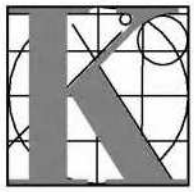
• EMISSION CONTROLS •

MANAGING WASTE EMISSIONS

Mitigating Odors, Dust, and Volatile Hazards



KUMA

Prepared By:

KUMA Corporation
Grass Valley, California
530/268-7070

KUMA

EMISSION CONTROLS

Mitigating Odors, Dust, and Volatile Hazards
at Waste Operations

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KUMA

Section A
Overview of KUMA's Emission Control Methods

Based on experience at various clean-up projects, KUMA utilizes a multi-pronged approach for abating annoying, and potentially dangerous emissions liberated by remediation activities. KUMA relies on the following elements, used alone or in combination, to provide project specific control of emissions.

- *ODEX Odor Mitigating Agent*. ODEX is a non-hazardous, biodegradable, odor mitigating agent made of food grade ingredients. This proprietary formulation has been thoroughly tested for safety, efficacy, and environmental compatibility. It is highly effective, and has been used for more than a decade by, and under scrutiny of, numerous federal, state and local environmental agencies.

- *Mobile Emissions Control*. KUMA's mobile emission control (MEC) systems are used to disperse ODEX solution immediately at and over the excavation as work is conducted. This approach squelches the major portion of hazardous and volatile organic compounds (VOCs), odors, and dust released during removal activities. Additional MECs may be needed in areas designated for truck loading, stockpiling, and treatment.

- *T-200 Organic Dust Suppressant*. T-200 is an organic, non-hazardous, biodegradable product used to suppress dust from non-traffic areas. Distribute T-200 using a common water truck, and notice the additional wind erosion protection provided. Depending on application rates, T-200 will reduce dust emissions for several days from undisturbed surfaces. HydroSeal or HydroSeal II should be used when longer term surface protection is needed.

- *OdorSeal*. Continuously apply organic, non-hazardous, biodegradable OdorSeal to working area, and/or exposed excavation areas, stockpiles, and filled loads. OdorSeal is highly effective in suppressing odors from sulfurous materials containing VOCs. The OdorSeal liquid coating solution is spray applied, inexpensive to use, and is disposed with the waste materials. Though OdorSeal provides immediate and substantial emission mitigation, it is not intended to cover odorous material for more than a day or two, depending on weather conditions. OdorSeal can be used in lieu of the Mobile Emissions Control system to combat severe emissions, and in conjunction with HydroSeal cover when more secure coverage is needed.

- *HydroSeal Cover*. Apply organic, non-hazardous, biodegradable HydroSeal cover matrix to all exposed excavation areas and stockpiles. This light-weight, low-permeability, cellulose cover material is easily spray applied, inexpensive to use, and can be disposed with the waste materials. It maintains integrity for weeks if not disturbed, is highly effective in containing VOCs and odors, and prevents contaminated dusts from becoming airborne. HydroSeal has been used in conjunction with tarps to secure odorous materials prior to transport over public roadways.

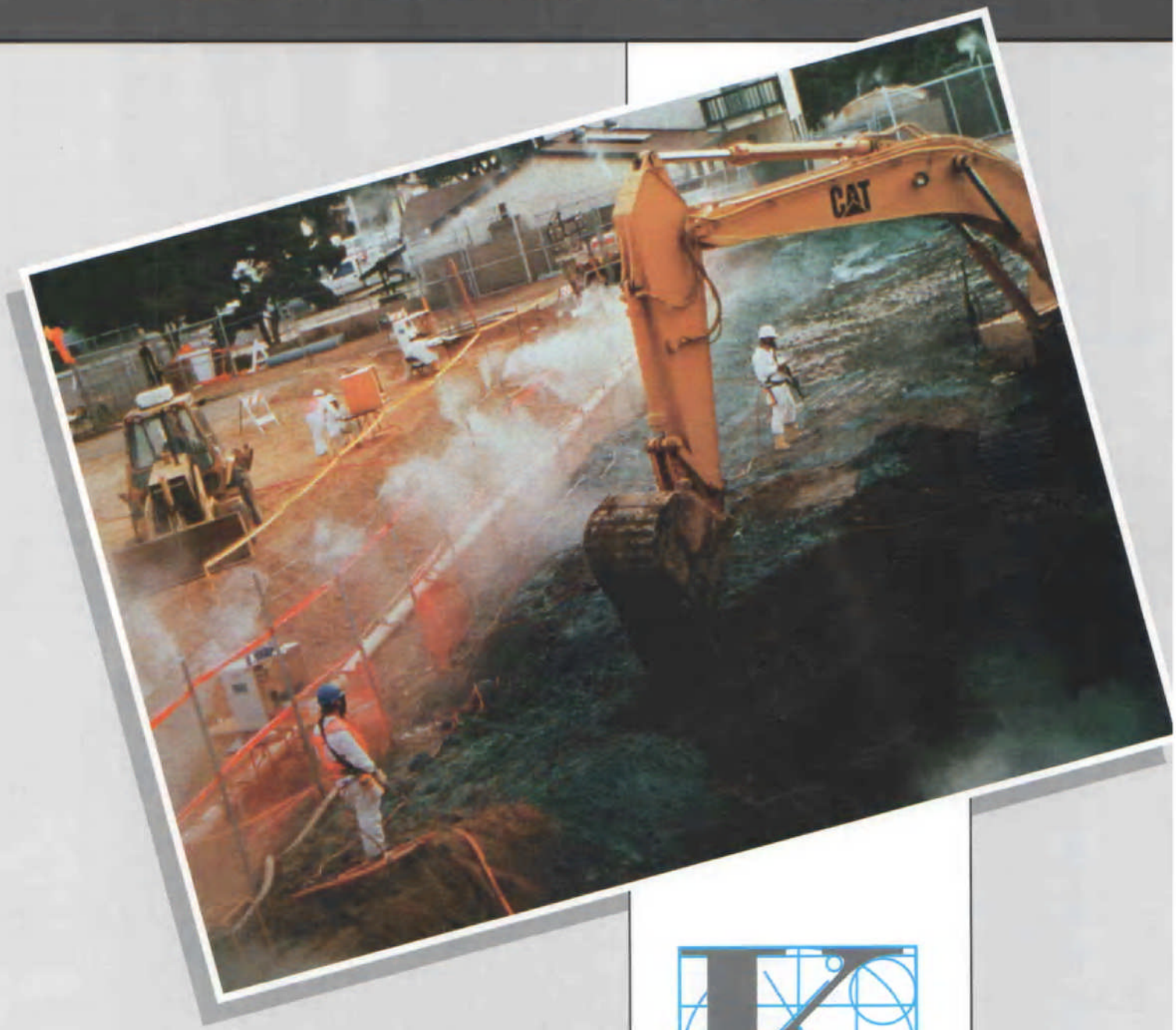
- *HydroSeal Type II*. Use KUMA's HydroSeal ™ Type II when a long-term, low permeability coating to restrict the flow of liquids and gases from the underlying soil or waste materials is desired. HydroSeal II prevents erosion of underlying materials by wind or rain, and substantially mitigates infiltration of any water into underlying materials. The barrier formed by HydroSeal II will last up to a year, and is effective in preventing subsurface gases and odor emissions from escaping into the atmosphere.

- *Mitigating Mist System*. Surround the work area with a misting system dispersing mid-pressure droplets, or fog, of dilute ODEX odor abatement solution. This wall of mist will intercept and neutralize fugitive emissions, creating one more impediment to migration of undesirable odors, dust, and VOCs. ODEX odor abatement agent is comprised of food grade ingredients, has been tested for safety and effectiveness. ODEX has been used by, and/or with approval of, the U.S. EPA at numerous Superfund remediation projects.

Each of these elements can be used alone or in conjunction with each other, more or less intensely, depending upon the severity of emission conditions. As an example, a particular situation may call for Mitigating Mist within an established perimeter, Mobile Emissions Control directed at material work and loading areas, and HydroSeal Cover to seal stockpiles awaiting transport. These elements may be applied in stages, and customized to address the specific needs of each project.

Attachments: KUMA Corporation Brochure
Project Data Summary: Emission Reductions
Odor and Dust Suppression Reference List
Project Reference Information

If We Can Improve The Smell Of A Place Like This...



Engineering Solutions For Today's Industrial Odor Problems

KUMA
Corporation

* Note New Area Code: (530) 268-7070

... IMAGINE WHAT W

There are two unfortunate realities of running a business today: your activities affect the environment, and your neighbors don't like it.

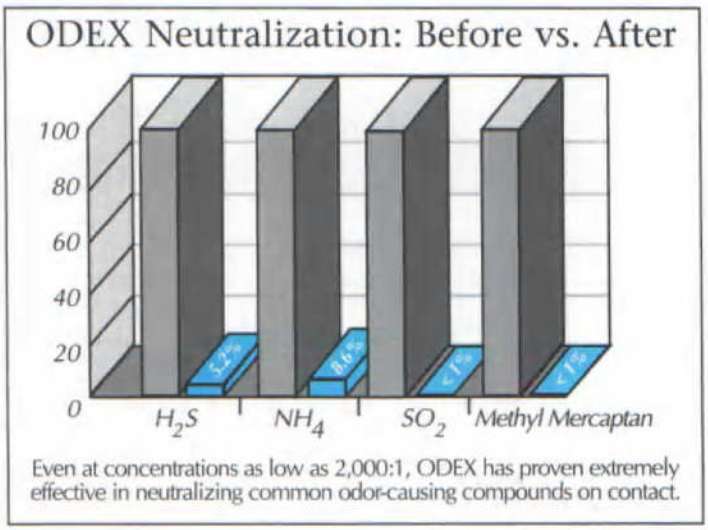
KUMA Corporation designs cost-effective solutions for our clients' environmental needs. Our experience in environmental management began more than 20 years ago, with an Alaskan oil spill clean-up. Later, we developed what is believed to be the first atomized mist odor management system, still being used in California.

So whether it be eliminating offensive odors, controlling fugitive dust, or containing vapor emissions, we can help. We currently offer a variety of odor and dust suppression products and services, including:

- **ODEX:** An industrial odor neutralizer made entirely of food-grade products;
- **T-200:** A binding agent that forms a thin, biodegradable surface that minimizes dust and odor emissions; and
- **HydroSeal:** A biodegradable cellulose mix that encapsulates and seals in ground-based odors.

ODOR ELIMINATION

The idea was simple: since it's seldom feasible and almost always expensive to contain and destroy odors, we developed ODEX. When diluted with water and atomized around the perimeter of your facility, ODEX surrounds and neutralizes odorous compounds before they reach your neighbors.



Even at concentrations as low as 2,000:1, ODEX has proven extremely effective in neutralizing common odor-causing compounds on contact.

The most common method of application is to atomize ODEX in droplets approximately 10 microns in diameter. At this size, the droplets have a combined surface area of up to 2.2 acres per cubic foot of air space, making it virtually impossible for an odorous compound to pass through the ODEX barrier.

ODEX is unlike other odor agents that overpower smells with strong fragrances that sometimes cause headaches. The effectiveness of ODEX stems from its ability to adsorb and neutralize odor components. Because ODEX contains such effective neutralizers, it can be used in very dilute form, making it remarkably cost-effective.

A very dilute ODEX solution is shown atomized around the perimeter of a large Superfund site to eliminate odors. HydroSeal was also used. During the 13 months KUMA was on site, there were no odor-induced shutdowns.

CAN DO FOR YOU!

DUST CONTROL

Grading just one acre of land, without use of dust mitigation measures, can contribute 55 pounds of airborne particulate matter per day to the atmosphere. Dust, or particulate matter, is an air pollutant regulated as PM-10 by the Federal Clean Air Act. PM-10 has been shown to have adverse effects on respiratory systems, cause restricted activity, and even lead to death. It's no wonder the South Coast Air Quality Management District recommends the use of non-toxic soil binders to mitigate fugitive dust from construction sites.

A common method for controlling dust is to repeatedly spray with water. The major drawback to this approach is, that once dry, dust particles re-enter the airstream. To reduce this problem, we developed KUMA T-200, a dust "adhesive" that binds tiny particles together, securing them even when dry.

HydroSeal is spray-applied to form a physical barrier that impedes VOC migration to the atmosphere. It's completely biodegradable, and can be left in place when operations resume.

T-200 is easily applied with a water truck, so there's no need to buy special equipment. When added to water, the results are immediately noticeable. The solution remains clear, though it becomes thicker, and slightly sticky. T-200's ability to hold water causes the ground surface to stay moist longer and acts to secure dust particles to each other, and to the ground surface.

A little T-200 goes a long way. Our customers have reported that concentrations as low as 1 pound of T-200 (less than $3) per 800 gallons of water has reduced water truck usage by about half... AND been more effective at suppressing dust than pure water!

Like all KUMA products, T-200 is comprised of non-hazardous, biodegradable ingredients and has been approved by California's Regional Water Quality Control Board for use in controlling dust.

VAPOR SUPPRESSION

When an odorous or dust prone area will be inactive for a few hours or a few days, a more secure means for mitigating emissions is readily available. HydroSeal, made entirely from natural ingredients, can be spray applied directly to the odorous material, creating a physical barrier to vapor flow. HydroSeal's completely biodegradable formula readily clings to excavation and fill slopes as steep as 1:1, and stays in place even when dry.

If not disturbed, HydroSeal will remain intact and effective for several days. When operations resume, the biodegradable HydroSeal can be buried or excavated along with the waste.

While some products can control a few odors (but let others pass through), HydroSeal is completely indiscriminate in its emission blockage properties. In tests performed by the U.S. Environmental Protection Agency (EPA), HydroSeal was found to be extremely effective at suppressing a wide array of volatile organic compounds (VOCs) commonly found at hazardous waste sites. HydroSeal outperformed all other products and methods tested, including some that were several times more expensive. The EPA study results are shown on the next page.

While atomized droplets of ODEX solution instantaneously suppress migrating odors, the HydroSeal barrier provides lasting sealing effects. These approaches are complimentary, and have often been used together: misting during operations, and HydroSeal for overnight, over weekend, or several days. If some residual fragrance is desired, ODEX can be added to the HydroSeal mix.

SAFETY

All KUMA products are non-hazardous, biodegradable, and comprised entirely of materials commonly found in grocery stores. Extensive product testing has been performed by our own research department, outside laboratories, and the EPA to assure product safety and use effectiveness. In fact, our array of products–ODEX, HydroSeal, and T-200–have all been used at Superfund projects, under close scrutiny of the EPA.

SUCCESSFUL APPLICATIONS

HydroSeal Wins!
At a California Superfund site, odor and VOC emissions had long been a community issue. Hand in hand with assessing possible site remediation measures, the EPA independently evaluated odor suppression techniques. HydroSeal was among eight products tested, including four odor combating solutions, lime slurry, a mixed slurry, and temporary foam. (No other KUMA products were tested.) The EPA report concluded that HydroSeal eliminated up to 100% of the total hydrocarbons and 98% of the benzene, notably outperforming all other suppression techniques tested. HydroSeal's application method and covering properties allow easy identification of gaps, and simple touch-up of missed areas. You can install a continuous barrier every time.

U.S. EPA TEST RESULTS

METHOD / PRODUCT FLUX CHAMBER TESTED	REDUCTION EFFICIENCY [%]			
	SO_2	Benz	THC	THC/GC
Hydrogen Peroxide	NA	38	35	55
Potassium Permanganate	NA	1	47	5
Odor Agent: EON 2000	29	42	0	63
Odor Agent: Epoleon	NA	43	40	60
Lime Slurry	65	68	**100**	80
Mixed Slurry	38	73	85	84
Temporary Foam	72	60	74	78
KUMA HydroSeal	**90**	**98**	**100**	**97**

NA: Test Not Performed
THC: Total Hydrocarbons
THC/GC: THC by Gas Chromatograph

SO_2: Sulfur Dioxide
Benz: Benzene
Reference: ***U.S. EPA***

Landfill Wins! As a gesture of neighborly goodwill, and a proactive measure against potential citations, the largest landfill in the City of Los Angeles has consistently relied on an atomized spray system for suppressing odors. KUMA staff installed this system more than 10 years ago, and continues to supply ODEX and necessary maintenance service to control emissions from the landfill and materials processing areas.

Because of the poor ambient air quality in Southern California, air regulations are stringently enforced. Nuisance odors are no exception. So as nearby landfills are bombarded with community opposition, forcing some to close their doors, this site continues to accept refuse while being a good neighbor.

Superfund Success! After two other odor service companies failed to keep complaints at bay, KUMA brought its full battery of products and equipment to bear. The wastes to be excavated had been disposed decades prior, and consisted mostly of aged petroleum by-products. Many of the waste ingredients (sulfur compounds, VOCs and petroleum hydrocarbons) were extremely odorous, and detectable at very low concentrations. Eliminating complaint-induced shut-downs was a big challenge.

A multi-stage strategy, incorporating ODEX mist, HydroSeal cover, and concentrated ODEX applications, mitigated odors from this hazardous site clean-up.

The combined effect of these methods and products–misting, HydroSeal, and vapor suppression–worked in a complimentary fashion, targeting the odor source. The remediation work continued, and we provided odor and dust suppression products through the remainder of the year-long project.

$crapped the $crubber and $aved! If this facility has an Achilles Heel, it's odors from the biosolids operations. Though the site is situated in an industrial area, sewage-like odors would probably lead to complaints, to community opposition, and finally to forced closure. Fortunately, ODEX has a track record of successfully combating sewage odors. So rather than purchasing an expensive scrubber system, a specialized misting network was installed to distribute ODEX solution. This alternative approach decreased capital costs by 75%, while dramatically reducing permit requirements, fees, and time needed for permit processing.

T-200 Cements Dust! At a cement manufacturing facility, KUMA supported closure activities. There, airborne cement residues and particles were identified as a potential worker safety hazard. To minimize this hazard, T-200 was used to cost-effectively bind and suppress silicate dust particles. In low concentrations, T-200 was sprayed via hydroseeder and water trucks to coat hard-to-drive areas, temporary roadways, and other surfaces prone to wind erosion.

KUMA
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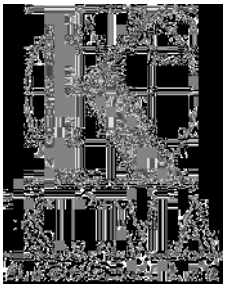
* Note New Area Code: **(530) 268-7070**
19114 Halcon Crest Court, Grass Valley CA 95949



Project Data Summary: Emission Reductions

Project	Industrial Site Remediation	Hazardous Waste Landfill Closure	Chemical Plant Site Remediation
Pollutants of Concern	Hydrogen Sulfide, Arsine Gas, Odors, Lead Dust	Mixed Volatile Organic Solvents and Odors	DDT Dust & breakdown products DDE & DDD
Timeframe	Fall 1999	Winter 1999	Fall 1998
Oversight Agencies	CA Dept. of Toxic Substance Control	USEPA	US EPA, CA Dept. Toxic Substance Control
Monitoring Device(s)	Hand-held Photo Ionization Detector & Mini Ram	Hand-held Photo Ionization Detector	Mini Ram
Excavation Point Source Mitigation	Direct Spray of Odex Solution	Continuous HydroSeal Application	Direct Spray of Odex Solution
Other Emission Controls Used	Perimeter Odex Mist & HydroSeal Cover of Excavation & Stockpiles	Perimeter Odex Mist & HydroSeal Cover of Excavation & Stockpiles	Perimeter Odex Mist & HydroSeal Cover of Excavation & Stockpiles
Without Mitigation	H_2S: 300 ppm Airborne Lead Dust Odors & Complaints	Test 1-VOCs: 220 ppm Test 2-VOCs: 130 ppm Noxious Odors	Airborne DDT Dust
WITH Mitigation	H_2S: 0.04 ppm Particulates: <0.05 mg/m^3 No Odor Complaints	Test 1- VOCs: ND* Test 2- VOCs: ND* Odor Mitigated	DDT, DDE, DDD: ND* Downwind Particulate Levels less than Ambient

NOTES: Particulate data (dust measurements) reflect time-weighted averages ND = None Detected

Project Reference Information

KUMA has been providing emission control products and services for projects owned by large private interests, developers, and government. We have provided services to large and small remediation and/or construction companies, industrial facility owners, and public works departments. Over the last fifteen years, KUMA has provided odor, dust and hazardous emission mitigation services, products, and equipment to a wide variety of customers, including the following:

x *Compass Environmental Services* (and predecessor Williams Environmental Services)
Work at Superfund listed sites and private clean-up projects at more than a dozen facilities, including manufactured gas plants located east of the Rockies.

x *Shaw Environment & Infrastructure* (and predecessors IT Corporation, OHM Remediation, RUST Remedial Services) Seven Superfund projects and four clean-ups for the U.S. Department of Defense.

x *U.S. Environmental Protection Agency*
Numerous Superfund sites in addition to the Shaw/IT/OHM/RUST projects.

x *Industrial/Manufacturing Facilities*
Three privately-owned, long-term industrial manufacturing facility clean-ups requiring services, products, and equipment, over the course of several years.

x *Permanent Waste Handling Operations*
Numerous public and privately-owned Landfills, Transfer Stations, Wastewater Treatment Plants, Recycling Operations, Solid Waste Treatment and Material Recovery Facilities.

SUPERFUND PROJECT REFERENCES

The following individuals may be contacted for additional information regarding our odor, dust and VOC mitigation activities.

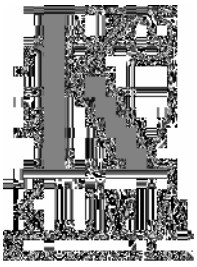
x EPA Region IX Contacts: Dick Vesperman: 415/744-2232
Bruni Davila: 415/744-2364

x Corps of Engineers Contact: Frank Hubel: 626/401-4044

x Remediation Project Managers: Keith Pushaw, Environmental Chemical Corporation
973/473-6500 (formerly with RUST/OHM)

Keith Hayes, Compass Environmental Services, Inc.
800/247-4030 (formerly Williams Environmental Services)

Mike Keenan, Environmental Chemical Corporation
650/347-1555 (formerly with RUST/OHM)



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Odor and Dust Suppression Reference List
Completed Remediation Projects

- Site/Project Name: Treasure Island Navy Base Clean-up [BRAC]
  Location: San Francisco, CA
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: June to July 2001
  Contact & Phone*: Ed Houston, IT Corporation [415/277-6985]

- Site/Project Name: Federal Creosote Demonstration Project [Superfund]
  Location: Manville, NJ
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: January 2001 Demonstration
  Contact & Phone*: Joel Czacharowski, Sevenson Env. [973/744-1221]

- Site/Project Name: Oakland Army Base
  Location: Oakland, CA
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: Fall 2000
  Contact & Phone*: Mike Keenan, Environmental Chem. Corp. [650/347-1555]

- Site/Project Name: Confidential Petroleum Site Clean-up
  Location: Los Angeles County, CA
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: Fall 2000 to Present
  Contact & Phone*: Margarita Quesada, American Remedial [323/357-1900]

- Site/Project Name: Alameda Corridor Railroad Project
  Location: Los Angeles County, CA
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: Fall 2000 to 2002
  Contact & Phone*: Jim Ross, Alameda Corridor Trans. Auth. [310/816-0460]

- Site/Project Name: Emeryville Shellmound Properties Clean-up
  Location: Emeryville, CA
  KUMA Services: Odor & Dust Suppression Services, Equipment, & Prods.
  Project Dates: May 1999 Demonstration, Fall 1999 Project
  Contact & Phone*: Michael Beck, Erler & Kalinowski [650/578-1172]

- Site/Project Name: San Diego Gas Site Clean-up
  Location: San Diego, CA
  KUMA Services: Odor & Dust Suppression Equipment, Start-up, & Products
  Project Dates: Fall 1999
  Contact & Phone*: Sean Shahin, ENV America [949/4453-9191]

* Last known contact phone number and/or company affiliation.

Odor and Dust Suppression Reference List
Completed Remediation Projects

- Project Name: Industrial Latex Site [Superfund]
  Location: Wallington, NJ
  KUMA Services: Suppression Equip. & Prods.
  Project Dates: Fall 1999
  Contact*: Keith Pushaw [973/473-6500]

- Project Name: Rocky Mountain Arsenal [RAC]
  Location: Denver, CO
  KUMA Services: Suppression, Eq., Start-up, & Products
  Project Dates: May 1999 to August 1999
  Contact*: Mike Smith [303/887-8959]

- Project Name: Rocky Mtn. Arsenal, Basin "A" [RAC]
  Location: Denver, CO
  KUMA Services: Suppression Eq., Start-up, & Products
  Project Dates: March 1999 to January 2000
  Contact*: Bill Wilkinson [303/793-5212]

- Project Name: Lowry Landfill [Superfund]
  Location: Denver, CO
  KUMA Services: Suppression Eq., Start-up, & Products
  Project Dates: March 1999 to June 1999
  Contact*: Harry Bolton [303/680-3499]

- Project Name: Montrose Chem. Clean-up [Superfund]
  Location: Torrance, CA
  KUMA Services: Suppression Services, Eq., & Prods.
  Project Dates: Sept. 1997 Demo, Sept. 1998 Project
  Contact*: Bruni Davila, USEPA [415/744-2364]

- Project Name: Ralph Gray Trucking Rem. [Superfund]
  Location: Westminster, CA
  KUMA Services: Suppression Services, Eq., & Prods.
  Project Dates: August 1994 to September 1995
  Contact*: Lucky Tabor, RUST [801/568-7702]

- Project Name: McColl Site Rem. Pilot [Superfund]
  Location: Fullerton, CA
  KUMA Services: Suppression Services, Eq., & Prods.
  Project Dates: June 1995 to September 1995
  Contact*: Rick Hardy, MK [714/523-0160]

- Project Name: Confidential: Petroleum Waste Rem.
  Location: Huntington Beach, CA
  KUMA Services: Suppression Eq., Start-up, & Products
  Project Dates: September 1995 to April 1996
  Contact*: Richard Lewis [714/375-1895]

- Project Name: MCAS Tustin Haz Rem. [RAC]
  Location: Tustin Marine Air Station, CA
  KUMA Services: Suppression Sacs., Eq., & Products
  Project Dates: June 1997 to 1999
  Contact*: Chris Johnson [714/651-0934]

- Project Name: Portland Cement Rem.[Superfund]
  Location: Salt Lake City, UT
  KUMA Services: Dust Suppression Eq. & Products
  Project Dates: June 1996 to January 1997
  Contact*: Lucky Tabor [801/568-7702]

- Project Name: PG&E Hazardous Waste Site Rem.
  Location: Pittsburg, CA
  KUMA Services: Odor Suppression Products
  Project Dates: October 1998 to November 1999
  Contact*: Charlie Heard [805/589-5220]

- Project Name: SoCal Edison Utility Site Rem.
  Location: Dinuba, CA
  KUMA Services: Suppression Eq., Start-up & Prods.
  Project Dates: 1994
  Contact*: Dale McCormick [510/770-0575]

- Project Name: Purity Oil Clean-up
  Location: Pittsburg, CA
  KUMA Services: Odor Suppression Products
  Project Dates: December 2000
  Contact*: Steve Hillman [510/772-9230]

- Project Name: Demenno Kerdoon Oil Recyclers
  Location: Los Angeles, CA
  KUMA Services: Suppression Eq., Start-up & Prods.
  Project Dates: 1999 to Present
  Contact*: Greg Rodriguez [310/537-7100]

- Project Name: Bradley Landfill & Compost
  Location: Sun Valley, CA
  KUMA Services: Suppression Equipment & Products
  Project Dates: 1986 to 1999
  Contact*: Brad Gorham [818/767-6180]

* Last known contact phone number and/or company affiliation.

KUMA

Section B
ODEX™ Odor Mitigating Agent

Product Description. ODEX Odor Mitigating Agent, a product used to safely neutralize malodors in dozens of applications during the last two decades, and having the following characteristics:

- Made from food grade flavorings and additives.
- Completely biodegradable, non-toxic, non-flammable, and water soluble.
- Effective in neutralizing malodors, even when diluted with water at 1,000:1.
- Cost-effective, at only 3 cents per gallon in typical use concentrations.
- Safe for human exposure, as determined by independent laboratory tests.
- Non-toxic to fathead minnows when tested by an independent laboratory in accord with State Definitive Testing Procedures, California Code of Regulations, Title 22.
- Does not contain constituents considered hazardous according to the Federal Hazard Communication Standard (29 CFR 1910.1200).
- Contains no volatile organic compounds (VOCs) as determined by EPA Method 8260.
- Is not an Insecticide, Fungicide, or Rodenticide, per the USEPA.
- Has compound authorization in accord with USDA guidelines.
- Has been used on numerous occasions with approval of the USEPA.
- Complies with the Toxic Substances Control Act.

ODEX Safety Testing. ODEX has been thoroughly tested by independent laboratories, and found safe for human exposure, though safe work practices should be employed whenever using ODEX or other industrial products. Personal protective equipment is often worn to protect against project hazards, but use of ODEX does not warrant special PPE. Test conducted in accord with protocols and guidelines established by the Consumer Product Safety Commission and Federal Hazardous Substance Act, the toxicology laboratory determined that ODEX is:

- **Not an eye irritant**
- **Not a primary dermal irritant**
- **Not toxic by oral ingestion**
- **Not toxic by dermal application**
- **Not toxic by inhalation**
- **Not a skin sensitizer**

ODEX is safely distributed in its most concentrated form, minimizing shipping costs. Product is typically shipped in 55 gallon containers having a gross weight of 485 pounds, with each gallon of ODEX making up to 1,000 gallons of odor mitigating solution. ODEX usage has no effect on dewatering and/or water treatment processes, as the small amount of solution needed is not significant. Kuma's MECs and Mitigating Mist systems have been specially designed for compatibility with ODEX.

Attachments: ODEX Non-hazardous Material Safety Data Sheet
Acute Toxicology Profile for ODEX
Acute Bioassay Report for ODEX
Analytical Report for ODEX, EPA Method 8260 (VOCs)

Material Safety Data Sheet	**U.S. Department of Labor**
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.	Occupational Safety and Health Administration (Non-Mandatory Form) Form Approved OMB No. 1218-0072
Identity (As used on Label and List): ODEX	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

SECTION I: / Emergency Contact

Manufacturer: KUMA Corporation 19114 Halcon Crest Court Grass Valley, CA 95949-9052	Emergency Telephone Number: (530) 268-7070 Information Telephone Number: (530) 268-7070
Distributor: KUMA Corporation	Date Prepared/ Last Revised: January 1, 1999

SECTION II: / Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s)):

OSHA PEL	ACGIH TLV	Other Limits Recommended	%(optional)
N/A	N/A		

All constituents are not considered hazardous according to the Federal Hazard Communication Standard (29 CFR 1910.1200).

SECTION III: Physical / Chemical Characteristics

Boiling Point:	212^{o} F	Specific Gravity (H_2O =1):	0.99
Vapor Pressure (mm Hg):	1	Melting Point:	N/A
Vapor Density (Air = 1):	Approximately as water	Solubility in Water:	Soluble
pH:	N/A	Evaporation Rate (H_2O = 1):	1
Appearance:	Milky Liquid	Odor:	Citrus/Almond

SECTION IV: Fire and Explosion Hazard Data

Flash Point (Method Used): Will not burn.	
Flammable Limits: Non-flammable.	
Lower Explosive Limit (LEL): N/A	Upper Explosive Limit (UEL): N/A
Extinguishing Media: N/A	
Special Fire Fighting Procedures: None.	
Unusual Fire and Explosion Hazards: None.	

SECTION V: Reactivity Data

Stability:	Conditions to Avoid (Stability):
Stable.	Storage at temperatures below freezing, and above 100°F.

Incompatibility (Materials to Avoid):
Strong oxidizing agents.

Hazardous Decomposition or By-products:
None known.

Hazardous Polymerization:	Conditions to Avoid (Polymerization):
Will not occur.	None known.

SECTION VI: Health Hazard Data

Route(s) of Entry:	Inhalation?	Ingestion?	Skin?
	Yes	Avoid	Eyes

Health Hazard (Acute and Chronic):
None known.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Overexposure:	Medical Condition Aggravated by Exposure:
None known.	Allergies to flavoring ingredients.

Emergency First Aid Procedures:
In case of eye contact, flush thoroughly with tepid water for 15 minutes. Seek medical attention.
In case of respiratory irritation/allergic reaction, move to fresh air. Aid breathing if necessary. Seek medical attention.
If ingested, dilute with water. Do not induce vomitting. Do not give fluids if victim is unconscious or having convulsions. Seek immediate medical attention.

SECTION VII: Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:
Contain, absorb, and collect spilled liquid. Dispose of wastes in a legal manner. Rinse spill surface with large quantities of water .

Waste Disposal Method:
Dispose of wastes in legal and proper manner. Product is biodegradable and non-hazardous.

Precautions to be Taken in Handling and Storing:
Product storage below 32 °F may cause layering.

Other Precautions:
Excessive pressure may result if containerized liquid stored near heat source.

SECTION VIII: Control Measures

Respiratory Protection (Specify Type):	Eye Protection:
None required.	Chemical goggles or safety glasses.
Ventilation:	Protective Gloves:
Good ventilation.	Not required.

Other Protective Clothing or Equipment:
None required.

Work/ Hygienic Practices:
Standard hygienic practices. Avoid splashing and spilling. Before eating, wash hands thoroughly.

Tox Monitor Laboratories, Inc.
33 West Chicago Avenue
Oak Park, Illinois 60302
(708) 345-6970

Kuma Corporation
19114 Halcon Crest Court
Grass Valley, California 95949

October 28, 1996

Acute Toxicology Profile
ODEX Odor Suppression Agent

TM Study 96-258-1 Primary Eye Irritation

No positive eye irritation reactions in any of the six test Subjects. Compound is not an eye irritant according to FHSA/CPSC Guidelines.

TM Study 96-258-2 Primary Dermal Irritation

The primary dermal irritation score was 2.17 indicating that the compound is not a primary dermal irritant according to FHAS/CPSC Guidelines

TM Study 96-258-3 Acute Oral Toxicity

The acute oral LD 50 was found to be greater than 5 Grams per Kilogram body weight. The Compound is not toxic by oral ingestion according to FHSA/CPSC Guidelines.

TM Study 96-258-4 Acute Dermal Toxicity.

The acute dermal LD 50 was found to be greater than 2 Grams per Kilogram body weight. The Compound is not toxic by dermal application according to FHSA/CPSC Guidelines.

TM Study 96-258-5 Acute Inhalation Toxicity

The acute inhalation LC 50 was found to be greater than a nominal concentration of 20 Milligrams per Liter of air for a one hour period. The compound is not toxic by inhalation according to FHSA/CPSC Guidelines.

TM Study 96-258-6 Acute Dermal Sensitization

Repeated topical exposure elicited no hypersensitivity reaction in any of the test subjects when compared to DCNB positive controls. The Compound is not a skin sensitizer.

Michael Kukulinski
Study Director

AQUATIC
BIOASSAY &
CONSULTING
LABORATORIES, INC.

TOXICITY TESTING • OCEANOGRAPHIC RESEARCH

September 19, 2000

Ms. Carole Kawamoto
KUMA Corporation
19114 Halcon Crest Court
Grass Valley, CA 95949-9052

Dear Ms. Kawamoto:

We are pleased to present the enclosed acute bioassay report. The product was tested under guidelines prescribed in *Static Acute Bioassay Procedures for Hazardous Waste Samples,* California Department of Fish and Game, 1988. Results were as follows:

CLIENT:	KUMA Corporation
SAMPLE I.D.:	ODEX Odor Abatement Agent –(250:1)
DATE RECEIVED:	08 March- 00
ABC LAB. NO.:	KUM0801.945

DOHS (TITLE 22) Hazardous Waste Bioassay Definitive Test
Fathead Minnows

96 Hour LC50 = >1000 mg/l

STATUS = Pass (State of California limit is 500mg/L)

Yours very truly,

Thomas (Tim) Mikel
Laboratory Director

CHEMICAL & ENVIRONMENTAL LABORATORIES, INC.

ANALYTICAL REPORT

--- EPA 8260 ---

Client Name: KUMA Corporation
Project Manager: Carole Kawamoto
Project Name: ODEX

Date Sampled: 01/01/99
Date Analyzed: 08/25/00
Date Reported: 08/28/00

C&E ID		K0824B-1
SAMPLE ID		ODEX
DF		10
COMPOUND	Detection Limit (ug/kg)	RESULT (ug/kg or ppb)
Benzene	5	ND
Bromobenzene	5	ND
Bromochloromethane	10	ND
Bromodichloromethane	10	ND
Bromoform	10	ND
Bromomethane	10	ND
n-Butylbenzene	5	ND
sec-Butylbenzene	5	ND
tert-Butylbenzene	5	ND
Carbon Tetrachloride	5	ND
Chlorobenzene	5	ND
Chloroethane	10	ND
Chloroform	5	ND
Chloromethane	10	ND
2-Chlorotoluene	5	ND
4-Chlorotoluene	5	ND
Dibromochloromethane	10	ND
1,2-Dibromo-3-chloropropane	10	ND
1,2-Dibromoethane	10	ND
Dibromomethane	10	ND
1,2-Dichlorobenzene	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
Dichlorodifluoromethane	10	ND
1,1-Dichloroethane	5	ND
1,2-Dichloroethane	5	ND
1,1-Dichloroethene	5	ND
cis-1,2-Dichloroethene	5	ND
trans-1,2-Dichloroethene	5	ND
1,2-Dichloropropane	5	ND
1,3-Dichloropropane	5	ND

To be continued on page 2

ANALYTICAL REPORT

--- EPA 8260 ---

Client Name: KUMA Corporation
Project Manager: Carole Kawamoto
Project Name: ODEX

Date Sampled: 01/01/99
Date Analyzed: 08/25/00
Date Reported: 08/28/00

C&E ID		K0824B-1
SAMPLE ID		ODEX
COMPOUND	Detection Limit (ug/kg)	RESULT (ug/kg or ppb)
2,2-Dichloropropane	5	ND
1,1-Dichloropropene	5	ND
cis-1,3-Dichloropropene	5	ND
trans-1,3-Dichloropropene	5	ND
Ethylbenzene	5	ND
Hexachlorobutadiene	5	ND
Isopropylbenzene	5	ND
4-Isopropyltoluene	5	ND
Methylene Chloride	10	ND
Naphthalene	5	ND
n-Propylbenzene	5	ND
Styrene	5	ND
1,1,1,2-Tetrachloroethane	5	ND
1,1,2,2-Tetrachloroethane	5	ND
Tetrachloroethene	5	ND
Toluene	5	ND
1,2,3-Trichlorobenzene	5	ND
1,2,4-Trichlorobenzene	5	ND
1,1,1-Trichloroethane	5	ND
1,1,2-Trichloroethane	5	ND
Trichloroethene	5	ND
Trichlorofluoromethane	10	ND
1,2,3-Trichloropropane	5	ND
1,2,4-Trimethylbenzene	5	ND
1,2,5-Trimethylbenzene	5	ND
Vinyl Chloride	10	ND
Total Xylenes	5	ND
MTBE	10	ND

ND = Not detected at the indicated detection limit.
DF = Dilution Factor
Reporting Limit = DF x Detection Limit

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

November 12, 1996

Carole Kawamoto, P.E.
Principal
Kuma Corporation
19114 Halcon Crest Court
Grass Valley, CA 95949

Dear Carole:

Thank you for your letter dated October 14, 1996, that describes your analysis of the "Non-applicability of FIFRA Testing Requirements" to a product which KUMA Corporation has recently developed which contains a deodorizing agent. In your letter you also request a confirmation on the accuracy of your analysis.

Based on the information you provided in your letter, the product described would not be considered a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and therefore not require registration, for several reasons supported by statements in your letter: 1) the product is described as a deodorizer, 2) the product is not intended for a pesticidal purpose, and 3) no pesticidal claims will be made in connection with its sale and distribution. Your analysis is consistent with 40 CFR Part 152.10. If you have any further questions, I can reached at (415) 744-1096 or Demorest.Allen@epamail.epa.gov.

Sincerely,

Allen Demorest

Allen Demorest
Life Scientist

KUMA

Section C.1
ODEX™ Application Methods - Mobile Emissions Control

The Mobile Emissions Control (MEC) Unit creates a focused "cloud" of ODEX solution that envelopes and suppresses odors, dust, and VOC emissions. This approach is very effective when tackling persistent malodors released during waste excavation. The directed ODEX spray/mist has been proven to suppress a variety of emissions, including odors, hazardous emissions, and dust, while adding little moisture to the wastes.

KUMA uses MECs in the immediate are of excavation, as well as in truck loading areas. Each unit includes one or more high pressure spray devices, manually directed at the contaminated soil malodor source, to resolve odor problems in the following manner:

- Directing the odor abating spray at the excavation (point-of-release of odor molecules), enhances the odds of physical contact between ODEX solution and the malodor agents. Neutralization occurs on contact, and due to the sheer number of odor molecules densely concentrated at the excavation area, a focused blast of ODEX solution has the ability to abate a major portion of the problem odors before they have a chance to migrate. The MEC provides very effective control at the odor source.
- In warmer work settings, the smaller atomized drops released from the sprayer evaporate before reaching the ground. This causes a localized cooling effect, making air in the excavation heavier than surrounding air, and thereby, less able to migrate out of the pit to surrounding areas.
- Because only part of the spray evaporates, the remainder contacts the surface of the contaminated soil. At the contact interface, two things happen: 1) the relative permeability of the soil to odor vapor is lessened, thereby hindering emissions, and 2) the ODEX solution neutralizes contaminants on the soil surface.

Equipment Description. KUMA utilizes several variations of the MEC-- some truck mounted, trailer mounted, with and without a generator, with and without a holding tank, depending on power and water availability. The basic MEC consists of a high-pressure electric pumping system, two 5 micron filter cartridges, a proportional injector (for measured dilution of ODEX with water), NEMA 4x electrical box, 250 feet of ½" high-pressure hose and a manually directed spray wand. Our MECs are designed for compatibility with ODEX Odor Mitigating Agents.

Utility Requirements. Necessary utilities provided by the Customer include: a) adequate quantities of potable water (up to 25 gpm, per MEC utilized), and sufficient diesel fuel or compatible electricity and hook-ups, per the unit(s) selected.

Labor Requirements. One full-time person per unit is needed to utilize the MEC.

Attachments: Photos of 2001 Model Mobile Emissions Control ™ Unit
Photos of MEC ™ in Use

Mobile Emissions Control Unit™
14 gpm, Trailer mounted, electric, with generator
2001 Model MEC-14ET

KUMA Corporation (530) 268-7070

Kuma Corporation

Hazardous Waste Labor

Emeryville, CA Redevelopment Project: Fall '99

Dust, odors and VOCs are most likely to become airborne while the contaminated material is being agitated. By placing a trained technician in the exclusion zone, we are able to ensure that Odex is always in the air suppressing odors during the two most odorous operations: excavating the material and transferring it to trucks.

Our Technicians are HazWoper certified and all participate in an annual medical monitoring program. And no job is too difficult. Before this project was over, our Technicians were working in supplied air, positioned over the excavation in a 60' man-lift and working during the middle of the night.

Left: Having a technician on the ground is extremely valuable in controlling dust, odors, and VOC emissions during excavation. Here, our technician is applying Odex to suppress sulphur-based odors during excavation.

Right: Because he is on the ground and mobile, our technician is able to turn around and spray Odex while the material is being dumped into a loader. Monitoring data collected at the downwind boundary of the exclusion zone showed a 99% reduction in emissions from the exposed soil source.

Kuma Corporation

Dust / VOC / Odor Suppression

Montrose DDT Superfund Site, Summer '98

Left: High-pressure mist treated with a dilute mixture of Odex is directed above the excavation implement, creating a cloud of mist which envelops and captures all fugitive emissions.

Below: A high-pressure stream of Odex and water was used to decontaminate the hauling trucks prior to leaving the site, as well.

KUMA

Section C.2
ODEX™ Application Methods - Mitigating Mist System

It is sometimes necessary to surround the excavation area with a mitigating mist system, continuously operating while waste is managed. The atomized mist is generally released 15 feet or more above the ground surface from tubing equipped with small nozzles. The tubing can be strung from portable bird poles, or is attached to security fencing, if available. A typical set-up consists of a central pump capable of delivering a metered ODEX solution through a system of flexible tubing and nozzles.

As odors naturally migrate from the excavation area outward, they encounter the ODEX mist particles before reaching the established boundary. When the odor molecules and mist meet, the smaller odor particles adhere to the surface of the mist, where dilute ODEX acts to neutralize and/or oxidize odor components. The water in the mist droplet then evaporates as it falls downward. In this manner, odor migration from the established boundary is minimized. Typically, mist generation is started 15 minutes or so prior to beginning the day's clean-up activities, and continues until after work has ceased and all wastes are covered.

Equipment Description. The Mitigating Mist modules are available in a variety of sizes, depending on the extent of the site and the density of the mist desired. Based on site conditions (size of the excavation area, stockpiles, climate, malodor constituents, proximity to sensitive receptors, etc.), KUMA can determine an appropriate system.

KUMA's Mitigating Mist systems are designed for compatibility with ODEX Odor Mitigating Agent. A standard module and line set-up includes a pump system (with water filters and electrical controls), and ODEX-compatible pump, seals, and parts.

Utility Requirements. Operation of the misting network requires large quantities of potable water, continuously supplied, and either diesel fuel, or conveniently available electric power.

Labor Requirements. A substantial initial effort is needed to set-up the misting system. This includes placing poles as necessary to establish the boundaries, or using existing fencing for supporting the misting lines. The pumps are typically set up in the general vicinity of water and/or power supplies, then connected to the misting line network. Once the network is set-up, it generally remains in-place from day to day, only requiring start-up, regular checking, maintenance, and refueling.

Attachment: Photos of Mitigating Mist in Use

Kuma Corporation

Dust / VOC / Odor Suppression

Montrose DDT Superfund Site, Summer '98

Left and Below: The entire work area was surrounded by a high-pressure mist of Odex and water. In addition to its odor eliminating abilities, Odex contains a wetting agent which increases the chances that any particle leaving the site will be absorbed by the water droplet and removed from the airstream.

KUMA

Section D
T-200™ Organic Dust Suppressant

Controlling dust can be a problem. In southern California, increased health risks caused by ambient airborne dust have been documented. A combination of natural wind, coupled with the size and composition of dust particles frequently causes conditions adverse to human and animal respiratory systems.

Similarly, while conducting site clean-up, large scale construction, and/or on-going earthwork, adverse but inherent dust conditions often warrant suppression. Apart from being a potential health concern, parties conducting clean-up and/or construction projects often find it in their own best interest to minimize a project's nuisance issues, including dust. KUMA's T-200 is a cost-effective additive for proven dust suppression from non-traffic areas.

Product Description. KUMA T-200 is an all natural, organic, non-hazardous, non-toxic, starch-like powder, delivered in 50 lb. sacks. Using a simple mixing unit, the powder completely dissolves in water, and is easily mixed and dispersed via an ordinary water truck-- no special equipment to buy. When applied to dusty areas, the additive helps wetted soil surfaces retain moisture, keeping dust down longer than water alone.

KUMA's T-200 aids efforts in controlling dust by: a) slowing the evaporation process, keeping small dust particles wet longer, and b) by binding dust particles together, making them effectively larger, and less likely to become airborne, even after the T-200 solution is dry.

T-200 is a material designed to absorb and retain water, in a manner similar to gelatin. It also has tremendous adhesive properties. As the solution dries, it forms a light "crust", similar to a sugar glaze, that binds dust particles to one another, thereby decreasing airborne potential.

KUMA has successfully used T-200 both alone, and as a key component of HydroSeal, to mitigate odor and dust emissions at several facilities (over many years) having U.S. EPA oversight. In addition, KUMA obtained use approval from California's Los Angeles Regional Water Quality Control Board.

Attachments: KUMA T-200 Non-hazardous Material Safety Data Sheet
T-200 Use Approval Letter from CA Regional Water Quality Control Board

Material Safety Data Sheet	**U.S. Department of Labor**
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.	Occupational Safety and Health Administration (Non-Mandatory Form) Form Approved OMB No. 1218-0072

Identity (As used on Label and List):	Note: Blank spaces are not permitted. If any item
Kuma T-200	is not applicable, or no information is available, the space must be marked to indicate that.

SECTION I: Manufacturer / Emergency Contact

Manufacturer:	Emergency Telephone Number:
KUMA Corporation	(530) 268-7070
19114 Halcon Crest Court Grass Valley, CA 95949-9052	Information Telephone Number: (530) 268-7070
Distributor: KUMA Corporation	Date Prepared/ Last Revised: January 1, 1999

SECTION II: Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s)):

OSHA PEL	ACGIH TLV	Other Limits Recommended	%(optional)
N/A	N/A		

All constituents are not considered hazardous according to the Federal Hazard Communication Standard (29 CFR 1910.1200).

SECTION III: Physical / Chemical Characteristics

General Description: Finely milled organic binder. Similar to bread flour.

Boiling Point:	Solid N/A	Specific Gravity (H_2O = 1):	Solid N/A
Vapor Pressure (mm Hg):	Solid N/A	Melting Point:	Decomposes
Vapor Density (Air = 1):	Solid N/A	Solubility in Water:	Soluble
pH:	Solid N/A	Evaporation Rate (Butyl Acetate = 1):	Solid N/A
Appearance:	Powder, cream color	Odor:	Beans

SECTION IV: Fire and Explosion Hazard Data

Flash Point (Method Used):

Solid N/A

Flammable Limits:	Lower Explosive Limit (LEL):	Upper Explosive Limit (UEL):
Will combust.	0.04 oz/cf. Similar to flour or grain dust.	Not determined.

Extinguishing Media:

Carbon dioxide, Chemical foam, Water

Special Fire Fighting Procedures:

Self contained breathing apparatus to avoid smoke.

Unusual Fire and Explosion Hazards:

Fine organic powder has the potential to form explosive mixture with air. Keep away from open flame and sparks.

Use preventive measures standard for handling fine organic materials. Avoid creating dust.

SECTION V: Reactivity Data

Stability:	Conditions to Avoid (Stability):
Stable.	Ignition sources, water contact.

Incompatibility (Materials to Avoid):
Strong oxidizers.

Hazardous Decomposition or By-products:
None.

Hazardous Polymerization:	Conditions to Avoid (Polymerization):
Will not occur.	None.

SECTION VI: Health Hazard Data

Route(s) of Entry:	Inhalation?	Ingestion?	Skin?
	Yes	Avoid	Eyes

Health Hazard (Acute and Chronic):
None known.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Overexposure:	Medical Condition Aggravated by Exposure:
None known.	May cause respiratory or eye irritation and/or allergic response.

Emergency First Aid Procedures:
In case of eye contact, flush thoroughly with tepid water for 15 minutes. Seek medical attention.
In case of respiratory irritation/allergic reaction, move to fresh air. Aid breathing if necessary. Seek medical attention.
May cause dryness of skin. Wash with soap and water. Apply suitable skin lotion.
Seek medical attention if symptoms persist.

SECTION VII: Precautions for Safe Handling and Use

Steps to be taken in Case Material is Released or Spilled:
Collect excess material and thoroughly sweep area. Mop or flush residue with warm water. Test area and repeat if necessary.
Dispose of all waste materials in a legal and proper manner.

Waste Disposal Method:
Dispose of waste materials in a legal and proper manner. Product is biodegradable and non-hazardous.

Precautions to be Taken in Handling and Storing:
Store in closed container or packaging to prevent moisture pick-up. Store in dry area, away from open flame or heat source.

Other Precautions:
Material is VERY slippery when wet.

SECTION VIII: Control Measures

Respiratory Protection (Specify Type):	Eye Protection:
Dust mask or respirator capable of removing fine dust particles.	Chemical goggles.
Ventilation:	**Protective Gloves:**
Good ventilation. Remove or recover airborne dust.	Rubber or plastic.

Other Protective Clothing or Equipment:
None required.

Work / Hygienic Practices:
Avoid creating excessive dust. Avoid spillage, as material becomes VERY slippery when wet, and readily takes up water.
Use standard hygienic practices. Before eating, wash hands thoroughly, remove excess product from clothing.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION
101 CENTRE PLAZA DRIVE
MONTEREY PARK, CA 91754-2156
(213) 266-7500
FAX: (213) 266-7600

February 25, 1997

Ms. Carole Kawamoto
KUMA Corporation
19114 Halcon Crest Court
Grass Valley, CA 95949

USE OF KUMA T-200 DUST SUPPRESSANT FOR LANDFILLS IN THE LOS ANGELES REGION (FILE NO. 100130)

We have reviewed your February 7, 1997, request (received February 13, 1997) to use KUMA T-200 Dust Suppressant, a non-hazardous, nontoxic substance made from for dust control at landfills located within the jurisdiction of the Los Angeles Regional Water Quality Control Board.

A review of the Manufacturers Material Safety Data Sheet and supporting data for this dust suppressant indicates that should be no adverse water quality impacts from its use, provided that it is applied in a controlled manner. We therefore have no objections to its use provided that:

1) There is no discharge of the dust suppressant into ground water or into any surface water course;

2) The dust suppressant is not applied when there is a potential of inclement weather or in excessive amounts as to affect water quality;

3) The landfill where this dust suppressant is to be used operates under a general National Pollution Discharge Elimination System (NPDES) stormwater discharge permit and maintains a current Stowmwater Pollution Prevention Plan (SWPPP) that includes these provisions. Personnel who will be applying this dust suppressant should be made aware of these provisions;

4) The use of this dust suppressant does not create, nor threaten to create, a condition of nuisance or pollution as defined by Section 13050 of the California Water Code; and

5) You have concurrence with the California Integrated Waste Management Board or the Local Enforcement Agency that the use of the dust suppressant is in accordance with the requirements of Title 14, California Code of Regulations, as they apply to vector control at landfills.

Should you have any questions, please contact Blythe Ponek-Bacharowski at (213) 266-7580.

Rodney H. Nelson

RODNEY H. NELSON
Senior Engineering Geologist
Landfills Unit

cc: Elizabeth Haven, State Water Resources Control Board
Michael Wochnick, California Integrated Waste Management Board
Richard Hanson, County of Los Angeles Department of Health Services, Solid Waste Management Division
Terrence Gilday, Ventura County Environmental Health Division
Wayne Tsuda, City of Los Angeles Env. Affairs Dept.
Steven Samaniego, City of West Covina, Local Enforcement Agency

KUMA

Section E
OdorSeal™

For more severe odors and emissions, particularly those that are sulfur-based or contain higher concentrations of VOCs, OdorSeal has proven very effective in extinguishing odors from the working area. OdorSeal is spray-applied to the wastes using a hose, or water truck sprayer as site specific conditions warrant.

OdorSeal may be mixed on-site using a water truck or HydroSealer, in conjunction with a specially designed flocculating apparatus (cost, about $150). As with HydroSeal, each batch must be individually mixed, as opposed to relying on the automatic proportional injector included in the MEC. However, the higher-protection OdorSeal is comparably priced, on a per gallon basis, with the ODEX solution dispersed by the MEC.

OdorSeal's low permeability coating effectively contains emissions within the soil matrix, thereby minimizing migration of VOCs and odors from the waste. Effectiveness increases with coverage, and is easily adjusted using additional lines or methods of dispersion. Depending on weather conditions and the severity of odors emanating from static wastes, OdorSeal may be used to coat surfaces for overnight protection. OdorSeal should not be relied upon as a long term cover. HydroSeal is a more appropriate product for multi-day cover. Added odor and emission mitigation of loads in transit can be achieved by coating filled truckloads with OdorSeal prior to departure from the site.

Product Description. OdorSeal is comprised of an organic binder (T-200), ODEX odor abatement agent, and water. Mix ingredients can be adjusted to material conditions for tailored protection. Generally, the mixed liquid solution has a slightly viscous, slippery consistency that is easily dispersed via a hose opening or large orifice sprayer. Material Safety Data Sheets for T-200 Binder is included.

OdorSeal provides an adhesive, odor mitigating, emission suppressing coating of the waste, and dries with a slight crustiness, not unlike sugar-coating. OdorSeal does not require removal, and may be disposed with the contaminated soil.

KUMA

Section F
HydroSeal™

A biodegradable organic cover matrix called HydroSeal will be used as necessary to secure exposed wastes. Typically, cover is applied at the close of each day's operations to seal exposed waste cut areas and stockpiles. Exceptionally odorous "hot spots" can also be combated during excavation, using a continuous spray of HydroSeal to coat offending materials as they are exposed. The coating effectively traps odorous materials beneath a low permeability, crust-like barrier, thereby minimizing migration of VOCs and odors from the waste. For extra protection prior to transport, filled truckloads can be coated with HydroSeal before leaving the site.

Product Description. HydroSeal is comprised of fibrous cellulose materials (paper and/or wood mulch) combined with a non-hazardous organic binding material (T-200) and water. A non-hazardous dye may be included in the fibers for visual assessment of material coverage, and a small amount of ODEX is usually added to enhance the odor mitigating effects of the matrix. Material Safety Data Sheet for HydroSeal Fibers is included.

The final product dispersed to the waste surface is a paper maché-like material, wet to the touch, but without free liquid. HydroSeal maintains a low profile, and will not be blown by normal winds. Since the sealing material clings to the waste surface, it will not adversely affect the dewatering or water treatment processes. The HydroSeal matrix forms a fibrous mat cover that maintains integrity for several days, if not disturbed, even as it dries. HydroSeal does not require removal, and may be disposed with the contaminated soil. As it dries, HydroSeal negligibly contributes to the weight of the waste materials.

Attachments: HydroSeal Fibers Non-hazardous Material Safety Data Sheet
Photos of HydroSeal and Use Application

Material Safety Data Sheet	**U.S. Department of Labor**
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.	Occupational Safety and Health Administration (Non-Mandatory Form) Form Approved OMB No. 1218-0072

Identity (As used on Label and List):	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
HydroSeal Fibers	

SECTION I: Manufacturer / Emergency Contact

Manufacturer:	Emergency Telephone Number:
KUMA Corporation	(530) 268-7070
19114 Halcon Crest Court	Information Telephone Number:
Grass Valley, CA 95949-9052	(530) 268-7070
Distributor:	Date Prepared/Last Revised:
KUMA Corporation	January 1, 1999

SECTION II: Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s)):

OSHA PEL	ACGIH TLV	Other Limits Recommended	%(optional)
N/A	N/A		

Ingredients: Cellulose material, water, dye.

All constituents are not considered hazardous according to the Federal Hazard Communication Standard (29 CFR 1910.1200).

SECTION III: Physical / Chemical Characteristics

General Description: Compressed cellulose mass. Tan in color. Green if non-hazardous dye included. When removed from packaging, avoid breaking into small, particles.

Boiling Point:	Solid N/A	Specific Gravity (H_2O = 1):	Solid N/A
Vapor Pressure (mm Hg):	Solid N/A	Melting Point:	Solid N/A
Vapor Density (Air = 1):	Solid N/A	Solubility in Water:	Will Disperse
pH:	Solid N/A	Evaporation Rate (Butyl Acetate = 1):	Solid N/A
Appearance:	Fibrous Mass	Odor:	No odor

SECTION IV: Fire and Explosion Hazard Data

Flash Point (Method Used):	Flammable Limits:
Solid N/A	Organic cellulose material. Will burn if exposed to flame.
Lower Explosive Limit (LEL):	Upper Explosive Limit (UEL):
Solid N/A	Solid N/A

Extinguishing Media:

Carbon dioxide, Water

Special Fire Fighting Procedures:

None.

Unusual Fire and Explosion Hazards:

None.

SECTION V: Reactivity Data

Stability:	Conditions to Avoid (Stability):
Stable.	Material is organic and combustible. Avoid extreme heat and open flame.

Incompatibility (Materials to Avoid):

None known.

Hazardous Decomposition or By-products:

Thermal decomposition may produce carbon monoxide and carbon dioxide.

Hazardous Polymerization:	Conditions to Avoid (Polymerization):
Will not occur.	N/A

SECTION VI: Health Hazard Data

Route(s) of Entry:	Inhalation?	Ingestion?	Skin?
	Yes	Avoid	Eyes

Health Hazard (Acute and Chronic):

None known.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Overexposure:	Medical Condition Aggravated by Exposure:
None known.	Allergies to cellulose or dye.

Emergency First Aid Procedures:

In case of eye contact, flush thoroughly with tepid water for 15 minutes. Seek medical attention.

In case of respiratory irritation/allergic reaction, move to fresh air. Aid breathing if necessary. Seek medical attention.

If ingested, dilute with water. Do not induce vomitting. Do not give fluids if victim is unconscious or having convulsions. Seek immediate medical attention.

SECTION VII: Precautions for Safe Handling and Use

Steps to be taken in Case Material is Released or Spilled:

Collect excess material, sweep area. Dispose of wastes in legal and proper manner.

Waste Disposal Method:

Dispose of in legal and proper manner. Product is biodegradable and non-hazardous.

Precautions to be Taken in Handling and Storing:

Store in dry area, in enclosed containers or packages. Store away from open flame or heat source. Material is combustible.

Other Precautions:

None known.

SECTION VIII: Control Measures

Respiratory Protection (Specify Type):	Eye Protection:
Not normally needed. Avoid creating dust.	Goggles recommended.
Ventilation:	Protective Gloves:
Good ventilation, local exhaust.	Not required.

Other Protective Clothing or Equipment:

None required.

Work / Hygienic Practices:

Standard hygienic practices. Before eating, wash hands thoroughly, remove excess product from clothing.

Kuma Corporation

VOC / Odor Suppression

Lowry Landfill Superfund Site, Winter '99

Left: Prior to our involvement, the Contractor had tried to contain VOCs using tarps, visqueen, foams and a high-pressure misting system. Even with these safeguards in place, VOC emissions as high as 800 ppm were recorded using a PID.

Right: HydroSeal applied to the exposed surface. With the EPA present, PID readings were taken ½" above the piles immediately prior to and following the application of HydroSeal. The results of the two tests are shown below.

Emission Reductions At Lowry Landfill	Test Project #1 March 2, 1999	Test Project #2 March 3, 1999
VOC Measurement PRIOR TO HydroSeal Application [ppm]	220	130
VOC Measurement FOLLOWING HydroSeal Application [ppm]	**0**	**0**

KUMA

Section G
HydroSeal™ Type II Cap

HydroSeal Type II is a thinly applied, non-hazardous matrix (approximately 1/4" thick) providing surface erosion and infiltration protection. HydroSeal II is a suitable long-term cover, maintaining integrity for up to a year, depending on specific site conditions.

Product Description. KUMA's HydroSeal ™ Type II (HydroSeal II) is a proprietary mixture consisting of water, cellulose fibers, organic and/or inorganic binders, pozzolans, and special amendments as needed.

HydroSeal II is applied as a viscous slurry. It is generally green in color, which aids in determining coverage areas. HydroSeal II is spray applied, and dries to form a crusty coating that adheres to underlying materials. Additional characteristics of HydroSeal II include the following:

- HydroSeal II should be spray-applied at a minimum total thickness of 1/4".
- Application is best achieved in ambient temperatures of 40° F to 100° F
- Application is best achieved in the absence of rain, wind, or other adverse weather conditions.
- The surface intended for coating with HydroSeal II should be as flat and smooth as economically feasible. Covering surface obstructions or irregularities adds to material and labor demands, thereby increasing costs.
- HydroSeal II may be applied to any surface that will support the adhesive material in a stable manner. On vertical surfaces, the soil or waste materials should be consolidated and dry, or fine grained. If the vertical or sloped surface is unconsolidated and dry, pre-moistening the areas to be covered may reduce the quantity of HydroSeal II otherwise needed.
- Increased roughness of the application surface (ground or waste pile) will increase material demand by as much as 100%, thereby increasing costs.
- Approximate cost of HydroSeal II (materials, equipment, and labor) is16¢ per square foot.

KUMA

Section H
OdorSeal™ and HydroSeal™ - Application Methods

Mixing and application of HydroSeal requires use of a HydroSealer. In addition, OdorSeal is sometimes mixed and applied using a HydroSealer, though more frequently, a water truck and KUMA flocculating apparatus are used. KUMA's HydroSealers have been selected and/or designed for expeditious delivery of a large volume of cover material. Following the close of operations, we find it advantageous to provide a thorough cover in a short period of time, minimizing overtime costs. Though highly effective in covering large expanses of waste materials, the HydroSealer is not appropriate for neatly covering narrow areas (less than four feet wide).

For situations in which HydroSeal is only applied at the end of each day, dispersing OdorSeal during active excavation may optimize use of the equipment, and eliminate the need for an additional water truck. The needs of each project are considered when designating and optimizing odor mitigation equipment. This section describes use of a HydroSealer.

Equipment Description. The HydroSealer, available in 800 and 1100 gallon units, are trailer-mounted, and consist of a 900 or 1200 gallon tank, interior agitation paddles, Kubota diesel engine, and slurry pump. The unit is used both to mix the component materials, as well as disperse the matrix/solution when ready. The equipment is capable of spraying HydroSeal or OdorSeal either via a high-volume "cannon", or through a 1½" hose and nozzle set-up. KUMA also has a 3300 gallon unit for use on larger projects.

Utility Requirements. The HydroSealers run on diesel fuel and require potable water as the major ingredient of the HydroSeal and OdorSeal solutions. For each batch of either product, approximately 800 gallons (or 1100 gallons) of potable water is needed.

Labor Requirements. For each HydroSealer in continuous use, two persons per unit are required. Typically, continuous use is not necessary, and instead, exposed wastes are generously coated at the end of each day, once operations have ceased. With this scenario, operators assigned to the MEC or other equipment (during operations) apply the HydroSeal. Two persons per unit are needed, for the duration, until all odorous surfaces and/or stockpiles are coated. This end-of-day cover activity usually necessitates overtime wages for all involved.

KUMA

Section I
Skilled Technicians

KUMA has trained, skilled technicians on staff with experience operating, maintaining, and repairing the equipment we provide. All of our field staff have completed HazWoper 40 hour training, as prescribed by OSHA, are current on their refresher courses and medical monitoring programs, and are familiar with construction safety procedures. Courses completed by our staff include:

- 40-hour Hazardous Waste Operations and Emergency Response (HazWoper) Training
- 8-hour Annual HazWoper Refresher Courses
- Landfill Operations Certificate Course
- Trench Shoring Competent Persons Training
- Company Illness and Injury Prevention Plan Training
- Daily Project Tailgate Safety Meetings

In addition, our technicians receive training and experienced in specialized applications for mitigating odors and VOC emissions. They are more able to adjust to changing conditions and optimize equipment performance than technicians less familiar with odor mitigation strategies.

Section J

Equipment Use & Warranty

When KUMA is contracted to conduct the odor/dust mitigation work, KUMA personnel will service the equipment, providing assurance that sudden, preventable breakdowns are avoided.

Customer Responsibility. However, in situations when equipment is leased to the Customer to conduct work, or equipment has been sold to the Customer, the Customer assumes full responsibility to safely and correctly use, maintain, and protect the equipment. This includes following all safety practices, using only authorized products with the equipment, and conducting regular service and maintenance per manufacturer's recommendations.

It is Customer's responsibility to use the equipment in a safe manner. High-pressure water, solution, and/or slurry matrices may cause severe bodily injury. Customer is instructed never to spray water or materials at another live being. KUMA equipment is not suitable for use in personal hygiene or emergency cleaning of body parts. The high - pressure spray mechanisms and/or turrets shall never be used for cleaning, bathing, or showering live beings.

Unless a damage waiver is purchased by the Customer at the start of the lease period, the equipment must be returned in "as delivered" condition. Charges for repairing equipment belonging to KUMA and returned in damaged condition will be borne by the Customer.

Equipment Warranty. KUMA warrants its equipment to be free of defects in material or workmanship. Liability under this policy extends for one year from date of installation or delivery, whichever comes first. KUMA's liability is limited to repair or replacement of any device or part which is returned, shipping prepaid, to its Grass Valley, California location, and which is proven defective upon examination. This warranty does not include installation or repair cost, and in no event shall KUMA's liability exceed its selling price of such equipment.

KUMA disclaims all liability for damage to its equipment or products caused by improper installation, maintenance, use, unauthorized repair, or attempts to operate such equipment beyond its functional capacity, intentionally or otherwise. Replaceable elastomeric parts are expendable and are not covered by any warranty, either expressed or implied. KUMA is not responsible for consequential or other damages, injuries, or expense incurred through use of its equipment.

The above warranty is in lieu of any other warranty, either expressed or implied. KUMA makes no warranty of fitness or merchantability. No agent of KUMA Corporation is authorized to make any warranty other than the above.