaction. As a result sorption shall be used in a generic way to address both phenomena. As a general rule, assuming a petroleum hydrocarbon is equally distributed between phases is ill advised. As hydrophobic compounds, these compounds will partition preferentially to the soils. Within a system where the pore water occupies 30% of the aquifer volume, two (2) liters of aquifer would contain 600 mL of water and 3500 grams of soil (soil is about 2.5 times more dense than water). As a result, if there was equal distribution of the contaminant between the phases, slightly less than 15% of the contaminant mass would reside within the aqueous phase. Give the hydrophobic nature of the targeted compounds much less of the targeted contaminant's mass is found in the dissolved phase. This partitioning is strongly associated with an individual compound's solubility, as the solubility of a hydrophobic compound decreases, the absorption coefficient increases.

Since adsorption is an exothermic process, values of K_{sorp} decrease with increasing temperature. A 10% increase in K_{sorp} will accompany a 10^{0} Celsius system decrease. (A compound that is highly soluble will have a small solubility product constant.) Thus, given the changes in measured temperature across a site the phase distribution of the contaminant and the potential aqueous phase increases due to the temperature decrease may be estimated to be 36.2% to 40% with just a ten degree temperature decrease.

Absorption of molecules can be represented as a chemical equation:

A+B $\rightleftharpoons$ A● B, where A is the adsorbate, B is the adsorbent and AB is the absorbed compound. Adsorbates are held on the surface by a variety of chemical forces. If the reaction is reversable, as it is for many compounds absorbed to carbon and soils, molecules continue to accumulate on the surface until the rate of the forward reaction is equal equals the rate of the reverse reaction (Adsorption = desorption). When this condition exists, equilibrium has been reached and no further accumulation will occur. One of the most important characteristics of an absorbent is the quantity of absorbate it can accumulate. Regardless of the absorbent an eventual equilibrium is achieved. Individual compounds absorb and desorb based on that compound's adsorpstion isotherm. This data may be used to estimate the equilibrium point via the Freunich equation:

$$q_e = KC^{1/n}_e$$

q_e *Equilibrium Surface Concentration*
C_e *Equilibrium Solution Concentration*
K *Constant related to the capacity of the absorbent for the absorbate*
1/n *Constant is a function of the strength of absorption*

The constants are generally known for activated carbon, but not soils, primarily due to the variability throughout soil types. However, given a sample point with known analytical values for both the aqueous phase and the soil phases a comparison of the calculated concentrations using the Freunich equation both for q_e *and* C_e is possible. Back calculating the calculated soil concentration from the known liquid value and the theoretical liquid concentration from the know soil concentration generates an agreed proportional relationship between the site's soils and carbon. This is possible when soil samples from the saturated zone are obtained. When no saturated samples are available some assumed correlations between the site's soil matrix and GAC is applied.

As an Example: Benzene data utilizing the constants below and an aqueous concentration of 0.463 ppm and a soil concentration of 47 ppm a corrected absorption factor may be calculated.

K	50	(mg/g)(L/mg)^1/n
1/*n*	0.533	
Aq Conc.	[redacted]	ppm
Calc.(*qe*)*o*	**33.16841148**	mg/g

Yields a theoretical q_e *of 33.17 ppm.* In that the site's soils tend to be clays, an assumed correction percentage of 35% (indicating that the soils tend to retain 35% of what a true carbon particle will entrain).

Thus applying this assumption to the previous calculation yields:

K	50	(mg/g)(L/mg)^1/n
1/*n*	0.533	
Aq Conc.	[redacted]	ppm
Calc.(*qe*)*o*	**33.16841148**	mg/g

Soil Corr.	35	%
Estimated Volume	567.4074074	Cu. Yds
Estimated Pore Volume	0.3	%
Calculated Soil Targeted	770490462.2	grams
Targeted Substrate in Soil	8944.580642	grams
Theoretical Substrate Oxygen Demand from Substrate	42826.65212	grams
Biological Assimilation Correction	21413.32606	grams
Calculated Soil Concentration	**11.60894402**	ppm

Partition Coefficient,

General:

Partitioning can be viewed simply as the preference of a particular organic molecule for either the aqueous or organic phase. Another way of describing this is to use the term *hydrophobicity*, or the tendency of that substance to leave the aqueous phase. The greater the hydrophobicity, the greater is the tendency of that substance to *partition* into the hydrophobic organic phase.

• The *partition coefficient,* therefore, is simply the ratio of the equilibrium concentrations between the two immiscible phases in contact, i.e.
P = {organic}/{aqueous} = K (5-1)

⇒ This simple relationship assumes that there are no significant solvent interactions (solvent is a continuum), solute-solute interactions (activity coefficient independent of concentration), or anything else.

⇒ The constant of proportionality is called the *partition coefficient*, or *distribution ratio*. The partition coefficient can be a vapor/solid, vapor/liquid, liquid/liquid, or liquid/solid measurement.

⇒ In this context the system of solvents are taken as a continuum, without discrete molecular structures.

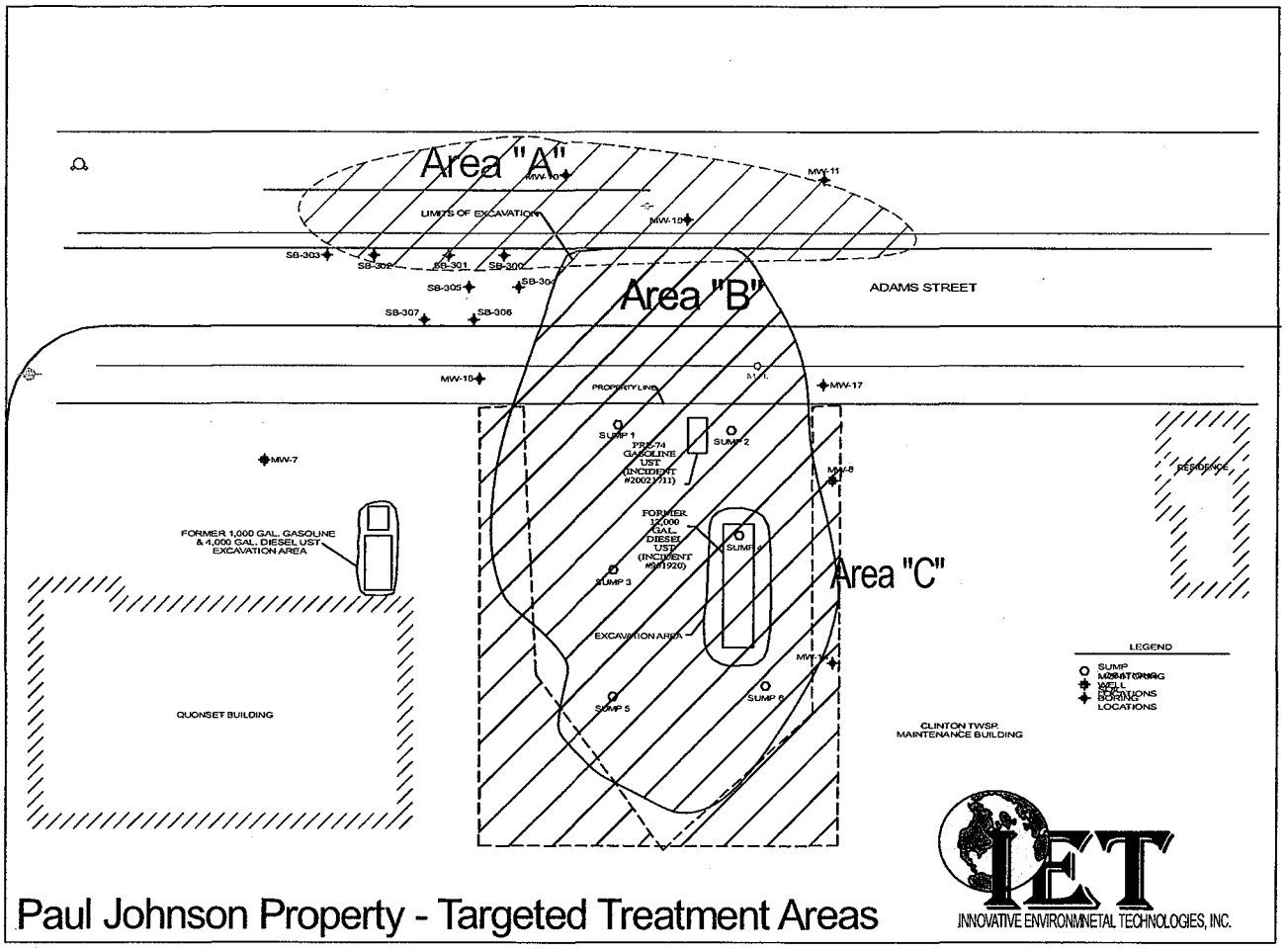
Using the filed demonstrated formula:

[*(Calculated Concentration)/(soil correction percentage)= Corrected soil value*

Applying this correction, a high correlation between observed and theoretical values are obtained, To obtain the correction value, a variety of calculations are involved such that corrected water and soil concentrations are established. Based on the calculated target concentrations, COD values are developed and essential injectants calculated. These individual calculations are attached in "appendix "A".

In addition to the effect of temperature on solubility product constants, an increase in the specific conductivity of a solution will significantly lower the adsorption coefficient of cations. Of specific interest at the site is how the increase in conductivity will effect the bioavailability of nutrients. If the decrease in the coefficient for hydrogen ion due to the increases in salinity is balanced by the increase in the coefficient due to the increase in pH across the site the cation availability can be expected to remain unaffected by the physical chemical changes of the environment. The issues of solubility product, sorption and desertion are not addressed in the states' assertion that a single ORC injection is capable of supplying all the necessary components necessary for biological growth. Neither does the states' assertion address the population management issues that will accompany the disproportionate growth of non-petroleum degrading gram positive species that is expected without vegetative pseudomonad augmentation. These issues have been addressed by the Innovative Environmental Technologies, Inc. proposal.

The site has generally been broken into three regions: Area "A", "B", and "C".as follows:



Phase I Calculation Summaries:

Area "A" evaluation: Phase I

Treatment Area

% Of Soil Load Targeted	100%	
Soil Correction Value	[redacted]	**as %**
Area		
Area of Zone	4090.215278	sq. ft
Average soil coulumn targeted	4	ft
Estimated radius of injection	9	ft
Estimated Area Volume	605.9578189	C.Yards
Estimated Pore Volume	30%	%
pH	6.9	

BTEX Calculations

Groundwater Analyses		
Benzene Concentration	0.275	ppm
Toluene Concentration	0.771	ppm
E. Benzene Concentration	0.313	ppm
Xylenes Concentration	0.388	ppm
Total		
Soil Analyses		
Benzene Concentration	0.0991	ppm
Toluene Concentration	0.366	ppm
E. Benzene Concentration	2.97	ppm
Xylenes Concentration	2.69	ppm
Total		

Number of Oxygen Injection Points	**17 Points**
Raw Amount of ORC/pt	**9.10 Pounds**
Raw Amount of CaH2O2/pt	**7.15 Pounds**
Gallons of Slurry	**850 gallons**
Corrected ORC/pt (corrected for excess H2O2 usage)	**8.0**
Corrected CaH2O2/pt (corrected of excess H2O2 usage)	**6.29**

Number of Bio Injection Points	**19 Points**
Gallons of LPD/Pt	**9.68726 Gallons**
Gallons of Slurry	**1900 Gallons**

Area "B" evaluation Phase I:

% Of Soil Load Targeted	100%	
Soil Correction Value	[redacted]	as %
Area		
Area of Zone	9979	sq. ft
Average soil coulumn targeted	2	ft
Estimated radius of injection	20	ft
Estimated Area Volume	739.1851852	C.Yards
Estimated Pore Volume	60%	%
pH	6.59	

6.6

BTEX Calculations

Groundwater Analyses		
Benzene Concentration	0.0716	ppm
Toluene Concentration	0.005	ppm
E. Benzene Concentration	0.005	ppm
Xylenes Concentration	0.041	ppm
(Average of MW-2 and MW-3)		
Total		
Soil Analyses		
Benzene Concentration	0.02	ppm
Toluene Concentration	0.02	ppm
E. Benzene Concentration	0.05	ppm
Xylenes Concentration	0.15	ppm
(Average of MW-2 and MW-3)		

Number of Oxygen Injection Points	**8 Points**
Raw Amount of ORC/pt	**1.01 Pounds**
Raw Amount of CaH2O2/pt	**0.67 Pounds**
Gallons of Slurry	**600 gallons**
Corrected ORC/pt (corrected for excess H2O2 usage)	**10**
Corrected CaH2O2/pt (corrected of excess H2O2 usage)	**6.04**

Number of Bio Injection Points	**6 Points**
Gallons of LPD/Pt	**660 Gallons**
Gallons of Slurry	**9000 Gallons**

Area "C" Phase I:

Area General Data and Calculations

% Of Soil Load Targeted	100%	
Soil Correction Value	[redacted]	**as %**
Area		
Area of Zone	3708.256944	sq. ft
Average soil coulumn targeted	4	ft
Estimated radius of injection	15	ft
Estimated Area Volume	549.3713992	C.Yards
Estimated Pore Volume	30%	%
pH	6.6	

BTEX Calculations

Groundwater Analyses		
Benzene Concentration	0.05	ppm
Toluene Concentration	0.0058	ppm
E. Benzene Concentration	0.005	ppm
Xylenes Concentration	0.0151	ppm
Total		
Soil Analyses		
Benzene Concentration	0.05	ppm
Toluene Concentration	0.05	ppm
E. Benzene Concentration	0.09	ppm
Xylenes Concentration	0.2	ppm

Number of Oxygen Injection Points	**6 Points**
Raw Amount of ORC/pt	**10.70 Pounds**
Raw Amount of CaH2O2/pt	**10.19 Pounds**
Gallons of Slurry	**450 gallons**
Corrected ORC/pt (corrected for excess H2O2 usage)	**11**
Corrected CaH2O2/pt (corrected of excess H2O2 usage)	**9.73**
Number of Bio Injection Points	**17 Points**
Gallons of LPD/Pt	**10 Gallons**
Gallons of Slurry	**1700 Gallons**

The objectives of the accelerated attenuation program proposed by Innovative Environmental Technologies, Inc. are:

1) Provide for sufficient dissolved oxygen across the site so as to sustain aerobic conditions,
2) Provide for sufficient bioavailable nutrients so as to sustain the respiratory processes of the heterotrophic populations,
3) Manage the population, utilizing indigenous and exdigenous heterotrophs and
4) Focus biomineralization processes on petroleum hydrocarbon constituents.

Technical Review of the Project

Bioremediation has been successfully demonstrated for many years. The ability of hetertrophic bacteria to mineralize petroleum hydrocarbons in contaminated soils and groundwater is well documented. IET has demonstrated through engineered delivery systems that these enzymatic pathways may be utilized to accelerate in-situ attenuation process, treating both soils and groundwater. In the process, soil microorganisms convert the hydrocarbons to carbon dioxide, water and biomass. The factors that affect the extent of hydrocarbon removal from the contaminated soils include:

* pH of the soil and water,
* temperature of the soil and the water,
* moisture content of the soil,
* concentration of nutrients within the soil and water,
* aeration (dissolved oxygen) in the aqueous fractions,
* total and selective microbial populations,
* contaminant characteristics,
* time,
* the availability of the contaminant to biocatalysis, and
* consistent, professional management of the site.

The in-situ program shall address each of the parameters above in order to accelerate the natural processes presently occurring in such site soils and groundwater to meet or exceed Soil and Groundwater Cleanup Criteria much more rapidly than had these processes been allowed to continue at their current rates.

In-situ biodegradation occurs through the action of naturally occurring microorganisms, which are encouraged to grow through addition of nutrients, oxygen, organic substrates or other materials. If naturally occurring organisms are absent or few in number, or when a more rapid clean up is desired, acclimated organisms are added to the surface environment. By combining the two approaches (organism addition with an enhanced environment for growth) a rapid and continuous remediation may take place.

pH

To insure the maintenance of proper operating pH throughout the in-situ remediation process a nutrient blend consisting of Mono Sodium Phosphate as the phosphorous source is used. By utilizing the MSP, the treatment zones' pH will be buffered by the nutrient augmentation. In the case that the time zero pH levels are below the optimal range, pH management will not be a component of the program. Further, in that the pH levels are assumed to be between6.5 and 7.5 throughout the site, the attenuation phase of the project (elevated DO resulting from the decomposition of the magnesium peroxide slurry points) is expected to truncate, due to an accelerated decomposition rate of the stabilized magnesium peroxide.

Temperature

Although control of the soil's temperature is not feasible, the bacterial blend selected for the project has a high proportion of Pseudomonas putida, a culture which has demonstrated excellent degradation kinetics at the temperatures typically associated with soils and groundwater. Further, some temperature management will occur via the source area treatment system.

Moisture Content

Controlling the moisture content within the soil matrix is critical in establishing and maintaining an environment supportive of the natural biodegradation of the contaminants at the site. To maximize the water introduction into the targeted soil areas, IET shall apply the nutrients and terminal electron acceptor into the soils in diluted aqueous solutions. These injections shall be accomplished via specially designed equipment and direct push drilling equipment.

Nutrients

Also critical to establishing and maintaining the activity of the bacteria in the site's soil is the control of the inorganic nutrients required by the bacteria for the cellular metabolism. Bacteria require both nitrogen and phosphorus in order to carry out cellular functions. The organism for microbial wall components, nucleic acids and proteins requires nitrogen. Nitrogen makes up nearly 15% of the molecular composition of a bacterial cell; any limitation on the nitrogen seriously impacts the metabolic functions of the organisms. Inorganic nitrogen sources will be required in the bioremediation program at the site.

The microorganisms in the synthesis of phospholipids and nucleic acids use phosphorus, in the form of inorganic phosphates. Phosphorus is also essential for the energy transfer reactions of ATP. The enzymes that hydrolyze the phosphate ester are present in nearly all organisms. In phosphorus limiting environments the metabolism of microorganisms decreases sharply, reducing their capacity to utilize the hydrocarbons in the soil as an organic carbon source. Inorganic phosphorus sources shall be applied with the phosphorus sources in order to stimulate and maintain the remediation project.

In developing a coordinated Nitrogen and Phosphorus nutrient augmentation program for the site, Innovative Environmental Technologies, Inc. has considered the potential for impacting the groundwater with nitrates. The nutrients to be added to the bioslurry shall be composed of the components: MSP (Mono Sodium Phosphate), Urea, and a small percentage of Dicyanodiamide. This component inhibits the nitrification of the ammonium to nitrate. Keeping the nitrogen in a more usable form and allowing for the injected oxygen to go towards respiration rather than being incorporated into the nitrate molecules resulting from the nitrification process. Applications of the nutrient mix with the oxygen source shall be at concentrations below the inhibitory or toxic levels of these materials to insure that growth is stimulated, rather than inhibited in the areas.

Aeration

Respiration processes require oxygen, generally an oxygen atmosphere of less than 1% in soil will change metabolism from aerobic to anaerobic. In aqueous and soil environments, oxygen concentrations less than 1 mg/l can switch metabolism from aerobic to anaerobic. Therefore, maintaining dissolved oxygen in the aqueous phase in and around the soil particles an organism is in contact with is critical to maintaining good degradative characteristics. The options available to a practitioner of bioremediation are limited generally to aeration of water and soils in the treatment area, the introduction of hydrogen peroxide, or the use of pure oxygen sources.

Innovative Environmental Technologies has selected to utilize hydrogen peroxide in the injection slurry so as to accelerate the mineralization process within the treatment zones during the active phase of the project. Dilute H_20_2 has been chosen for the active phase of the remediation for the following reasons:

1) Sparging into the small, concentrated contaminated zones will not allow for the surgical-like remediation available via the injection technique,
2) SVE system installation into the areas would significantly impair the continued commercial use of the site,
3) SVE systems consists of expensive equipment, requiring long term operating and maintenance costs, and
4) The overall electron acceptor requirements are moderate to low for meeting the requirements.

Oxygen will be additionally supplied to the ground water via a slow release solid magnesium peroxide product. This patented technology controls and prolongs the release of oxygen while maintaining moderate pH levels. Together with enhanced population density of heterotrophs with TPH degrading capacity, the low-level extended release of oxygen to the groundwater will enhance the efficacy of the soil remediation injections, which shall occur during the active phase of the remediation.

In treating the soil matrix via injections, each treatment cell shall have a maximum H_2O_2 concentration of 800 ppm injected with each application, limiting the potential toxicity issues, which would limit biological activity at higher H_2O_2 concentrations.

Total and Selective Microbial Populations

Over the years numerous field experiences, laboratory studies and third party evaluations have shown that biodegradation of petroleum hydrocarbons can be accelerated in contaminated soils by optimizing culture conditions and introducing high concentrations of viable, specialized strains of hydrocarbon degrading organisms. As compared to a program in which enhancement of the indigenous organisms is the sole source of bacterial action, an augmented bioremediation approach allows for a more competitive environment establishing a high proportion of selective bacteria for hydrocarbons. These larger population ratios allow for greater utilization of nutrients and oxygen in degrading the contaminants of the site. Although enhancement technologies alone have had field successes, frequently the steps taken towards enhancement are more expensive and time consuming than an augmented approach. Through an augmented approach, selective counts quickly approach that of the total counts, increasing the biological degradation of the hydrocarbons by orders of magnitude early in the remedial process. As the treatment area's population dynamics stabilizes, higher activity with regard to TPH degradation is still seen.

In structuring the bioremediation program for the site, Innovative Environmental Technologies shall utilize a proprietary blend of bacterial cultures specifically designed and manufactured to IET's specifications. Targeting and degrading the light-distilled oil fractions as well as the heavier fractions of hydrocarbons normally associated with fuel oils, crude oil and coal tar. Many of the cultures within IET's hetertrophic blend are those which were evaluated and recommended by the EPA's Risk Reduction Laboratory in Cincinnati, Ohio and involved testing the effectiveness of treating, through bioremediation, the weathered Prudhoe Bay crude oil in sea water from Prince William Sound. The results were compared against those produced by inorganic fertilizers. At a confidence level of 95%, the culture recommended by NETAC biodegraded the hydrocarbons in the oil significantly better than the fertilizer control. These cultures and one other company's product were identified as the most promising commercially available technologies from a field of 39 proposals from companies having bioremediation technologies for potential application in the Exxon Valdez oil spill cleanup.

IET's ***"Liquid Petroleum Degrader" (LPD)***, is composed of twelve strains of Pseudomonads consisting of: Pseudomonas aeruginosa (for biosurfactant production), Pseudomonas stutzeri, and Pseudomonas putida. Combined, these organisms target the following compounds: Anthracene, Methyl naphalene, Napthalene, Xylenes, Ethyl Benzene, Toluene, Benzene, and $>C_{20}$ aliphatics. These cultures have been demonstrated to perform at optimal kinetics when applied under the following conditions:

pH	6.0-8.5 (6.8-7.4 optimal),
Temperature	40°F-100°F (65°F-85°F optimal),
Dissolved Oxygen	>2.0 mg/l (1.0 mg/l minimum),
Nutrients (N&P)	>1.0 mg/l Ammonium Nitrogen,
	>0.5 mg/l Ortho Phosphate.

Availability of the Contaminant to Biocatalysis

Based on the data available, the techniques practiced by Innovative Environmental Technologies and proposed herein are expected to greatly accelerate the biological mineralization of the petroleum constituents in both the targeted soil and the groundwater of the site outside the source area. Some limitations may appear through the remediation related to the closure of the most contaminated areas. These limitations may be a result of low-bioavailability or low-accessibility areas with regard to residual hydrocarbons. Should these conditions appear during the final stages of the remediation in the site, additional slurry introductions, inoculations, and additional ORC points should be considered.

Injection Techniques and Applications

ORC has been used in the successful remediation of dissolved phase TPH and BTEX compounds. It is most frequently used to address dissolved phase contamination in the ground water in addition to sorbed material in the saturated capillary fringe and smear zones. It is these latter areas that if not addressed at the same time the ground water is addressed, re-contamination of the water will continue to occur.

How Is It Applied?

When first introduced into the remediation market, it's form for use in accelerating the bio-remediation of dissolved phase petroleum compounds in ground water was "filter socks". The "socks" consisted of ORC mixed in a ratio with a carrier matrix, encased in a fabric pouch which was wrapped in a protective plastic webbing. The "socks" measured approximately 3" x 12" for use in 4" diameter monitoring wells, with grommets on both ends that were laced together to form a chain. These were then lowered into the well. The number of "socks" used in each well depended on the length of the water column. Optimum effectiveness was obtained when the total saturated area was filled.

The observation was that although the effect of the ORC on the ground water in the well could be measured, it was difficult to measure the effect of the ORC treatment outside the well. The combination of ground water moving into the casing to replace the displaced volume of the ORC when it is removed for sampling, combined with the effect of purging 3 to 5 casing volumes prior to ground water sampling resulted in oxygen depleted upgradient ground water being introduced into the well. The sample results reflected this condition.

In addition, unless a significant number of ORC packed wells were installed throughout the affected area, especially upgradient of the area of initial release, the whole affected area was not being remediated, only the water immediately in and passing through the original monitoring wells. A combination of barrier wells installed just downgradient of the area of initial release and at the downgradient property boundary, helped to treat and contain some of the contamination, but another method needed to be developed for delivering the ORC throughout the affected area.

SLURRY INJECTION

A more cost-effective and efficient method for placing ORC throughout the affected area of a site has evolved. Bulk ORC powder is prepared as a slurry, mixed with water at varying concentrations. The slurry is injected directly into the SATURATED ZONE, at locations predetermined to facilitate accelerated attenuation, through the use of direct-push boreholes introduced by a Geoprobe or similar equipment.

Until recently, the pump most often used to inject the slurry has been the Geoprobe GS-1000. Although it is rated at 1000 psi, the maximum injection pressure usually attained was between 250 and 275 psi. Most often, the slurry was found to escape under these pressures from around the probe, making it necessary to install boreholes closer in order to be able to affect all the impacted groundwater.

Recently made available to the remediation industry, designed specifically for injecting ORC slurry and the subsurface introduction of other remedial materials, is IET's licensed injection process. The use of air as a driving force rather than pumps offers flexibility to the remedial contractor, offering prefracturing, post fracturing and high volume injections. The benefits of this increased injection flexibility are:

1) ***The ability to affect a much larger radius of influence per injection point,***
2) ***The injection points can be spaced farther apart without sacrificing subsurface area coverage, hence fewer boreholes will need to be installed to affect the same area,***
3) ***More even distribution of the injected slurry insures pH excursions are minimized due to localized pockets of ORC,***
4) ***Using our newly designed horizontal injection point in conjunction with the injection process enables contaminated areas under previously inaccessible areas (i.e.; buildings, small rivers or stream beds) to be accessed and treated.***

Another limitation of the ORC slurry injection process has been the expendable point and adapter that is used by borehole installers. Both the adapter and expendable point used on the end of both 1" and 1.25" rods were originally designed to inject grout when backfilling a borehole. They were designed to inject the mixture in a vertical direction, which served the purpose well.

The problem with using these same tools to inject ORC slurry is the inability to control the horizontal extent of slurry distribution. The engineer must rely on the existing pathways of the geologic formation to disburse the slurry. Even in an optimum matrix, such as medium/fine grained sand, the mixture will seek preferential pathways rather than equal distribution (similar to "air channeling" that occurs in sparging systems). Factoring in the additional possibility of silt or clay lenses, or an entire matrix composed of silts or clays, only exacerbates the problem.

We have designed an injection point and adapter that can be used with existing, industry standard 1" and 1.25" direct push rods that will inject the ORC slurry in a HORIZONTAL pattern. The distribution of the slurry will be much more predictable when combined with the

utilization of our novel and patented injection process. In addition, fewer boreholes are necessary to completely affect treatment in all areas.

Innovative Environmental Technologies shall address the impacted soil and groundwater via in-situ injection of essential cultures, nutrients and oxygen sources.

A sample was obtained from the site and analyzed at TMI Analytical Services, LLC. The sample was be evaluated for both Total Selective Heterotrophs and Selective Heterotrophs (McKonkey's Plate). The McKonkey's agar utilized is specific for Pseudomonads. The literature and our experience indicates that the majority of heterotrophs capable of aromatic degradation are pseudomonads. This is born out by the attached Battelle paper. In this paper we evaluated toluene degraders via the MPN method and pseudomonads via the McKonkey's agar. As you will see there is a very high coorelation between the toluene degraders and the pseudomonads in all wells except G-103, where there appears to be additional gram positive (probably bacilli) capable of degrading toluene. In that G-103 is the center of the plum and, has been exposed to the aromatics the longest period of time the assimilation of some non-pseudomonad aromatic degraders should be expected.

If, the remedial plan were to consist solely of oxygen enrichment, as the IEPA seems to request, greater consumption of the resources would occur by the non-aromatic degrading, gram positive population sub-set. The lab evaluation and the plating process indicate whether there exists bacteria at the site, it does not evaluate the activity of that population. It is important to recognize that the plating process allows for the dormant cultures to become active. It is difficult to judge the in-situ conditions, where competition for resources is present. The capabilities of the dormant Pseudomonas to become vegetative and utilize resources consumed by the competing gram-positive population will significantly vary from laboratory enumerations. It is most probable that the nutrient and terminal acceptor limiting conditions have existed at the site for some period of time. As a consequence the total plate count represents spored gram-positive organisms.

Innovative Environmental Technologies, Inc. (IET) has utilized dilute hydrogen peroxide within the bioslurry component to meet the SCOD demand. This demand will come from primarily the inorganic sources such as iron and manganese. Further the sequestration of bioavailable o-PO4 by the non-oxidized cationic species shall be addressed by the integration of additional o-PO4 within the bioslurry. The agency's request for copper, zinc and lead analysis can only be assumed to be an outgrowth of cationic sump feature which is addressed both by the H2O2, o-PO4 and biosequestion that will occur within the IET program.

The remedial program recommended by IET integrates vegative pseudomonas so as to compete effectively with the ingenious gram positive, general BOD degrading population. Further, the incorporation of the vegative BTEX degrading pseudomonas allows for effective bio-film formation in the vadose zone during the critical "mounding" stage of the process. It is during this phase that abundant oxygen and nutrients are present with the vegetative cultures in the capillary area. Without the incorporation of the cultures, stimulation with oxygen and nutrients will drive the population ratios in the saturated zone further toward the non-BTEX degrading gram positive strains and in the vadose zone entirely allow for gram positive bio-film formation.

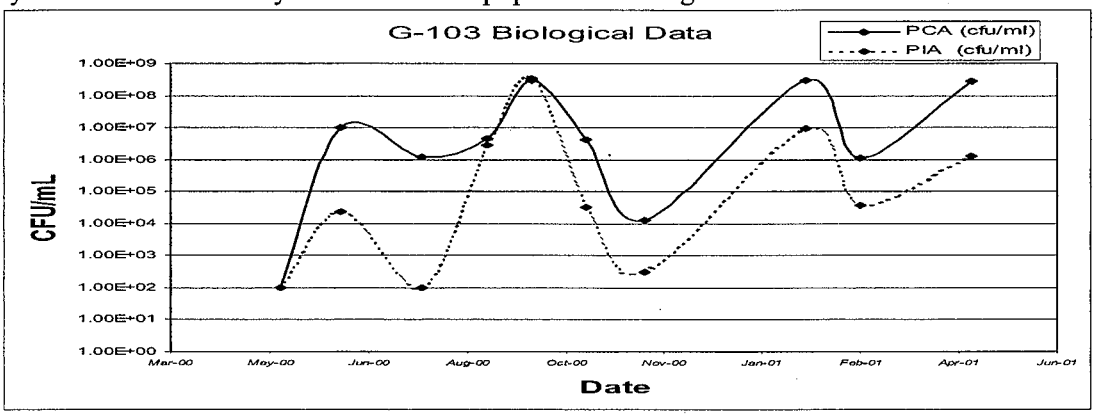
In addition to the effect of temperature on solubility product constants, an increase in the specific conductivity of a solution will significantly lower the adsorption coefficient of cations. Of specific

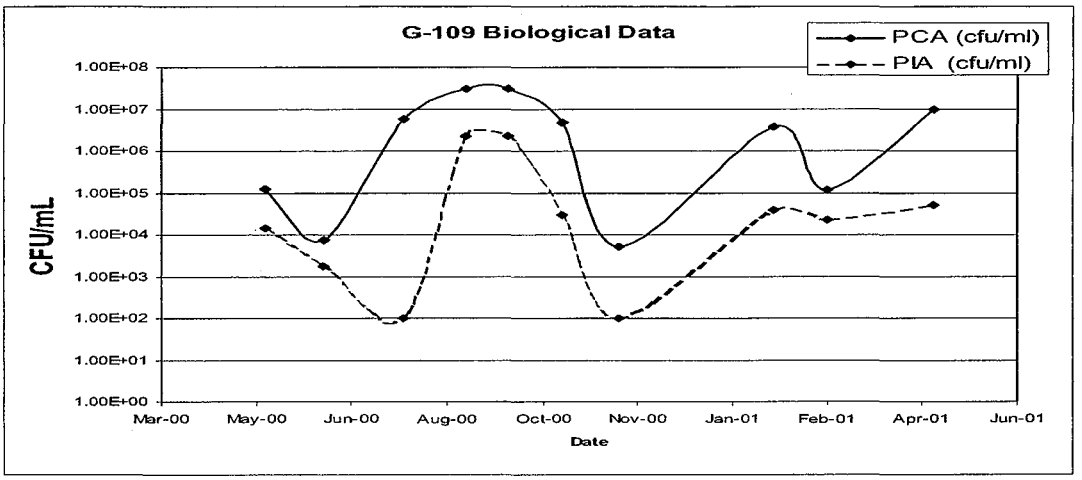
interest at the site is how the increase in conductivity will effect the bioavailability of nutrients. If the decrease in the coefficient for hydrogen ion due to the increases in salinity is balanced by the increase in the coefficient due to the increase in pH across the site the cation availability can be expected to remain unaffected by the physical chemical changes of the environment. The issues of solubuility product, sorption and desertion are not addressed in the states' assertion that a single ORC injection is capable of supplying all the necessary components necessary for biological growth. Neither does the states' assertion address the population management issues that will accompanie the disproportionate growth of non-petroleum degrading gram positive species that is expected without veragative pseudomonad augmentation.

Only those chemicals that tend to ionize are affected significantly by pH. The only influence on neutral molecules would be a change in the character of the soils' surface. However, the general increase in pH across the site will significantly affected the soil sorption of charged species, in particular cationic ions. Given the logarithmic nature of the pH scale and the general 0.5 or more increase in pH expacted at the site, the soils will have been transformed from acidic to alkaline. This change in pH has also resulted in a decrease in the charge of the soils. Under alkaline conditions, soil surface hydroxyls lose their protons and the resulting surface will be anionic. The overall effect of this change in charge will be a significant decrease in cationic ions in the aqueous phase. The nutrient augmentation and monitoring program is designed to address these issues through periodic monitoring and adjustment of nutrient feed.

Selective enumeration of the samples utilizing McKonkey's agar was utilized by TMI. McKonkey's agar selects for Pseudomonas. The correlation between toluene degrading capability of a consortia and Pseudonomad counts is well documented. Further, the Battelle paper delineates this correlation. Also as an outgrowth of our activities at the site in Princeton Illinois on which the paper was written, the methodology employed by IET to manage the population clearly indicates the augmentation of the indigenous population yields a high proportion of selective bacteria (Pseudomonas).

As shown above, in a case were no populations were present in the water sample the methods applied by IET at a similar site yielded excellent population management.





As shown above in an extreme incidence where the population of pseudomonas was relatively high at time zero, again the processes applied by IET at the site produced good population management. Generally, the BTEX:BOD:SCOD loading ratios at particular a well will produce the varied time zero variances in population ratios. It is interesting to note that the graphs presented here are from monitoring wells at the same site. The extreme differences in population dynamics is the result of the target constituent chemical loadings and the time with which the soils in the well areas have been in contact with the petroleum hydrocarbons. This heterogenaity is common and must be expected.

Phase One: Primary Active Remedial Phase – Time zero

Phase one of the remediation shall consist of the preliminary inoculation of the site via liquid injection followed by bioslurry treatment. The primary objective is to mound the groundwater through the capillary zone and supply the needed essential nutrients for bio-mineralization and dissolved oxygen for the heterotrophic respiration processes. By utilizing the entrained petroleum distillates within the targeted zone as a primary growth substrate, the active vegetative cultures shall acclimate and grow, utilizing the components of the bioslurry in their respiratory processes.

Phase I (Time zero) and Phase II (Time 100 days):

IET and its subcontractors shall inject, via the direct push equipment and the air driven injection tanks into Areas "A" and "C" 150 gallons/pt of bioslurry (or as much as the point will accept at the injecting pressure) and a pretreatment of 10 gallons of liquid heterotrophs, based on BOD/COD/TPH loadings, biological counts and historical soil contact with contaminants. Before each injection, the zone will undergo a pre-injection fracture - utilizing a ten seconds, 175 psi, 500 cfm (minimally) fracture. The location of these points' locations and the anticipated impact zone for each is presented in diagram "Phase I" - All points' field notes shall be recorded and reported in the final project report. Into area "B", 110 gallons of LPD and 1500 gallons of bioslurry shall be introduced into the six sumps.

Following the bio-inoculation and bio-slurry injection, slow release oxygen sources points shall be installed through the grid to insure continued dissolved oxygen over the site as accelerated

attenuation occurs. Each oxygen point shall receive 10 lbs of ORC in a slurry no Calcium peroxide shall be utilized due to pH management issues. Dosing based on attached calculations. Active Remediation components:

ASTRO PRODUCT CODE #6124

MATERIAL SAFETY DATA — CALCIUM PEROXIDE — FMC

1305 -79 -9 -1

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PRINTED FOR..... FMC CORPORATION

1. CHEMICAL PRODUCT/COMPANY IDENTIFICATION

PRODUCT NAME..... CALCIUM PEROXIDE
CALCIUM PEROXIDE, FOOD GRADE (75% MIN. ASSAY)

SYNONYMS..... CALCIUM SUPEROXIDE

INFORMATION PROVIDED BY.. PEROXYGEN CHEMICALS DIVISION
FMC CORPORATION
1735 MARKET STREET
PHILADELPHIA, PA. 19103
(215) 299-6000

EMERGENCY PHONE NUMBERS
CHEMTREC..... (800) 424-9300
MEDICAL..... (303) 595-9048 CALL COLLECT
PLANT/OTHER..... (716) 879-0400 CALL COLLECT

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS # AND COMPONENTS.... MATERIAL/COMPONENT: CALCIUM PEROXIDE
PERCENT..... 75% MINIMUM
CAS # 1305-79-9
MATERIAL/COMPONENT: CALCIUM HYDROXIDE
PERCENT..... 25% MAXIMUM
CAS #..... 1305-62-0

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW..... OXIDIZER! CONTACT WITH COMBUSTIBLES MAY CAUSE FIRE. UNDER FIRE CONDITIONS PRODUCT MAY DECOMPOSE RELEASING OXYGEN THAT INTENSIFIES FIRE. DELUGE CONTAINER WITH WATER AT SAFE DISTANCE OR IN PROTECTED AREA.

HEALTH EFFECTS..... AIRBORNE DUST MAY BE IRRITATING TO EYES, NOSE, THROAT AND LUNGS. NO SIGNIFICANT LONG TERM INHALATION HAZARD; IRRITATION USUALLY SUBSIDES AFTER EXPOSURE CEASES.

4. FIRST AID MEASURES

EYES..... IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER LIDS INTERMITTENTLY. SEE AN OPHTHALMOLOGIST.

SKIN..... WASH WITH WATER. IF IRRITATION OCCURS AND PERSISTS, OBTAIN MEDICAL ATTENTION.

INHALATION..... REMOVE TO FRESH AIR. IF BREATHING DISCOMFORT OCCURS AND PERSISTS, OBTAIN MEDICAL ATTENTION.

INGESTION..... IF SWALLOWED, DRINK PLENTY OF WATER. OBTAIN MEDICAL ATTENTION.

NOTES TO PHYSICIAN..... MODEST IRRITATION IS THE ONLY EXPECTED EFFECT, AND SHOULD HAVE NO SERIOUS CONSEQUENCES EXCEPT

(CONTINUED) PAGE 01

U.S./CANADA VERSION EFFECTIVE: 06/22/93 PRINTED: 05/22/96

4. FIRST AID MEASURES

PERHAPS IN THE CASE OF DIRECT EYE CONTACT. CONTAMINATED EXTERNAL SURFACES SHOULD BE FLOODED WITH WATER, AND DIRECT EYE CONTACT DESERVES OPHTHALMOLOGIC EVALUATION. IF INGESTED, GASTRO-INTESTINAL IRRITATION BUT NOT CAUSTIC BURNS ARE TO BE EXPECTED; DILUTION WITH WATER INDICATED AS MAY BE GASTRIC EVACUATION VIA EMESIS OR LAVAGE IF LARGE DOSES OR SEVERE IRRITATION IS EVIDENT. DEMULCENTS SHOULD BE HELPFUL. NO SYSTEMIC EFFECTS ARE EXPECTED THOUGH HUMAN TOXICITY DATA IS SPARSE.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA	WATER
SPECIAL FIREFIGHTING PROCEDURES	USE FLOODING QUANTITIES OF WATER. USE WATER SPRAY TO KEEP FIRE EXPOSED CONTAINERS COOL.
DEGREE OF FIRE AND EXPLOSION HAZARD	UNDER FIRE CONDITIONS MAY DECOMPOSE AND RELEASE OXYGEN GAS.
HAZARDOUS DECOMPOSITION PRODUCTS	OXYGEN THAT SUPPORTS COMBUSTION AND CALCIUM HYDROXIDE.

6. ACCIDENTAL RELEASE MEASURES

PROCEDURE FOR RELEASE OR SPILL	CONFINE SPILL AND PLACE INTO CONTAINER; DILUTE WITH LARGE QUANTITY OF WATER FOR DISPOSAL. DO NOT RETURN PRODUCT TO ORIGINAL CONTAINER. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD. DO NOT FLUSH POWDERED MATERIAL TO SEWER.

7. HANDLING AND STORAGE

HANDLING	AVOID CONTACT BY USING PERSONAL PROTECTION EQUIPMENT. USE RESPIRATORY PROTECTIVE EQUIPMENT WHEN RELEASE OF AIRBORNE DUST IS EXPECTED. IF COMPOUNDED WITH ORGANICS OR COMBUSTIBLE MATERIAL, BE SURE TO EXCLUDE MOISTURE.
VENTILATION	PROVIDE MECHANICAL LOCAL EXHAUST VENTILATION TO PREVENT THE RELEASE OF DUST INTO THE WORK ENVIRONMENT. IF VENTILATION IS INADEQUATE OR NOT AVAILABLE, USE DUST RESPIRATOR AND EYE PROTECTION.
STORAGE	KEEP MATERIAL DRY. STORE IN A CLEAN COOL PLACE. DO NOT STORE NEAR OR EXPOSE TO HEAT SOURCES I.E. STEAM PIPES, RADIANT HEATERS HOT AIR VENTS OR WELDING SPARKS. AVOID CONTACT WITH REDUCING AGENTS AND MOISTURE.

(CONTINUED) PAGE 02

U.S./CANADA VERSION EFFECTIVE: 04/22/93 PRINTED: 05/22/96

==========	8. EXPOSURE CONTROLS/PERSONAL PROTECTION =======
CONTROL MEASURES.....	PROVIDE MECHANICAL LOCAL EXHAUST VENTILATION TO PREVENT RELEASE OF DUST INTO THE WORK AREA. IF RELEASE IS EXPECTED USE RESPIRATORY PROTECTION.
RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT	
RESPIRATORY.....	USE APPROVED DUST RESPIRATOR WITH FULL FACE PIECE.
EYES.....	CHEMICAL TYPE GOGGLES AND/OR FACE SHIELD.
GLOVES.....	GENERAL PURPOSE RUBBER OR NEOPRENE.
SPECIAL CLOTHING AND EQUIPMENT	LONG SLEEVE SHIRT, IMPERIOUS APRON OR CLOTHING.
FOOTWEAR.....	GENERAL PURPOSE RUBBER OR NEOPRENE.
==========	9. PHYSICAL AND CHEMICAL PROPERTIES ==========
MELTING/FREEZING POINT...	DECOMPOSES ON HEATING (ABOUT 275°C)
BOILING POINT.....	NOT APPLICABLE
VAPOR PRESSURE.....	NOT APPLICABLE
VAPOR DENSITY (AIR=1)....	NOT APPLICABLE
ROOM TEMPERATURE.....	YELLOW TO WHITE POWDER
APPEARANCE AND STATE	
ODOR.....	NONE
SPECIFIC GRAVITY (H20=1)..	APPROX. 2.92. BULK DENSITY 27 LBS/CU.FT.
SOLUBILITY IN H2O % BY WT	INSOLUBLE
% VOLATILES.....	NOT APPLICABLE
EVAPORATION RATE.....	NOT APPLICABLE
(BUTYL ACETATE=1)	
PH (AS IS).....	NOT APPLICABLE
PH (1% SOLUTION).....	SLURRY 12 - 13
ODOR THRESHOLD.....	NOT APPLICABLE
DENSITY (G/ML).....	NOT AVAILABLE
PARTITION COEFFICIENT....	NOT AVAILABLE
N-OCTANOL/WATER	
FLASH POINT.....	NOT APPLICABLE
AUTOIGNITION TEMPERATURE.	NOT COMBUSTIBLE
FLAMMABLE LIMITS UPPER..	NOT APPLICABLE
(AIR) LOWER..	NOT APPLICABLE
EXPLOSIVE PROPERTIES.....	DECOMPOSITION AT HIGH TEMPERATURES RELEASES OXYGEN.
OXIDIZING PROPERTIES.....	OXIDIZER
SOLUBILITY.....	NO DATA
- FAT SOLUBILITY (SOLVENT - OIL)	
==========	10. STABILITY AND REACTIVITY ==========
STABILITY.....	STABLE (DECOMPOSITION COULD OCCUR WHEN EXPOSED TO HEAT OR MOISTURE)

(CONTINUED) PAGE 03

U.S./CANADA VERSION EFFECTIVE: 08/22/93 PRINTED: 05/22/96

10. STABILITY AND REACTIVITY

HAZARDOUS POLYMERIZATION	WILL NOT OCCUR
CONDITIONS TO AVOID	HEAT, MOISTURE, REDUCING AGENTS. GRINDING WITH ORGANICS.
MATERIALS TO AVOID	HEAVY METALS
MAJOR CONTAMINANTS THAT CONTRIBUTE TO INSTABILITY	MIXTURES WITH POLYSULFIDE POLYMERS MAY IGNITE. HEAT, MOISTURE, REDUCING AGENTS.
INCOMPATIBILITY	GRINDING MIXTURES WITH ORGANICS. (OXIDIZABLE MATERIALS CAN BE IGNITED BY GRINDING AND MAY BECOME EXPLOSIVE); HEAVY METALS
HAZARDOUS DECOMPOSITION PRODUCTS	OXYGEN WHICH SUPPORTS COMBUSTION.
SENSITIVITY TO MECH IMPACT	OXIDIZABLE MATERIALS CAN BE IGNITED BY GRINDING AND MAY BECOME EXPLOSIVE.
SENSITIVITY TO STATIC DISCHARGE	NO DATA AVAILABLE

11. TOXICOLOGICAL INFORMATION

EYE CONTACT	SEVERELY IRRITATING TO UNWASHED EYES; MINIMALLY IRRITATING TO WASHED EYES (RABBIT) REF. FMC 188-1053
SKIN CONTACT	NON-IRRITATING (RABBIT) REF. FMC 188-1054
SKIN ABSORPTION	DERMAL LD50 ABOVE 10 GM/KG (RABBIT) REF. FMC ICG/T. 79,026
INHALATION	LC50 ABOVE 17 MG/L (1HR.-RAT). REF. FMC ICG T/79,026
INGESTION	ORAL LD50 ABOVE 5 GM/KG (RAT) REF. FMC 188-1052
ACUTE EFFECTS FROM OVEREXPOSURE	DUST IRRITATING TO EYES, NOSE, THROAT AND LUNGS.
CHRONIC EFFECTS FROM OVEREXPOSURE (EFFECTS CONSIDERED INCLUDE: SENSITIVITIES, CARCINOGENICITY, TERATOGENICITY, MUTAGENICITY, SYNERGISTIC PRODUCTS, AND ANY MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE.)	NO CHRONIC PROBLEMS ON RECORD.

(CONTINUED) PAGE 04

U.S./CANADA VERSION EFFECTIVE: 06/22/93 PRINTED: 05/22/96

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE	AS INDICATED BY CHEMICAL PROPERTIES, OXYGEN IS RELEASED INTO ENVIRONMENT.
ENVIRONMENTAL EFFECTS	EFFECT OF LOW CONCENTRATIONS ON AQUATIC LIFE NOT DETERMINED. REF. NIOSH RTECHS NO. 79-100.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD	DISSOLVE IN WATER TO ALLOW THE RELEASE OF OXYGEN AND DISPOSE VIA A TREATMENT SYSTEM IN ACCORDANCE WITH GOVERNMENTAL AGENCIES REGULATIONS. CONTACT APPROPRIATE REGULATORY AGENCY PRIOR TO DISPOSAL.

14. TRANSPORT INFORMATION

DOT PROPER SHIPPING NAME	CALCIUM PEROXIDE
IATA	CALCIUM PEROXIDE
IMDG	CALCIUM PEROXIDE
DOT CLASSIFICATION	5.1 OXIDIZER
DOT LABELS	OXIDIZER
DOT MARKING	CALCIUM PEROXIDE UN 1457
DOT PLACARD	5.1 OXIDIZER
UN NUMBER	UN 1457
HAZARDOUS SUBSTANCE/RQ	NOT APPLICABLE
49 STCC NUMBER	4918717
PRECAUTIONS TO BE TAKEN IN TRANSPORTATION	PLACE SPILLED MATERIAL IN SUITABLE CONTAINER AND WASH RESIDUE WITH PLENTY OF WATER.
OTHER SHIPPING INFORMATION	100 LB. FIBER DRUMS DOT 21C115 W/POLYLINER. PACKING GROUP II

15. REGULATORY INFORMATION

OSHA EXPOSURE LIMITS

SUBSTANCE(S)	CALCIUM PEROXIDE	CALCIUM HYDROXIDE
OSHA PEL-TWA	N.A.	5 MG/CU.M
STEL	N.A.	N.A.
CEILING	N.A.	N.A.
SKIN DESIGNATION	N.A.	N.A.
ACGIH TLV-TWA	N.A.	5 MG/CU.M
STEL	N.A.	N.A.
CEILING	N.A.	N.A.
SKIN DESIGNATION	N.A.	N.A.

TARGET ORGAN EFFECTS	EYES AND RESPIRATORY PASSAGES
CARCINOGENIC POTENTIAL	CALCIUM PEROXIDE AND COMPONENTS
REGULATED BY OSHA	NO

(CONTINUED) PAGE 05

U.S./CANADA VERSION EFFECTIVE: 08/22/93 PRINTED: 05/22/95

15. REGULATORY INFORMATION

LISTED ON NTP REPORT...	NO
IARC GROUP 1, 2A, 2B...	NO
U.S. EPA REQUIREMENTS	
RELEASE REPORTING	
CERCLA (40 CFR 302)	CALCIUM PEROXIDE AND COMPONENTS
LISTED SUBSTANCE(S)....	NO
RQ.....	N.A.
CATEGORY.....	N.A.
RCRA WASTE NO....	N.A.
UNLISTED SUBSTANCE(S)..	YES
RQ.....	100 LBS
CHARACTERISTIC...	CORROSIVITY, IGNITABILITY
RCRA WASTE NO....	D002, D001
SARA TITLE III SEC 313	
(40 CFR 372).....	CALCIUM PEROXIDE, CALCIUM HYDROXIDE
LISTED TOXIC CHEMICAL..	NO
INVENTORY REPORTING	
SARA TITLE III SEC 311/312	
(40 CFR 370)	
SUBSTANCE(S).....	CALCIUM PEROXIDE, CALCIUM HYDROXIDE
HAZARD CATEGORY.....	IMMEDIATE (ACUTE) HEALTH HAZARD FIRE HAZARD
PLANNING THRESHOLD.....	10,000 LBS.
EMERGENCY PLANNING	
SARA TITLE III SEC 302-303	
(40 CFR 355)	
LISTED SUBSTANCE(S)....	NO
RQ.....	NOT APPLICABLE
PLANNING THRESHOLD.....	NOT APPLICABLE
U.S. TSCA STATUS.....	LISTED 12
CANADA	
INGREDIENT DISCLOSURE LIST	
SUBSTANCE(S).....	CALCIUM HYDROXIDE
CONTROLLED PRODUCT.....	YES
HAZARD SYMBOLS.....	MATERIALS CAUSING OTHER TOXIC EFFECTS, OXIDIZER
CLASS & DIVISION.....	CLASS D: DIV. 2: SUBDIV. B: CLASS C
PRODUCT IDENTIFICATION NO:	1457.
DOMESTIC SUBSTANCE LIST..	LISTED
CEPA PRIORITY LIST.....	NOT LISTED
CARCINOGENICITY	
ACGIH APPENDIX A.....	NOT LISTED
A1 - CONFIRMED HUMAN...	NOT APPLICABLE
A2 - SUSPECTED HUMAN...	NOT APPLICABLE
IARC GROUP 1 OR 2.....	NO
LABEL LANGUAGE (US/CANADA)	
HEALTH.....	AIRBORNE DUST IS IRRITATING TO EYES, NOSE THROAT AND LUNGS. NO SIGNIFICANT LONG TERM

(CONTINUED) PAGE 06

U.S./CANADA VERSION EFFECTIVE: 06/22/93 PRINTED: 05/22/96

15. REGULATORY INFORMATION

PHYSICAL	INHALATION HAZARD. IRRITATION SUBSIDES AFTER EXPOSURE CEASES. REACTS WITH MOISTURE TO LIBERATE OXYGEN WHICH INITIATES OR PROMOTES COMBUSTION IN OTHER MATERIALS. DECOMPOSES TO RELEASE OXYGEN.
HANDLING AND STORAGE	WEAR SUITABLE PROTECTIVE EQUIPMENT. AVOID CONTAMINATION. KEEP MATERIAL DRY. STORE IN A CLEAN DRY PLACE. DO NOT STORE NEAR OR EXPOSE TO HEAT SUCH AS STEAM PIPES, RADIANT HEATERS, HOT AIR VENTS OR WELDING SPARKS. AVOID CONTACT WITH REDUCING AGENTS. REACTS WITH MOISTURE. IF COMPOUNDED WITH ORGANICS OR COMBUSTIBLE MATERIAL, BE SURE TO EXCLUDE MOISTURE. KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE. FOR STORAGE REQUIREMENTS, REFER TO THE NFPA BULLETIN 43A ON THE STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS.
FIRST AID	IMMEDIATELY FLUSH EYES AND SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF IRRITATION OCCURS AND PERSISTS, OBTAIN MEDICAL ATTENTION.
STATE REGULATIONS	PROPOSITION 65 - CALIFORNIA SAFE DRINKING WATER AND TOXICS ENFORCEMENT ACT OF 1986 REQUIRES THAT THE GOVERNMENT OF CALIFORNIA DEVELOP A LIST OF CARCINOGENS(A) AND REPRODUCTIVE TOXINS(B). NO PERSONS DOING BUSINESS SHALL KNOWINGLY EXPOSE ANY INDIVIDUAL TO CHEMICALS ON THIS LIST WITHOUT FIRST GIVING CLEAR AND REASONABLE WARNING. THIS PRODUCT CONTAINS LESS THAN 3 PPM ARSENIC(A); 0.5 PPM CHROMIUM(A); AND 5 PPM LEAD(B).

16. OTHER INFORMATION

PRODUCT USES	CALCIUM PEROXIDE IS USED AS A CURING AGENT IN CERTAIN RUBBER COMPOUNDS. OTHER USES INCLUDE STARCH MODIFICATION, DOUGH CONDITIONER, AND AS AN INGREDIENT IN DEODORANTS, COSMETICS, AND DENTRIFICES.
NFPA 704	
HEALTH	1
FLAMMABILITY	0
REACTIVITY	1
SPECIAL HAZARD	OX

(DEGREE OF HAZARD
0 = NO HAZARD
4 = SEVERE HAZARD)

(CONTINUED) PAGE 07

U.S./CANADA VERSION	EFFECTIVE: 06/22/93	PRINTED: 05/23/96

THE CONTENTS AND FORMAT OF THIS MSDS ARE IN ACCORDANCE WITH OSHA HAZARD COMMUNICATION AND CANADA'S WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

Innovative Environmental Technologies, Inc.

MATERIAL SAFETY DATA SHEET
PRODUCT: Liquid Petroleum Degrader (LPD)

Information

I. Product Identification 888-721-8283

Form:	Slightly Turbid Liquid
Color:	Cloudy
Odor:	Slight

II. Hazardous Ingredients

None

III. Physical/Chemical Characteristics

Specific Gravity:	1.0 ± 0.01 g/ml
Water Solubility:	Soluble
pH of 10% Solution:	8.0 ± 0.2
Particle Size:	N/A
Moisture (% Wet Wt.):	> 95%

IV. Fire and Explosion Hazard

Flash Point:	NA
Special Fire Fighting Procedures:	Self-contained breathing apparatus
Extinguishing Media:	Water

V. Reactivity Data

Stability:	Stable
Incompatibility:	Excessive heat, ignition sources, strong acids, and strong oxidizers
Hazardous Byproducts:	Carbon monoxide, carbon dioxide, oxides of sulfur, aldehydes
Hazardous Polymerization:	Will not occur.

VI. Health Hazard Data

Eye Contact:	May cause irritation.
First Aid:	Flush with water for at least 15 minutes. Contact physician.
Recommended Precautions:	Safety goggles. Avoid enclosed environment.
Skin Contact:	Exposure may irritate sensitive skins.
First Aid:	Wash with soap and water. Remove contaminated clothing
Recommended Precautions:	Limit exposure. Use rubber gloves. Do not handle product directly.
Ingestion:	May lead to nausea or diarrhea.
First Aid:	Give two glasses of water to dilute product, do not induce vomiting. Contact physician if condition persists.
Recommended Precautions:	Store in safe place. Avoid splashing.

Inhalation:	Large amounts may cause sensitive individuals to cough.
First Aid:	Remove individual to fresh air, and loosen clothing around neck.. Contact physician if condition persists.
Recommended Precautions:	Ensure adequate ventilation.
General Precautions:	Treat as you would any chemical or biological materials. Always wash hands thoroughly after use.

VII. Storage and Handling of Product

Recommended Storage:	Store in dry area between 41° F and 104° F (5° C and 40° C).
Precautions for Handling:	No danger from handling packaged material. Ensure containers remain sealed.
Waste Disposal:	Uncontaminated spillages can be returned to the container. Product is biodegradable. Check local and state authority requirements for disposal of large quantities.

VIII. Biological Hazard Data

Microbial Formulation:	The product formulation consists of a range of naturally-occurring microorganisms which are known to be non-pathogenic to humans, livestock, and agricultural crops. Contains *Pseudomonas cepacia* [CAS# 68332-96-7] (renamed Burkholdia sp.), *Pseudomonas putida* [CAS# 68332-91-2], *Pseudomonas aeruginosa* [CAS# 68583-29-9],*Pseudomonas fluorescens* [CAS# 68332-93-4].

IX. Regulatory Information

All the organisms contained herein are classified as Biosafety Level I, as recognized by the American type Culture Collection (www.atcc.org), and Center for Disease control. Biosafety level I means these organisms are not associated with human or animal disease.

X. Manufacturer's Information

Innovative Environmental Technologies, Inc.
830 Bear Tavern Road
Suite 301
Ewing, New Jersey 08628
(888) 721-8283, Fax (609) 538-1991

MATERIAL SAFETY DATA SHEET

24 - HOUR EMERGENCY ASSISTANCE:

INNOVATIVE ENVIRONMENTAL TECHNOLOGIES 1-888-721-8283
CHEMTREC 1-800-424-9300

MANUFACTURER:

INNOVATIVE ENVIRONMENTAL TECHNOLOGIES
830 BEAR TAVERN ROAD
SUITE 301
EWING, NJ 08628
888-721-8283

PRODUCT IDENTIFICATION:

TRADE NAME: BIO IET-3

COMPONENTS:

1. Urea
   - CAS Number: 57-13-6
   - Synonym(s): Carbamide; Carbonyldiamine; Carbamidic Acid
   - Chemical Family: Amide
   - Molecular Formula: CH_4N_2O
   - Molecular Weight: 60.07
2. Diammonium Phosphate (DAP)
   - CAS Number: 7783-28-0
   - Synonym(s): Ammonium phosphate, Diammonium hydrogen phosphate, Dibasic ammonium phosphate
   - Chemical Family: Salt
   - Molecular Formula: $(NH_4)_2HPO_4$
   - Molecular Weight: 132.06
3. Monoacidum Phosphate (MSP)
   - CAS Number: 7558-80-7
   - Synonym(s): Sodium acid phosphate, Sodium phosphate monobasic, Sodium dihydrogen phosphate
   - Chemical Family: Salt
   - Molecular Formula: NaH_2PO_4
   - Molecular Weight: 119.98

PRODUCT HAZARD SUMMARY:

HEALTH: May be harmful if swallowed. May be irritating to the skin, eyes and respiratory tract. Heated material may cause thermal burns.

FLAMMABILITY: Non-combustible

REACTIVITY: Stable

PRODUCT HEALTH HAZARD INFORMATION:

INGESTION: Slightly toxic. Domestic animal oral LD50 of Urea is 511 mg/kg. Acute oral LD50 of Diammmonium Phosphate is >1000 mg/kg in male rats. May cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

SKIN: Slightly irritating. Repeated or prolonged skin contact may cause reddening, itching and inflamation. Contact with heated material mat cause thermal burns.

EYE: Slightly irritating. Contact with heated material may cause thermal burns.

INHALATION: May cause respiratory tract irritation.

SPECIAL TOXIC EFFECTS: Asthmatics exposed to dust may have difficulty in breathing. Urea is a naturally occuring chemical in the body. It is an end product of protein metabolism and is excreted in the urine.

FIRST AID:

INGESTION: Do not induce vomiting. Keep affected person warm and at rest. Get medical attention.

SKIN CONTACT: Wash area of contact thoroughly with soap and water. Launder clothing before reuse. Get medical attention if irritation persists. For contact with molten product, do not remove contaminated clothing. Flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. Pack with ice. Thermal burns require immediate attention.

EYE CONTACT: Flush immediately with large amounts of water for at least fifteen minutes. Eyelids should be held away from eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

INHALATION: Remove affected person from source of exposure. If not breathing, ensure open airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. Get medical attention.

PERSONAL PROTECTION INFORMATION:

EYE PROTECTION: Wear safety glasses or chemical goggles to prevent eye contact. Do not wear contact lenses when working with this substance. Have eye washing facilities readily available where eye contact can occur.

SKIN PROTECTION: Wear impervious gloves and protective clothing to prevent skin contact. Suggested protective materials are butyl rubber.

RESPIRATORY PROTECTION: None normally needed. Use NIOSH or MSHA approved equipment when airborne exposure limits are exceeded. NIOSH/MSHA approved breathing equipment must be available for non-routine and emergency use.

PHYSICAL PROPERTIES:

BOILING POINT:	Decomposes
SPECIFIC GRAVITY:	NA
MELTING POINT:	133-211 C (271-412 F)) DAP decomposes at 155 C (311 F)
% VOLATILE:	NA
VAPOR PRESSURE:	NA
EVAPORATION RATE (WATER=1)	NA
VAPOR DENSITY (AIR=1)	NA
VISCOSITY:	NA

% SOLUBILITY IN WATER, GM/100 GM @ 25 C	Urea	119
	DAP	41
	MSP	71

OCTANOL/WATER PARTITION COEFFICIENT: ND
POUR POINT: NA
pH ND

APPEARANCE/ODOR: White granules with little to no odor. Ammonia odor will develop upon long standing.

FIRE AND EXPLOSION DATA:

FLASH POINT: NA
AUTOIGNITION TEMERATURE: NA
FLAMMABILITY LIMITS IN AIR (% BY VOLUME) LOWER: NA
FLAMMABILITY LIMITS IN AIR (% BY VOLUME) UPPER: NA

BASIC FIREFIGHTING PROCEDURES: Use extinguishing agent suitable for type of surrounding fire. Material itself burns with great difficulty. Urea becomes slippery when wet. Guard against falls.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Fire may produce poisonous or irritating gas, fumes or vapor. Irritating or toxic substances may be emitted upon thermal decomposition. Exposed firefighters should wear MSHA/NIOSH approved self-contained breathing apparatus with full face mask and full protective equipment. Uncontaminated Urea, DAP and MSP are not explosion hazards. They may form explosive mixtures subject to spontaneous dentonation when contaminated with strong acids (nitric, picric, perchloric) or nitrate fertilizers. At elevated temperature dry Urea may omit ammonia. Wet Urea may hydrolize to corrosive ammonium carbamate. Aqueous solution of Urea at elevated temperatures may decompose to highly toxic hydrogen cyanide. DAP decomposes upon heating to ammonia and polyphosphoric acid.

REACTIVITY DATA:

STABILITY/INCOMPATIBILITY: Stable when stored dry at up to 160 F and atmospheric pressure. Avoid contact with strong oxidizers, acids and bases, and nitrates. Decomposes to ammonia, biuret, NO_X, CO_X and polyphosporic acid.

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS: Thermal decomposition products may be hazardous. Urea reacts with sodium or calcium hypochlorite to form explosive nitrogen trichloride. Dicy heated with ammonium nitrate at 170 C or higher, forms explosive nitroguanidine. Diammonium phosphate will react with alkali to liberate ammonia.

ENVIRONMENTAL INFORMATION:

SPILL OR RELEASE TO THE ENVIRONMENT: No special procedures are required for clean-up of this material. Avoid methods that result in water pollution. Caution should be exercised regarding personnel safety and exposure to the material as set forth elsewhere in this data sheet.

EMERGENCY ACTION: Keep unnecessary people away.

WASTE DISPOSAL: This substance, when discarded or disposed of, is not specifically listed as a hazardous waste in Federal regulations; however it could be hazardous if it is considered toxic, corrosive, ignitable or reactive according to Federal definitions (40 CFR 261). Additionally, it could be designated as hazardous according to state regulations. This substance could also become a hazardous

waste if it is mixed with or comes in contact with a hazardous waste. If such contact or mixing have occurred, check 40 CFR 261 to determine whether it is a hazardous waste. If it is a hazardous waste, regulations at 40 CFR 262, 263 and 264 apply.

The transportation, storage, treatment and disposal of this waste material must be conducted in compliance with all applicable Federal, state and local regulations.

SARA TITLE III INFORMATION: Listed here are the hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370):

Immediate Hazard-no-Delayed Hazard-no-Fire Hazard-no-Pressure Hazard-no
Reactivity Hazard-no

ADDITIONAL ENVIRONMENTAL REGULATORY INFORMATION: There may be specific regulations at the local, regional or state level that pertain to this material.

REGULATORY INFORMATION:

All components of this product are listed on the TSCA Inventory.
All components of this product are listed on the Canadian DSL Inventory.

HANDLING AND STORAGE INFORMATION:

HANDLING/STORAGE: Store in tightly closed containers in cool, dry, isolated, well ventilated area away from heat, sources of ignition and incompatibles. Avoid contamination with other "look-alike" materials that may produce an explosion hazard (see Unusual Fire and Explosion Hazards section).

EMPTY CONTAINERS: Empty containers may contain product residue. Do not reuse without adequate precautions.

TRANSPORTATION REQUIREMENTS:

D.O.T. Proper Shipping Name (49 CFR 172.101)	NA
D.O.T. Hazard Class (49 CFR 172.101)	NA
UN/NA Code (49 CFR 172.101)	NA
Bill of Lading Description (49 CFR 172.202)	BIO IET-3
D.O.T. Labels Required (49 CFR 172.101)	NA
D.O.T. Placards Required	NA

INGREDIENTS AND HEALTH HAZARD INFORMATION:

COMPONENTS	CAS NUMBER	%	EXPOSURE LIMITS-REF.
Urea	57-13-6	50	10 mg/M^3 (total) TLV (ACGIH), as nuisance dust
DAP	7783-28-0	25	ND
MSP	7558-80-7	25	ND

Revision Date: 8 March, 2002

NA = Not Applicable
ND = No Data

MATERIAL SAFETY DATA SHEET

24 - HOUR EMERGENCY ASSISTANCE:

CHEMTREC 1.800.424.9300

MANUFACTURER:

INNOVATIVE ENVIRONMENTAL TECHNOLOGIES
P. O. BOX 672
81 MARTER AVE.
MT. LAUREL, NJ 08054
856.721.8283

PRODUCT IDENTIFICATION:

TRADE NAME: BIO NUTRI-SOURCE

COMPONENTS:

1. Urea
   - CAS Number: 57-13-6
   - Synonym(s): Carbamide; Carbonyldiamine; Carbamidic Acid
   - Chemical Family: Amide
   - Molecular Formula: CH_4N_2O
   - Molecular Weight: 60.07
2. Monosodium phosphate, Anhydrous (MSP)
   - CAS Number: 7558-80-7
   - Synonym(s): MSP; Sodium phosphate, monobasic; Phosphic acid, monosodium salt
   - Chemical Family: Salt
   - Molecular Formula: NaH_2PO_4
   - Molecular Weight: 119.97
3. Dicyandiamide (Dicy)
   - CAS Number: 461-58-5
   - Synonym(s): Dicy, Cyanoguanidine
   - Chemical Family: Amide
   - Molecular Formula: $H_2NC(=NH)NHCN$
   - Molecular Weight: 84.08

PRODUCT HAZARD SUMMARY:

HEALTH: May be harmful if swallowed. May be irritating to the skin, eyes and respiratory tract. Heated material may cause thermal burns.

FLAMMABILITY: Non-combustible

REACTIVITY: Stable

PRODUCT HEALTH HAZARD INFORMATION:

INGESTION: Slightly toxic. Domestic animal oral LD50 of Urea is 511 mg/kg. Acute oral LD50 of Mono Sodium phosphate is 7100 mg/kg in male rats. May cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

SKIN: Slightly irritating. Repeated or prolonged skin contact may cause reddening, itching and inflamation. Contact with heated material mat cause thermal burns.

EYE: Slightly irritating. Contact with heated material may cause thermal burns.

INHALATION: May cause respiratory tract irritation.

SPECIAL TOXIC EFFECTS: Asthmatics exposed to dust may have difficulty in breathing. Urea is a naturally occuring chemical in the body. It is an end product of protein metabolism and is excreted in the urine.

FIRST AID:

INGESTION: Do not induce vomiting. Keep affected person warm and at rest. Get medical attention.

SKIN CONTACT: Wash area of contact thoroughly with soap and water. Launder clothing before reuse. Get medical attention if irritation persists. For contact with molten product, do not remove contaminated clothing. Flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. Pack with ice. Thermal burns require immediate attention.

EYE CONTACT: Flush immediately with large amounts of water for at least fifteen minutes. Eyelids should be held away from eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

INHALATION: Remove affected person from source of exposure. If not breathing, ensure open airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. Get medical attention.

PERSONAL PROTECTION INFORMATION:

EYE PROTECTION: Wear safety glasses or chemical goggles to prevent eye contact. Do not wear contact lenses when working with this substance. Have eye washing facilities readily available where eye contact can occur.

SKIN PROTECTION: Wear impervious gloves and protecive clothing to prevent skin contact. Suggested protective materials are butyl rubber.

RESPIRATORY PROTECTION: None normally needed. Use NIOSH or MSHA approved equipment when airborne exposure limits are exceeded. NIOSH/MSHA approved breathing equipment must be available for non-routine and emergency use.

PHYSICAL PROPERTIES:

BOILING POINT:	Decomposes
SPECIFIC GRAVITY:	NA
MELTING POINT:	133-662 C (271-1224 F)
% VOLATILE:	NA
VAPOR PRESSURE:	NA
EVAPORATION RATE (WATER=1)	NA
VAPOR DENSITY (AIR=1)	NA
VISCOSITY:	NA

% SOLUBILITY IN WATER, GM/100 GM @ 25 C	Urea	118
	MSP	92.3
	Dicy	4
OCTANOL/WATER PARTITION COEFFICIENT:	ND	
POUR POINT:	NA	
pH	ND	

APPEARANCE/ODOR: White granules with little to no odor. Ammonia odor will develop upon long standing.

FIRE AND EXPLOSION DATA:

FLASH POINT:	NA
AUTOIGNITION TEMERATURE:	NA
FLAMMABILITY LIMITS IN AIR (% BY VOLUME) LOWER:	NA
FLAMMABILITY LIMITS IN AIR (% BY VOLUME) UPPER:	NA

BASIC FIREFIGHTING PROCEDURES: Use extinguishing agent suitable for type of surrounding fire. Material itself burns with great difficulty. Urea becomes slippery when wet. Guard against falls.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Fire may produce poisonous or irritating gas, fumes or vapor. Irritating or toxic substances may be emitted upon thermal decomposition. Exposed firefighters should wear MSHA/NIOSH approved self-contained breathing apparatus with full face mask and full protective equipment. Uncontaminated Urea, MSP and Dicy are not explosion hazards. They may form explosive mixtures subject to spontaneous dentonation when contaminated with strong acids (nitric, picric, perchloric) or nitrate fertilizers. At elevated temperature dry Urea may emit ammonia. Wet Urea may hydrolize to corrosive ammonium carbamate. Aqueous solution of Urea at elevated temperatures may decompose to highly toxic hydrogen cyanide.

REACTIVITY DATA:

STABILITY/INCOMPATIBILITY: Stable when stored dry at up to 160 F and atmospheric pressure. Avoid contact with strong oxidizers, acids and bases, and nitrates. Decomposes to ammonia, biuret, cyanuric acid, NO_X, CO_X and polyphosporic acid.

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS: Thermal decomposition products may be hazardous. Urea reacts with sodium or calcium hypochlorite to form explosive nitrogen trichloride. Dicy heated with ammonium nitrate at 170 C or higher, forms explosive nitroguanidine.

ENVIRONMENTAL INFORMATION:

SPILL OR RELEASE TO THE ENVIRONMENT: No special procedures are required for clean-up of this material. Avoid methods that result in water pollution. Caution should be exercised regarding personnel safety and exposure to the material as set forth elsewhere in this data sheet.

EMERGENCY ACTION: Keep unnecessary people away.

WASTE DISPOSAL: This substance, when discarded or disposed of, is not specifically listed as a hazardous waste in Federal regulations; however it could be hazardous if it is considered toxic, corrosive, ignitable or reactive according to Federal definitions (40 CFR 261). Additionally, it could be designated as hazardous according to state regulations. This substance could also become a hazardous waste if it is mixed with or comes in contact with a hazardous waste. If such contact or mixing have occurred, check 40 CFR 261 to determine whether it is a hazardous waste. If it is a hazardous waste, regulations at 40 CFR 262, 263 and 264 apply.

The transportation, storage, treatment and disposal of this waste material must be conducted in compliance with all applicable Federal, state and local regulations.

SARA TITLE III INFORMATION: Listed here are the hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370):

Immediate Hazard-no-Delayed Hazard-no-Fire Hazard-no-Pressure Hazard-no
Reactivity Hazard-no

ADDITIONAL ENVIRONMENTAL REGULATORY INFORMATION: There may be specific regulations at the local, regional or state level that pertain to this material.

REGULATORY INFORMATION:

All components of this product are listed on the TSCA Inventory.
All components of this product are listed on the Canadian DSL Inventory.

HANDLING AND STORAGE IMFORMATION:

HANDLING/STORAGE: Store in tightly closed containers in cool, dry, isolated, well ventilated area away from heat, sources of ignition and incompatibles. Avoid contamination with other "look-alike" materials that may produce an explosion hazard (see Unusual Fire and Explosion Hazards section).

EMPTY CONTAINERS: Empty containers may contain product residue. Do not reuse without adequate precautions.

TRANSPORTATION REQUIREMENTS:

D.O.T. Proper Shipping Name (49 CFR 172.101)	NA
D.O.T. Hazard Class (49 CFR 172.101)	NA
UN/NA Code (49 CFR 172.101)	NA
Bill of Lading Description (49 CFR 172.202)	BIOBLEND RAPID
D.O.T. Labels Required (49 CFR 172.101)	NA
D.O.T. Placards Required	NA

INGREDIENTS AND HEALTH HAZARD INFORMATION:

COMPONENTS	CAS NUMBER	%	EXPOSURE LIMITS-REF.
Urea	57-13-6	72	10 mg/M^3 (total) TLV (ACGIH), as nuisance dust
MSP	7558-80-7	25	10 mg/M^3 TLV/TWA (ACGIH), as nuisance dust
Dicy	461-58-5	2	ND

Revision Date: 29 January, 1999

NA = Not Applicable
ND = No Data

VAN WATERS & ROGERS INC -- HYDROGEN PEROXIDE (20 TO 60%)

MSDS Safety Information

FSC: 6810
MSDS Date: 04/03/1998
MSDS Num: CHTWL
LIIN: 00N039289
Product ID: HYDROGEN PEROXIDE (20 TO 60%)
MFN: 01
Responsible Party
Cage: D0735
Name: VAN WATERS & ROGERS INC
Address: 6100 CARILLON POINT
City: KIRKLAND WA 98033-7357
Info Phone Number: 425-889-3617
Emergency Phone Number: 800-424-9300 (CHEMTREC)
Published: Y

Contractor Summary

Cage: D0735
Name: VAN WATERS & ROGERS SUB OF UNIVAR
Address: 6100 CARILLON POINT
City: KIRKLAND WA 98033
Phone: 425-889-3400
Cage: 0STM5
Name: VAN WATERS AND ROGERS INC
Address: 6100 CARILLON POINT
City: KIRKLAND WA 98033-7357
Phone: 425-889-3400/425-889-3617

Ingredients

Cas: 7722-84-1
RTECS #: MX0900000
Name: HYDROGEN PEROXIDE (SARA 302)
% Wt: 20-60
OSHA PEL: 1 PPM
ACGIH TLV: 1 PPM

Cas: 7732-18-5
RTECS #: ZC0110000
Name: WATER
% Wt: 40-80
OSHA PEL: N/K (SP N)
ACGIH TLV: N/K (SP N)

Name: EXPLO HAZ: MAY CAUSE FIRE. EFTS MAY BE DELAYED. CONT W/ORG LIQS/VAPS MAY CAUSE IMMED FIRE/EXPLO, ESP IF HEATED.

Name: ING 3: UNDER CERTAIN CNDTNS, DETONATION MAY BE DELAYED. OXYGEN RELEASE FROM HYDROGEN PEROXIDE MAY FORCE ORG OR

Name: ING 4: HYDROGEN VAPORS INTO EXPLOSION RANGE. FOLLOW APPROP NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES.

Name: HAZ DECOMP PROD: PRESS. MAY REACT DANGEROUSLY W/RUST, DUST, IRON, COPPER, HEAVY METALS/THEIR SALTS (SUCH AS

Name: ING 6: MERCURIC OXIDE/CHLORIDE), ALKALIES, & WITH ORGANIC MATERIALS (ESPECIALLY VINYL MONOMERS).

Name: EFTS OF OVEREXP: DISCOMFORT, DFCLTY BRTHG/SHORTNESS OF BREATH; OR FATALITY FROM GROSS OVEREXP. INGEST MAY CAUSE

Name: ING 8: IRRIT OF GI TRACT W/UPPER ABDOM PAIN, "HEARTBURN", NAUS, VOMIT, & DIARR. "COFFEE GROUNDS" VOMITUS & BLACK

Name: ING 9: TARRY STOOLS MAY OCCUR AS RSLT OF GI TRACT BLEEDING. ADDNL EFTS FROM OVEREXP INCL RED BLOOD CELL DESTRUCT

Name: ING 10: OR GAS EMBOLISM. WHEN USED AS COLONIC LAVAGE, HYDROGEN PEROXIDE HAS CAUSED GAS EMBOLISM & GANGRENE OF

Name: ING 11: INTESTINE AT CONCS DOWN TO 0.75%. GROSS OVEREXP BY INGEST MAY BE FATAL. FOR TOXICOLOGICAL INFO CONT NIOSH (RTP N).

Name: FIRST AID PROC: BY MOUTH TO AN UNCON PERS. CALL MD. NOTES TO MD: IF SWALLOWED, LGE AMTS OF OXYGEN MAY BE

Name: ING 13: RELEASED QUICKLY. DISTENSION OF STOM/ESOPHAGUS MAY BE INJURIOUS. INSERTION OF GASTRIC TUBE MAY BE ADVISABLE.

Name: SPILL PROC: METABISULFITE/SODIUM SULFITE (1.9 LBS SO*2 EQUIVALENT PER LB OF PEROXIDE) AFTER DILUTING TO 5-10%

Name: ING 15: PEROXIDE. REPORTABLE QTY FOR >52% HYDROGEN PEROXIDE IS 1 LB. IF HYDROGEN PEROXIDE (20-60%) IS SPILLED &

Name: ING 16: NOT RECOVERED, OR IS RECOVERED AS WASTE FOR TREATMENT OR DISPOSAL, THE CERCLA REPORTABLE QUANTITY IS 100 LBS.

Name: WASTE DISP METH: REGULATED HAZ WASTE UPON DISPOSAL DUE TO THE OXIDIZING CHARACTERISTICS UNDER IGNITABILITY CATEGORY.

Name: OTHER PREC: IMPURITIES, CONTAMINANTS, TEMPS, ETC. NEVER USE PRESS TO EMPTY DRUMS. STORE IN PROPERLY VENTED CONTR

Name: ING 19: OR IN APPRVD BULK STOR FACILITIES. DO NOT BLOCK VENT. DO NOT STORE ON WOODEN PELLETS/WHERE CONT WITH

Name: ING 20: INCOMPATIBLE MATLS COULD OCCUR, EVEN W/SPILL. HAVE WATER SOURCE AVAIL FOR DILUTING. DO NOT ADD ANY OTHER

Name: ING 21: PROD TO CONTR. NEVER RETURN USED/UNUSED PEROXIDE TO CONTR, INSTEAD DILUTE W/PLENTY OF WATER & DISCARD.

Name: ING 22: RINSE EMPTY CONTAINERS THOROUGHLY WITH CLEAN WATER BEFORE DISCARDING.

Name: OTHER PROT EQUIP: SUIT W/BRTHG AIR SUPPLY. MATLS SUCH AS NATRL RUBB, NATRL RUBB PLUS NEOPRENE, NITRILE/PVC

Name: ING 24: AFFORD ADEQ PROT. ADEQ PERS PROT IS ESSENTIAL FOR ALL INDUSTRIAL CONCENTRATIONS. SKIN CREAMS SHOULD NOT BE USED.

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Health Hazards Data

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LD50 LC50 Mixture: LD50(ORAL RAT): 1232 MG/KG (35% H*2O*2).

Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: ACUTE: SKIN: CONT W/AQUEOUS SOLNS OF <50% MAY CAUSE IRRIT W/DISCOMFORT/RASH. HIGHER/PRLNG EXPOS MAY RSLT IN SKIN BURNS/ULCERATION. EVIDENCE SUGGESTS THAT SKIN PERMEATION CAN OCCUR IN AMTS CAPABLE OF PRODUCING SYSTEMIC TOXICITY. EFTS OF EYE CONT W/AQUEOUS SOLNS OF <5% MAY INCL EYE IRRIT W/DISCOMFORT, (EFTS OF OVEREXP)
Explanation Of Carcinogenicity: NOT RELEVANT.
Signs And Symptions Of Overexposure: HLTH HAZ: TEARING/BLURRING OF VISION. HIGHER/PRLNG EXPOS MAY RSLT IN EYE CORR W/CORNEAL/CONJ ULCERATION. CONT W/AQUEOUS CONCS OF >10% MAY RSLT IN EYE CORR W/CORNEAL/CONJ ULCERATION WHICH CAN LEAD TO BLINDNESS. INHAL MAY CAUSE NAUS, HDCH/WEA K. HIGHER INHAL EXPOS MAY LEAD TO TEMPORARY LUNG IRRIT EFTS W/COUGH,
Medical Cond Aggravated By Exposure: INDIVIDUALS WITH PREEXISTING DISEASES OF THE SKIN, EYES, OR LUNGS MAY HAVE INCREASED SUSCEPTIBILITY TO THE TOXICITY OF EXCESSIVE EXPOSURES.
First Aid: INHAL: IMMED REMOVE TO FRESH AIR. IF NOT BRTHG, GIVE ARTF RESP. IF BRTHG IS DFCLT, GIVE OXYGEN. CALL MD. SKIN: IMMED FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS WHILE REMOVING CONTAM CLTHG & SHOES. CALL MD. WASH CONTAM CLTHG & SHOES PROMPT LY & THORO. EYES: IMMED FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS. CALL MD. INGEST: DO NOT INDUCE VOMIT. GIVE LGE QTYS OF WATER. NEVER GIVE ANYTHING

Handling and Disposal

Spill Release Procedures: USE APPROP PERS PROT EQUIP DURING CLEAN-UP. COMPLY W/FED, STATE, & LOC REGS ON REPORTING RELEASES OF WASTES. FLOOD AREA W/WATER & DRAIN TO APPRVD CHEM SEWER/WASTEWATER TREATMENT SYS, INCL MUNICIPAL SEWERS IF APPRVD. MAY BE DESTROYED W/SODIU M
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Methods: COMPLY W/FED, STATE, & LOC REGS. IF APPRVD, MAY BE DILUTED & DRAINED TO MUNICIPAL SEWER/WASTE TREATMENT PLANT, MAY BE DILUTED & DRAINED THRU SCRAP METAL PIT (IRON, COPPER, ETC) RO REDUCE PEROXIDE CONC. HYDROGEN PEROXIDE MAY BE AN RCRA
Handling And Storage Precautions: DO NOT GET IN EYES. DO NOT TASTE/SWALLOW. AVOID CONT W/SKIN & CLTHG. AVOID CONT W/FLAM/COMBUST MATLS. AVOID CONTAM FROM ANY SOURCE.
Other Precautions: USE EXTREME CARE WHEN ATTEMPTING ANY RXNS BECAUSE OFFIRE & EXPLO POTENTIAL (IMMED/DELAYED). CONDUCT ALL INITIAL EXPTS ON SMLSCALE & PROTECT PERS W/ADEQ SHIELDING AS RXNS ARE UNPREDICTABLE & MAY BEDELAYED, & MAY BE AFFECTED BY

Fire and Explosion Hazard Information

Extinguishing Media: USE ONLY WATER.
Fire Fighting Procedures: WEAR NIOSH APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). FLOOD WITH WATER. COOL TANK/CONTAINER WITH WATER SPRAY.
Unusual Fire/Explosion Hazard: WILL NOT BURN, BUT DECOMP, WHICH MAY BE CAUSED BY HEAT/CONTAM WILL CAUSE RELEASE OXYGEN WHICH WILL INTENSIFY FIRE. STRONG OXIDIZER. CONT W/CLTHG/COMBUSTS

Control Measures

Respiratory Protection: WHERE THERE IS POTENTIAL FOR AIRBORNE EXPOSURE IN EXCESS OF APPLICABLE LIMITS, WEAR NIOSH APPROVED RESPIRATORY PROTECTION.
Ventilation: USE SUFFICIENT VENTILATION TO KEEP EMPLOYEE EXPOSURE BELOW

RECOMMENDED EXPOSURE LIMITS.
Protective Gloves: IMPERVIOUS GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGG (SUP DAT)
Other Protective Equipment: ANSI APPRVD EMER EYEWASH & DELUGE SHOWER (FP N). APRON, PANTS, JACKET, HOOD, & BOOTS/TOTALLY ENCAPSULATED CHEM
Work Hygienic Practices: WASH THORO AFTER HNDLG. DO NOT WEAR LEATHER GLOVES/SHOES(UPPERS/SOLES)/COTTON CLTHG: THEY CAN IGNITE ON CONT W/PEROXIDE.
Supplemental Safety and Health: BP: 20%: 217F/103C; 35%: 226/108C; 50%: 237F/114C; 60%: 246F/119C. SPEC GRAV: 20%: 1.07; 35%: 1.13; 50%: 1.19; 60%: 1.24. VP (@ 77F/25C): 20%: 20.6; 35%: 17.4; 50%: 13.5; 60%: 10.7. MP: 20%: 5.7F/-14.6C; 35%: -27.4F/-33.0C; 50%: -62.0F/-52. 2C; 60%: -67.9F/-55.5C. EYE PROT: & FULL LENGTH FACESHIELD (FP N).

Physical/Chemical Properties

B.P. Text: SUP DAT
M.P/F.P Text: SUP DAT
Vapor Pres: SUP DAT
Spec Gravity: SUP DAT
Evaporation Rate & Reference: >1
Solubility in Water: 100 WT%
Appearance and Odor: COLORLESS WITH SLIGHTLY PUNGENT, IRRITATING ODOR.

Reactivity Data

Stability Indicator: NO
Stability Condition To Avoid: HEAT OR CONTAMINATION. LIBERATION OF OXYGEN GAS MAY RESULT IN DANGEROUS PRESSURES.
Materials To Avoid: MOST FLAM/COMBUSTS, CYANIDES, NITRIC ACID, POTASSIUM PERMANGANATE, OXIDIZING/REDUCING AGENTS. MIXT W/ORGS & SOME ACIDS.
Hazardous Decomposition Products: CONTAM/HEAT MAY CAUSE SELF-ACCELERATING EXOTHERMIC DECOMP W/OXYGEN GAS & STEAM RELEASE THAT CAN CAUSE DANGEROUS
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: NOT RELEVANT.

Toxicological Information

Ecological Information

MSDS Transport Information

Regulatory Information

Other Information

HAZCOM Label

Product ID: HYDROGEN PEROXIDE (20 TO 60%)
Cage: 00735
Assigned IND: Y
Company Name: VAN WATERS & ROGERS SUB OF UNIVAR
Street: 6100 CARILLON POINT
City: KIRKLAND WA
Zipcode: 98033
Health Emergency Phone: 800-424-9300 (CHEMTREC)

Label Required IND: Y
Date Of Label Review: 09/02/1998
Status Code: C
Label Date: 09/03/1998
Origination
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: WARNING
Respiratory Protection IND: YES
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Slight
Reactivity Hazard: Slight
Hazard And Precautions: ACUTE: SKIN: CONT W/AQUEOUS SOLUTIONS OF <50% MAY CAUSE IRRIT W/DISCOMFORT/RASH. HIGHER/PROLONGED EXPOS MAY RESULT IN SKIN BURNS/ULCERATION. EVIDENCE SUGGESTS THAT SKIN PERMEATION CAN OCCUR IN AMOUNTS CAPABLE OF PRODUCING SYSTEMIC TOXICITY. EFFECTS OF EYE CONT W/AQUEOUS SOLUTIONS OF <5% MAY INCLUDE EYE IRRIT W/DISCOMFORT, TEARING/BLURRING. MAY RESULT IN EYE CORROSION W/CORNEAL OR CONJUNCTIVAL ULCERATION & MAY LEAD TO BLINDNESS. INHAL: MAY CAUSE NAUS, HEADACHE, WEAKNESS, LUNG IRRIT, COUGH, DIFFICULTY BREATHING, & FATALITY. INGEST: MAY CAUSE GI IRRIT, ABDOMINAL PAIN, NAUS, VOMIT & DIARRHEA. MAY BE FATAL. CHRONIC: NONE LISTED BY MANUFACTURER.

==========

REGENESIS

ORC MSDS

ORC MATERIAL SAFETY DATA SHEET

Last Revised : April 17, 1998

SECTION# 1 - MATERIAL IDENTIFICATION

SUPPLIER:

REGENESIS Bioremediation Products

1011 Calle Sombra

San Clemente, CA 92673

Tel: 949-366-8000

Exhibit D

COPYING ORDER FOR GEOLOGICAL RECORDS

Name [illegible]

Company [illegible]

St. address 3140 [illegible] P.O. box

Town [illegible] IL Zip 60515

Phone [illegible]-795-113[illegible]

REMARKS

Phone

Fax X

In person

Mail

E-mail

ISGS invoice number [illegible]

GRU order number [illegible]

COPYING CHARGES	Amount	Cost
Geophysical logs / $8.00 each (up to 6,000 ft)		
Geophysical logs / $12.00 (over 6,000 ft)		
Parts of logs and/or faxed sheets / $1.50 each		
Single sheets / $0.50 each	4	2.00
Total copying costs		
Shipping charges, add 10%. Minimum charge $0.50 per order*		[illegible]
TOTAL CHARGES		[illegible]

*For orders exceeding $50, add 10% for the first $50 and 5% for the amount over $50. Example: For an order of $60, add $5.50 (10% of $50 and 5% of $10).

Received by K. Burns Date 7-2-01

County	T-R	S	Qtrs.	Operator	Well name	Year	TD Permit number	Entire folder	E-log	Other wireline	Driller's log	Comp. rep.	Plugging	Sample study	Drilling time	Summary sheet	Permit	Well drlg. rep.	Geol. rep.	Other
[illegible]	35N-4E		NW [illegible]	[illegible]-15												X				
	38N-4E		[illegible]	[illegible]-16												X				

SALES INVOICE

ILLINOIS STATE GEOLOGICAL SURVEY

Natural Resources Building
615 E. Peabody Dr., Champaign, IL 61820-6964
(217) 333-4747

Invoice No. 124051

[redacted]

Billing Address

Clayton Group Services

3140 Finley Rd
Downers Grove IL 60515

Account No.	P.O. Number	Salesperson	Shipping Method	Page	Invoice Date	Amount Due
CLAENN		KLB	1ST CLASS/UPS	1	7/3/2001	$2.50

Ordered	Shipped	B/O	Item No.	Bin	Description	Price	Extended Price
4	4	0	GRU SHEETS		Photocopied Single Sheets	$0.50	$2.00

Payment Method

Approved Crd

Payment due upon receipt of invoice
Return invoice copy with remittance
Remittance payable to
Illinois State Geological Survey

Subtotal	$2.00
Ship/Handling	$0.50
Total	$2.50
Amount Received	$0.00

Comments

GRU #3848

Illinois Department of Natural Resources

PURCHASER

Well #2
OLD WELL (DRIFT)

#1 --

Mp ~~Well~~ + F.

City WATERMAN County DE KALB

Section 16 Twp. No. 38 N Range 4 E

Location (in feet from section corner) 2700' S, 1080' W. of NE ~~2400 N, 1050 W. of SE~~ Corner

Owner Village of Waterman Send copy of analysis to → Authority James Lovig, W.W. Supt.

Contractor Frank F. Morse Address Waterman, Ill.

Date drilled 1906 Elev. above sea level top of well 820'± (approx. ground lev

Depth 72'

Log Water-bearing gravel stratum Corrections per RTS 6/29

Were drill cuttings saved ? Where filed ?

Size hole 6 in If reduced, where and how much

Casing record 6 in pipe with 10' of 4-in. Clayton Mark No. 18 slot screen at bottom

Distance to water when not pumping Oct 14, 1946; 24' (8 hrs. idle), direct measurement when pump was removed - Distance to water is 46 on Oct. 14, 1946

feet after pumping at 80 G. P. M. for Continuous (q/hole in col. pipe) hours.

Reference point for above measurements Pump base

Type of pump Cook 6 in. 14 Stage turbine Distance to ~~cylinder~~ bowls 50' of 4-in. flanged column pipe.

Length of ~~cylinder~~ bowls 66 in. Length of suction pipe below ~~cylinder~~ bowls None

Length stroke Speed

Hours used per day 8 at present Type of power Electric

Rating of motor 7½ H.P. Rating of pump in G. P. M. delivers 80 gpm. against 43 #pres.

Can following be measured: (1) Static water level No (air line not replaced on Oct 15, 1946)

(2) Pumping level No (3) Discharge No.

(4) Influence on other wells None

pH=7.2 (Running in cup)

Temperature of water 51°F. Was water sample collected from tap on disch. of pump after 8 hr at 80 gpm.

Date Sept. 29, 1947. Effect of water on meters, hot water coils, etc. Large iron content, Stains porcelain bowls and causes considerable corrosion.

Date of Analysis Analysis No. 112080

Recorder J. L. Geib

Date 9-30-47

2807-22617 12

Well #2
New Well (Limestone)

#2

Min + F

City Waterman County DeKalb

Section 16 Twp. No. 38 N Range 4 E

Location (in feet from section corner) 2700, S 1053, NE W. of SE corner

Owner Village of Waterman Send copy of analysis to → Authority James Lovig, W.W. Supt.

Contractor J.P. Miller Artesian Well Co. Address Waterman, Ill.

Date drilled Sept. 1946 Elev. above sea level top of well 820'± (also approx. ground level)

Depth 400' corrections per RTS 6/79

Log Shale and gravel 0-40; Shale 40-57; Gravel 57-80; Shale 80-122; Limestone (water-bearing) 122-375; Shale 375-385; Limestone 385-400'

Were drill cuttings saved Yes Where filed S.G.S.

Size hole 10 in If reduced, where and how much None

Casing record 10 in. pipe 0-124'

Distance to water when not pumping 30 ft. in Sept. 1946, 19 " " May 1947, 30½ on 9/29/47 (10 min recovery) Distance to water is 115 ft on Sept. 29, 1947 (113' on May 28 1947 after 1 hr @ 165)

feet after pumping at 165 G. P. M. for 25/600 hours.

Reference point for above measurements Pump base

Type of pump Peerless turbine No. 33867 ⊗ Distance to bowls ? ⊗

Length of bowls ? ⊗ Length of suction pipe below bowls ? ⊗

Length stroke Speed

Hours used per day 7 during Summer 1947 Type of power Electric

Rating of motor 15 HP Rating of pump in G. P. M. 165 gpm. against 43 # press.

Can following be measured: (1) Static water level Yes by 157' air line

(2) Pumping level Yes by 157' air line (3) Discharge No.

(4) Influence on other wells None

pH = 7.45 (Running in cup)

Temperature of water 51°F Was water sample collected from top at pump after 25 min. @ 165 gpm

Date Sept. 29. 1947 Effect of water on meters, hot water coils, etc. Reported to have less iron than drift well.

Date of Analysis Analysis No. 112 084

Recorder J. L. Geils

Date Sept. 30, 1947.

⊗ Will endeavor to get data from J.P. Miller Art. Well Co. in Brookfield

2807-22617 12

Covers

#3 ...sp, F, NO_3, Mn

Well #3

City Waterman County DeKalb

Section 15 Twp. No. 38N Range 4E

Location (in feet from section corner) ~~2200~~ 2150'N, 600'E, SW corner

Owner Village Well No. 3 Authority Paul Leifheit

Contractor Wehling Address

Date drilled Oct. 1963 Elev. above sea level top of well ~~808~~ 813

Depth 400' correction per RTS 6/29

Log dolomite

Were drill cuttings saved yes Where filed SGS - Naperville

Size hole 12" 0-108' If reduced, where and how much 11 3/4" 108-400'

Casing record 12" 0-108'

Distance to water when not pumping 32' Distance to water is

feet after pumping at 190± G. P. M. for 6 hours.

Reference point for above measurements top of casing, 2' above LSD

Type of pump test turbine Distance to cylinder

Length of cylinder Length of suction pipe below cylinder

Length stroke Speed

Hours used per day Type of power

Rating of motor Rating of pump in G. P. M.

Can following be measured: (1) Static water level

(2) Pumping level (3) Discharge

(4) Influence on other wells

Temperature of water 52.0°F Was water sample collected yes 1 qt

Date 10-21-63 Effect of water on meters, hot water coils, etc.

Date of Analysis Analysis No. 161461

Recorder /s/ Robert T. Sasman

Date Oct. 21, 1963

Well #3

(65600—60M—10-57)

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Clay and gravel	38	0	38
Shale	32	38	70
Gravel	18	70	88
Shale	2	88	90
Sandy gravel	10	90	100
Limestone	300	100	400
Hole Size: 12" 0-400'			
Casing : 12" 0-108'			
Static water level 40'			
Drawdown water level ?			
190 gallons per minute in 6 hours			
Permit issued October 1963. Location given as 400'N line, 600'W line of NW SE.			
Stratigraphic picks by JDT & DRK -			
Galena		105	
Platteville		275	
S. S. # 45592			
Rec'd from Naperville			
No Envelope			

COMPANY Wehling Well Works
FARM Village of Waterman NO. 3
DATE DRILLED October, 1963 COUNTY NO. 624
AUTHORITY
ELEVATION ~~808'~~ 812'±
LOCATION 2200' S line, 600' W line of SW
COUNTY