Collection System Management

Presented By:

Rick Allen, MSU, GSD

BioLynceus

Overview

Water Soil Plants

This Session Covers

- Collection System Considerations
- FOG/H2S/BOD/TSS/Contaminates
- Financial Considerations
- Mechanical/Chemical/Biological Programs

Remember this …

Water Soil Plants

- Every Action = Reaction
- Chemicals Degrade Microbiology
- Wastewater Treatment Plants use what?
- Microbiology behaves like teenagers

Challenges You Are Facing

Water Soil Plants

- EPA/ DEQ - NPDES Permitting (Wheatland-Odor)
- Discharge & Zero Discharge
- Optimization of Waste Treatment
- Changing rules; BOD, TSS, AN, Phos, PPCP

Compliance Issues

Water Soil Plants

- EPA, DEQ, DPH are still expanding rules
- New rules for:
  - Ammonia/Nitrates
  - Phosphorous
  - H2S
- Other contaminants contribute to the growing issues (P/PCP)
- New issues are continuing to emerge
- Mercury Fillings (Amalgam)

Cedaredge, CO

Chemical Degrade the Natural Biology

Water Soil Plants

- Contaminants weaken the microbiology
- Chlorines, Chlorides kill beneficial biology
- Chemicals create microbial deficiencies
- Many solutions for treatment are:
  - Toxic to the environment
  - Difficult to remediate once introduced (Baraclear)
  - Create imbalances in the environment – by fixing one problem, a new one is created.

Collection System Realities

Water Soil Plants

- Reduce Odors
- Cost per mile to jet lines and keep lines open
- Reduce shut-down, clogs and other operational interruptions
- Remove congestion from pipes and trap stations
- Reduce contamination by chemical and / or processing materials
- Improve bio-degradation of solids in treatment processing
- Reduce expensive costs where budgets are already being cut and reduced

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Special Assessments and Fines

Water Soil Plants

- BOD as high as $3 million
- TSS as high as $3 million
- H2S as high as 50 % total bill

EPA is now monitoring H2S in some states

What is in Your Water?

Water Soil Plants

Materials that Degrade ….

Water Soil Plants

- Contaminants weaken wastewater biology
- Chemicals create microbial deficiencies & systemic imbalances. (**CM** producers dispose contaminants into wastewater.)
- Some waste deposits have hazardous waste disposal issues. (Town in Wyoming)

Contaminates That Damage Digestion

Water Soil Plants

- **Crystal Meth**. (Critical Issue)
- Anti-Bacterial Cleaning Solutions
- Hydro-Carbons
- Pesticides, Herbicides, Fungicides
- Fertilizers
- Solvents and Foams
- Septic tank waste
- **Car Fenders**, etc.

Chemistry vs. Biology

Water Soil Plants

- Chemicals affect Biology
- CM
- Chlorides used to fight Caustics
- Collection System Chemicals: Oxides, Root Removal
- Industrial (Sinclair)

City of Paul pH 9.5

Self- Inflicted Contaminates

Water Soil Plants

- Emulsifiers, Enzymes, Acids & Surfactants (Grease)
- Chlorides / Acids / Nitrates (H_2S)
- Algaecides/Herbicides
- Aluminum / Polymers (Sludge) Water
- Copper Sulfate
- Potassium & Magnesium Peroxide

… all have a negative impact on biology.

Colorado City Kills Digesters

The Problems You are Trying to Solve

Water Soil Plants

- Reduce Odors
- Keep lines open
- Reduce shut-down, clogs and other operational interruptions
- Remove congestion from pipes and lift stations
- Reduce the cost of pumping and hauling

Valley of Death)

Do you have problems with FOG

Everyone has Fog Issues

… and manage the system for long term results instead of the short term gain.

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FOG: Fats, Oils, Grease

Water Soil Plants

Definition:

A liquid or solid material containing substances which may solidify or become viscous at temperatures between 32 degrees and 150 degrees Fahrenheit, composed primarily of fats, oils or grease from animal or vegetable sources. The phrases "fats, oils and grease (FOG)," "oil and grease," or "oil and grease substances" is included in this definition.

Management Expenses Rise

Water Soil Plants

Colorado Cities hauling grease

Inflates Expenses to Manage Systems

- Expensive Grease Removal; Vacuuming/pumping and hauling solids
- Increases labor resources to manage FOG; scraping, etc.
- Expensive mechanical retrofits
- Replacement of equipment; replacing wet wells or feeder lines

$168 per hour for a crew

Environmental Pressures

Water Soil Plants

- FOG Ordinances
  - don't exist, or
  - are not enforced
- Grease Traps
  - water is released at hotter temps (180^{o} to 210^{o})
  - traps are not maintained or managed properly
- People
  - are under – educated on FOG, and
  - dump everything down the drain, especially cooking oils
- Seasonal Influxes (tourism, beekeeping…)
  - Temperatures impact how FOG accumulates
  - Increases in volume and materials in sewers;

You have been mandated to collect FOG in your collection lines.

Ultimately you want to accomplish

Water Soil Plants

- Digesting Grease throughout the system
- Products that do not make big grease, little grease or harm microbiology
- Ways to remove grease without excessive man hours or equipment cost
- Reduction of odors
- Fewer complaints
- Healthy microbiology
- Cost effective

EPA currently estimates $1 per foot or $5,200 per mile for cleaning

Reduction of Grease

Water Soil Plants

FOG in Wastewater Systems

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Interferes with the Proper Operation of Wastewater Systems by causing on-going problems for the entire system including:

- Hardened grease and solids in sewer lines, grease traps, lift stations, pumps and supporting equipment
- Blockage of sewer lines; clogs; overflows
- Decreases flow rate
- Produces foul odors

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Jetting and Cleaning

Water Soil Plants

- Lift Stations
- Collection Systems
- Cost per hour
- Cost per mile
  - $5,200
- Jetting and Cleaning is often seen as a business requirement for preventive maintenance and is often built into the budget.

SSO's: 100K (fine art loss)

$168 + OT

$.39 to $1.38

Missoula Throne

Mechanical Means

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These solutions are expensive and the results are short-lived.

- Jetting Lines.
  - temporary fix to grease build-up
  - some lines require jetting every two weeks
- Vacuuming
  - $6/ per cubic foot (or more)
  - temporary solution
- Scraping; Floats, Pumps, etc.
  - labor intensive
  - nobody loves the dirty jobs
- Pumping (lift stations or grease traps)
  - things have gone south – or really, really bad

Do you have Hot Spots?

Cost $400 K

10 to 12 years

Cody, WY was manually scraping lift stations frequently.

Grease Ordinance Enforcement

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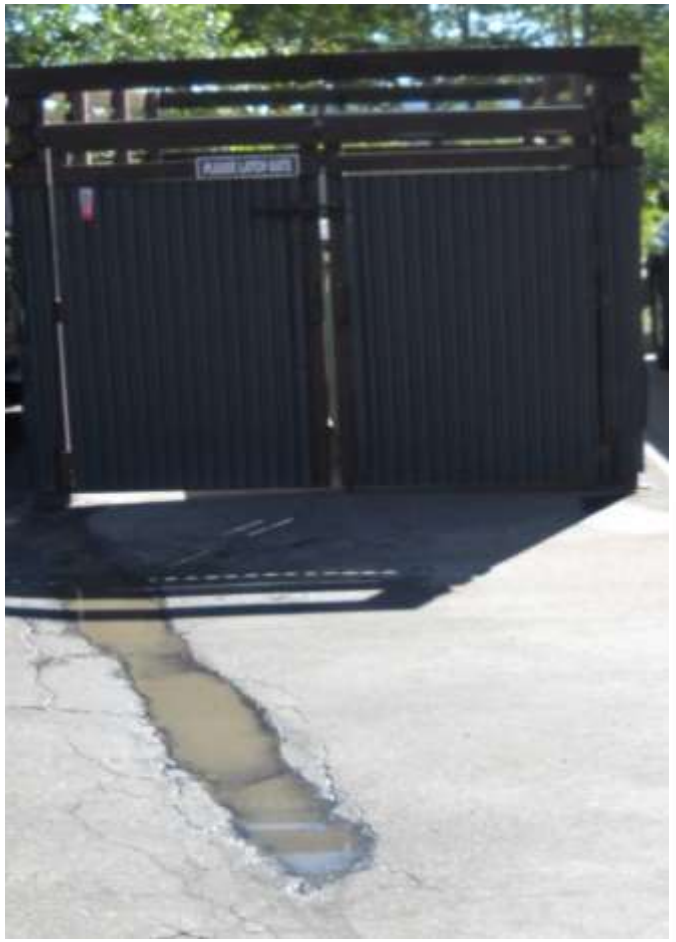
- Confined Humans
- Valley of Death Line
- Industrial – Including other things not commonly thought of as Industrial.
- Transportation of Grease
- Dumping: Storm Drains
- Grease Interceptors



EPA is looking at FOG as a mandate

Confined Human

Water Soil Plants

- Apartment Complexes
- Nursing Homes
- Hospitals
- Prisons – Correctional Institutions
- Mobile Home Parks
- Schools – Academic Institutions
- Mental Institutions

FOG

P/PCP

Caustics

Cost at the WWTP

Water Soil Plants

- 80% at the plant.
- BOD
- TSS
- Foaming
- Power Consumption
- Chemicals
- Pumper Trucks

Wasilla, Alaska

What's in that truck?

Pumper Games

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- Did they pump? Really!?
- What pumps at night stays on site
- When In Doubt Inspect
- Manage your restaurants & your haulers
- Manifests Lie
- Where is all that material being dumped? Legal/Illegal

Really? 6000 Gallons went into that 3200 Gallon Truck that stopped 5 Times before you??

Utah Grease Pumper

How do you work the system?

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- Utah Pumper
- I paid but no service
- Dropped the material into the nearest manhole.
- Latest scam in Colorado – **Water Only**
- City involvement to solve the problem (Billings/Bozeman hauler)
- Pump it dry
- City Employee must be on site

The Density of Water & Oil

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Substance	lbs./gallon
water	8.34
Peanut oil	7.62
Olive oil	7.66
Corn oil	7.69
Coconut oil	7.67

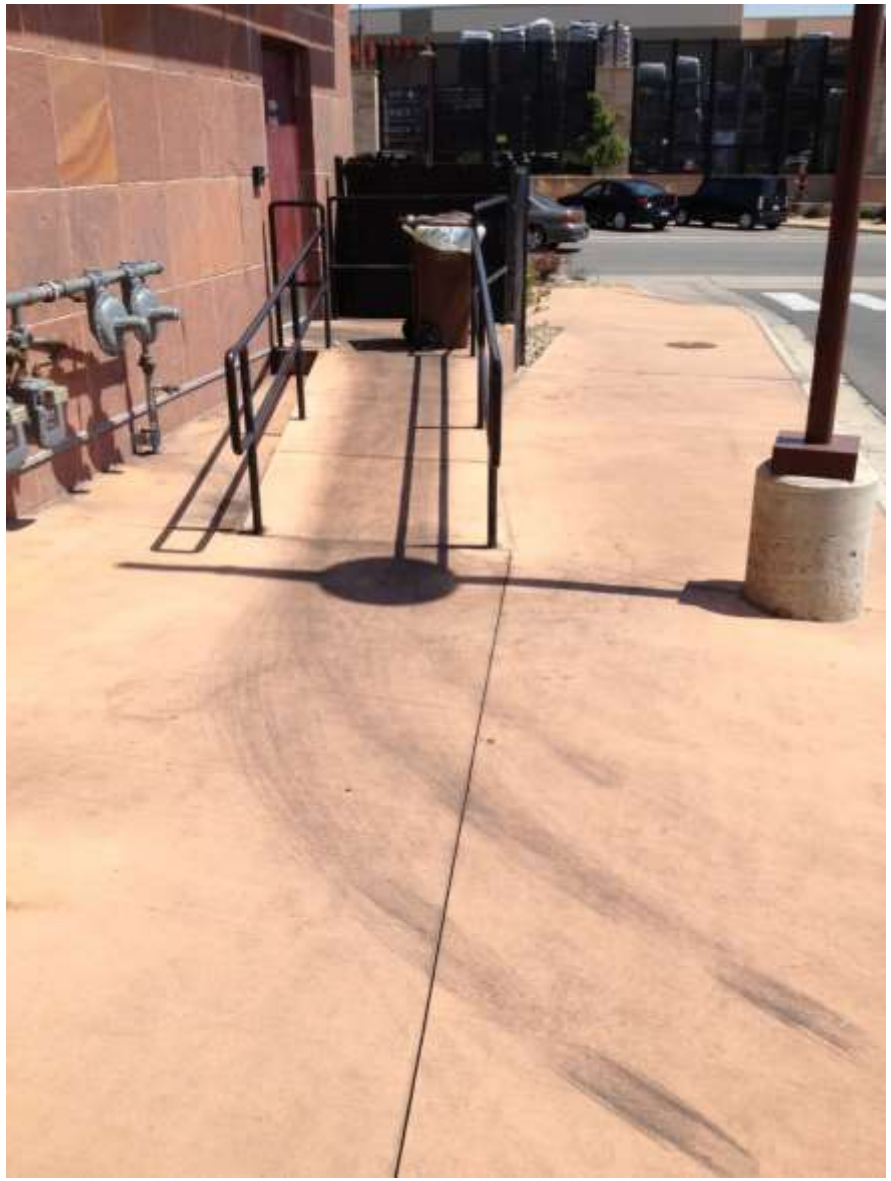
These are just a few

Water has heavier density, so oils float on top.

BMP

Water Soil Plants

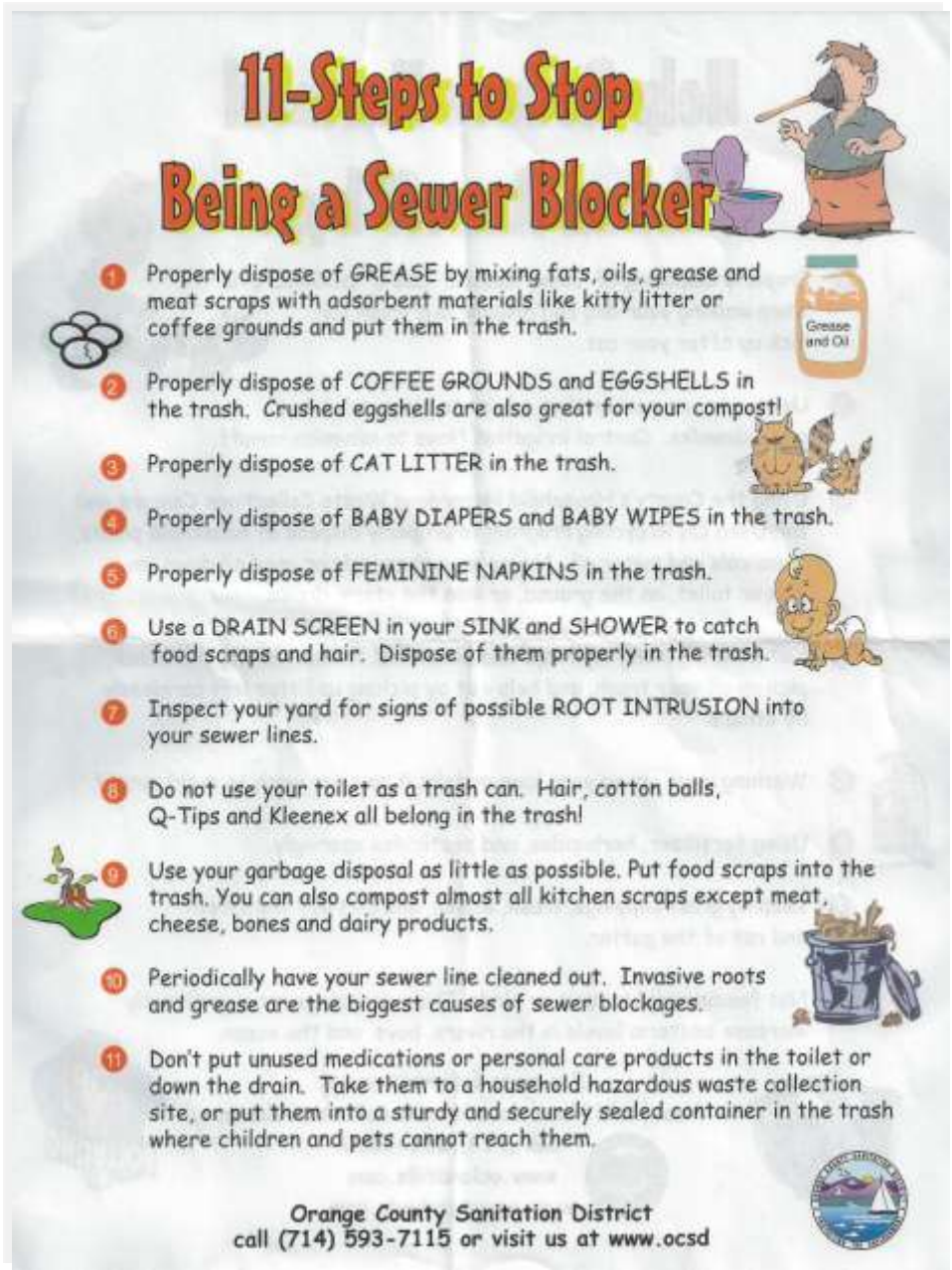
- Education (service workers & public)
  - Food service workers trained monthly
  - Provide education to public
  - Grade school is the best place
- Inspections
  - Floors and Drains
  - Hoods
- Enforcement (Mayor)
- Scrape and discard (can it, bag it)



EPA Looking at FOG in Storm Drains

Educate

Water Soil Plants



11-Steps to Stop Being a Sewer Blocker

1. Properly dispose of GREASE by mixing fats, oils, grease and meat scraps with adsorbent materials like kitty litter or coffee grounds and put them in the trash.
2. Properly dispose of COFFEE GROUNDS and EGGSHELLS in the trash. Crushed eggshells are also great for your compost!
3. Properly dispose of CAT LITTER in the trash.
4. Properly dispose of BABY DIAPERS and BABY WIPES in the trash.
5. Properly dispose of FEMININE NAPKINS in the trash.
6. Use a DRAIN SCREEN in your SINK and SHOWER to catch food scraps and hair. Dispose of them properly in the trash.
7. Inspect your yard for signs of possible ROOT INTRUSION into your sewer lines.
8. Do not use your toilet as a trash can. Hair, cotton balls, Q-Tips and Kleenex all belong in the trash!
9. Use your garbage disposal as little as possible. Put food scraps into the trash. You can also compost almost all kitchen scraps except meat, cheese, bones and dairy products.
10. Periodically have your sewer line cleaned out. Invasive roots and grease are the biggest causes of sewer blockages.
11. Don't put unused medications or personal care products in the toilet or down the drain. Take them to a household hazardous waste collection site, or put them into a sturdy and securely sealed container in the trash where children and pets cannot reach them.

Orange County Sanitation District
call (714) 593-7115 or visit us at www.ocsd

Things to Consider: Many Cities in U.S.

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- No chemicals or surfactants
- No enzymes
- No grinders
- Don’t make big grease little grease
- Manage trash bins and grease receptacles
- Live bugs OK in lines not grease traps
- Storm sewers and parking lots

Estes Park, Pocatello, Modesto

Delta Colorado – Degreaser

Treated with degreasers and enzymes

Water Soil Plants

Erosion H2S

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H_2S in the News

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Health Concerns May Spur Hydrogen Sulfide Ruling (Wall Street Journal, Ilan Brat Thursday, December 13, 2007)

The U.S. Environmental Protection Agency is considering broadly regulating hydrogen sulfide, a common gas that smells like rotten eggs and has been increasingly linked to a variety of health problems.

Sour gas leak kills worker: Employee never returned from changing flow meter at remote gas facility (*The Edmonton Journal*, *March 8, 2008, Jennifer Fong*).[8]

A 46-year-old employee of ELH Enterprises in Whitecourt was working on contract for Calgary-based oil and gas company Orleans Energy when he died on the job Friday afternoon.

Alabama residents suspect health problems to be related to hydrogen sulfide and contaminated water (9CBS 8 TV, Montgomery, AL)

Residents along Old Stage Road in Conecuh County, Alabama, have been experiencing headaches, open sores, miscarriages and other health effects, which they believe are related to air and water contamination.

WTP Plant put 3 Operators in Hospital for H_2S Exposure

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Corrosion of Plant Equipment

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What does H2S Cost?

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Plant & Operational Expenses

- NM (500K) Lift Station
- WY (5 MGD) Man Hole Cover
- Colorado (1 MGD) Painting
- WA (10 + MGD) Air Exchange Unit
- H2S Explosive
- Black Flies

Deaths related to H_2S Exposure

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United States

According to the 2007 Annual Report of the American Association of Poison Control Centers' National Poison Data System, 1134 single exposures and 13 fatal outcomes were reported.[1]

It is very important to realize that 25% of fatalities usually involve rescuers, professionals, or bystanders.[2]

Definition of H_2S

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- Chemical/Physical Properties Hydrogen sulfide gas is a naturally occurring chemical (chemical formula H_2S).

- The gas has a characteristic rotten egg odor at low concentrations. About half of the population can smell it at concentrations as low as 8 parts per billion (ppb) in air, and more than 90% can smell it at levels of 50 ppb. At higher concentrations, hydrogen sulfide rapidly deadens the sense of smell. For most people, this occurs at approximately 150 ppm.

- Hydrogen sulfide is heavier than air, and it often settles in low-lying areas where it can accumulate in concentrations that can injure or kill livestock, wildlife, and human beings. Additionally, hydrogen sulfide has been found to migrate into surface soils and groundwater.

H_2S Hydrogen Sulfide Gas Effects

♦Water ♦Soil ♦Plants

Health Effects	H2S Levels, PPM	Symptoms
Instant Death ☠	1000	Immediately Fatal
	700	Paralysis of the nervous system
Extreme to Deadly ☹ ➡ ☠	600	♦Paralyzes the respiratory system ♦Overcomes victim almost instantaneously ♦Death after 30-60 minutes of exposure.
	500	♦May cause muscle cramps, low blood pressure and unconsciousness after 20 minutes
	300	♦Pulmonary edema (lungs fill with fluid, foaming at the mouth, chemical damage to lungs).
	250	
Severe to Deadly ☹ ➡ ☠	200-250	♦Nervous system depression (headache, dizziness and nausea are symptoms). ♦Prolonged exposure may cause fluid accumulation in the lungs ♦**Fatal in 4 to 8 hours of continuous exposure**
	100-150	♦Loss of smell, stinging in the eyes and throat ♦**Fatal after 8 to 48 hours of continuous exposure**
Mild to Moderate 😐 ➡ ☹	50	♦May cause muscle fatigue, inflammation and dryness of nose, throat and tubes leading to the lungs ♦**Exposure for one hour or more at levels above 50 PPM can cause severe eye tissue damage.** ♦ Long Term exposure can cause lung disease
	30	
	10-20	♦Causes painful eye, nose and throat irritation, headaches, fatigue, insomnia, gastrointestinal disturbance, loss of appetite, dizziness. ♦Prolonged exposure can cause bronchitis and pneumonia
None to Tolerable ☺ ➡ 😐	4.6	♦Strong intense odor, but tolerable. **Prolonged exposure may deaden the sense of smell.**
	0.13	♦ An odor threshold – Odor is unpleasant. Causes sore eyes
	0.0086	♦ SRCSD Odor Nuisance Threshold per the Odor Control Master Plan 2003

May be fatal in 1 to 4 hours of continuous exposure

Sickeningly sweet smell noted

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Hydrogen Sulfide (H2S)

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- Deadly Environmental Contaminate – Toxic to workers
- 1100 Reported Incidents per year of injury
- Several deaths occur annually due to H2S Contamination
- Expensive to Infrastructure; $45 Billion Annually in capital costs for replacement of equipment.
- Corrosive (**Manhole in WY**)
- Odor; DEQ Fines; Special Assessments & Fines

Where Does H2S Build-Up

Water | Soil | Plants

- Lift Stations
- Mechanical Plants: All Types
- Collection Lines
- Forced Mains
- Gravity Mains
- Poorly ventilated areas
- Low Flow

6 People Died – last 90 days in 2011

Wichita Falls

6 others Died – in one incident at Lift Station

Scottsdale and Idaho

Forced Mains

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Before Treatment

After Treatment

Preventing H_2S Accidents

Water Soil Plants

H2S Accidents

In wastewater treatment facilities, there is the potential for H2S accidents. Some common problem areas and gas monitoring applications include:

- **H_2S Sludge De-Watering**
  Sludge from waste treatment facilities may contain H_2S and methane gas as well. The sludge is transported through a spiral conveyor into the dewater system where the water is removed.
- **Confined Spaces are often trouble spots that have H_2S**

Preventing H_2S Exposure & Accidents

4 Gas Monitor

- **Use Gas Detectors & Monitors**
- **Audit your facility for potential areas of exposure. Implement a Safety Procedure for H_2S Operations.**
- **Practice Confined Space Procedures**

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Solutions: Treatments

Water | Soil | Plants

- Preventative
  - Anti-Corrosive Materials
  - Engineered Solutions
- Chemical
  - Chlorines
  - Nitrate
  - etc.
- Non-Chemical
  - Bioaugmentation

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Some Other Mechanical Options

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- Compressed Air
- Oxygen Generators
- Ventilation
- Epoxy
- Fiberglass
- Heavy Water
- Ozone

Prison System

School Bus Stop

Chemical & Additive Solutions

Water Soil Plants

Product	Safety	Anti-bacterial	Sludge	Suppressing Capabilities	% Efficient	Odor Stability	Ratio (lbs.)	Required Exposure	Odor Suppression
Bacterials	Non-Corrosive – Safe	No	None	Biological	90+	Stable	2-7 G/Day	Continuous	Continuous
Chlorine MoreInfo	corrosive	Yes	No	Oxidizer	Not Efficient	3 hr. suppression	8.4 chlorine/ lb.	1-3 hrs.	3 hrs.
Ferric Chloride MoreInfo	corrosive & acidic	Yes	Yes- large amount	Oxidizer/ Precipitator	40	Suppresses what reacts	11.5 lbs.FECL3/ lb.	1-3 hrs.	Limited suppression
Ferrous Chloride	corrosive & acidic	Yes	Yes	Precipitator	40	Stable	3.7 lbs. FECL2/ lb.	1-3 hrs.	same as above
Ferrous Sulfate	corrosive & acidic	unknown	Yes	Precipitator	40	Stable	2.75 lbs. FESO4/ lb.	1-3 hrs.	same as above
Hydrogen Peroxide	Oxidizer, Extreme fire hazard	Yes	No	Oxidizer	unknown	3 hr. suppression	1.8-7.2 lbs.H202/lb.	1-3 hrs.	3 hrs.
Oxygen	oxidizer	Yes	No	Oxidizer	unknown	Suppresses for hrs.	3 lbs./ lb.	2 hrs.	3 hrs.
Sodium Nitrate,Calcium Nitrate MoreInfo	oxidizer	Yes	No	Oxidizer	unknown	Suppresses for 8 hrs.	7 lbs./ lb.	1-2 hrs.	8 hrs.
Nitrazyme	oxidizer	Yes	No	Oxidizer	unknown	Suppresses for 8 hrs.	9 lbs./ lb.	1-2 hrs.	8hrs.
Thioguard mag./ hyd	Corrosive to skin	No	Yes & scaling	pH Control	44	Depends on agitation/pH	3/4 lb./ lb.	3 hrs.	8 hrs.
Calcium Hyd/ slurry	Corrosive to skin	No	Yes & Scaling	pH Control	40-50	Stable	5.5 lbs./ lb.	3 hrs.	8 hrs.
Potassium Permanganate	Oxidizer, Fire hazard & staining	Yes	Yes	Oxidizer	Not Efficient	Suppresses for hrs.	17 lbs./ lb	3 hrs.	7 hrs.

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Microbial & Biological

Water Soil Plants

- All Solutions are not Created Equal
- High PH
- Low PH
- Do your research
- Precipitants

Chemical Additives

Water Soil Plants

- Special Handling, Equipment & Safety
- Changes pH
- Impacts aerobic biological activity in plant
- Varying efficacy, depends on application rates.
- Corrosive material can add to cost of maintenance and corrosion in plant.
- Application & Cost Varies
- Increased BOD/COD Inflow Levels

Augmentation or Stimulation

Water Soil Plants

- Augmentation
  - Add Microbiology
  - Improve diversity and population
- Stimulation
  - Activate Indigenous
  - Catalysts

Bio-Augmentation in Wastewater

Water Soil Plants

- Pro-biological compounds and techniques are used to increase, develop, support and sustain beneficial biological systems to correct problems associated with damaged environments.

EPA

- Probiotics are being used to correct nutrient deficiencies, as well as mitigate contamination problems.

Bio-Augmentation – Know the Facts

Water Soil Plants

CFU: Colony Forming Units

	Pseudomonads CFU/ml
Sample # 3	33,000 - SRD (4)
Sample #2	<10
Sample #1	<10

Bio-Augmentation … what's in a product?

Water Soil Plants

	Pseudomonads MoSA 37-8.3 (mod) CFU/ml	Heterotropic Plate count, SM 9215C (CFU/ml)
Sample #1	1 x 10^1	3.5 x 10^6 - SRD (1)
Sample #2	<1 x 10^1	3.8 x 10^6 - SRD (1)
Sample #3	54 x 10^7	310 x 10^7 - SRD (6)

CFU = Colony Forming Units/Milliliter Sample

SRD= Species Richness Diversity.

Results reported as "<" are below the detection limit for analysis

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Microbiolgy in Action

Water Soil Plants

- Buffering of Swings
- Nutrient recycling
- Clean-up of chemical residue
- Biological Nutrient Removal: PAO's & GAO's
- Decomposition & Pro-Biotic Dredging of solids residues and Organic Matter
- Development of ecosystem balance (Cannibals – I & I)

Southern Colorado reduced sludge build-up by 75% in 18 Months using liquid pro-biotic solutions.

Benefits of Managing Microbiology

Water Soil Plants

- Increase dissolved oxygen
- Increase microbial action & waste digestion
- Reduce total suspended solids & bio-chemical oxygen demand
- Eliminate most odors and ammonia levels
- Reduce nitrate and phosphate levels
- Positive effects on effluent discharge

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Bio-Augmentation or Bio-Stimulation

Water Soil Plants

- Liquid Microbes
  Cold Processed
- Liquid Microbes
  Heat Processed
- Enzymes
- Dry Microbes (Bugs in a Bag)
- Chemical additives: Oxidizers

…… not all solutions are created the same

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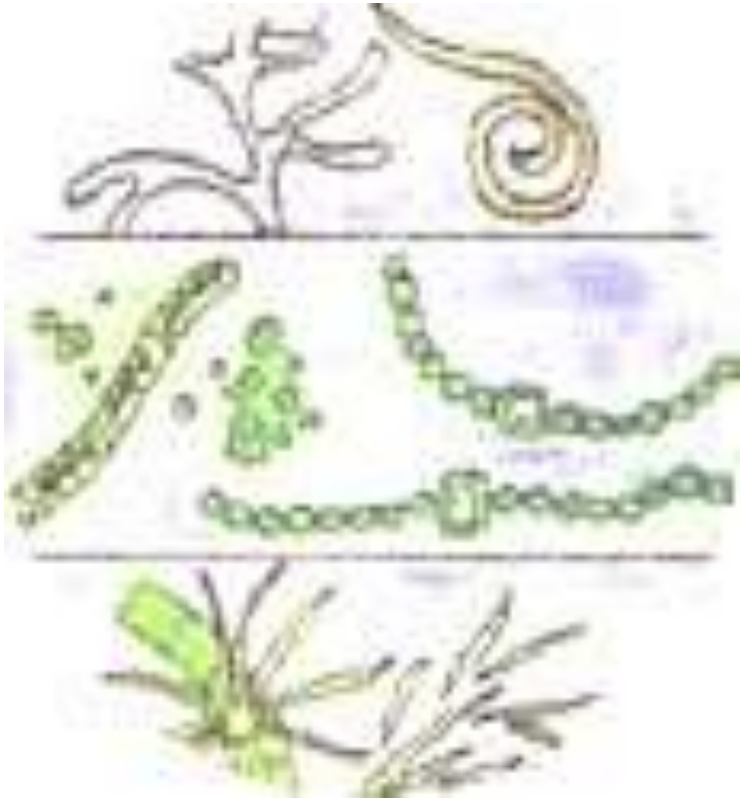
ProBiotics

Water Soil Plants

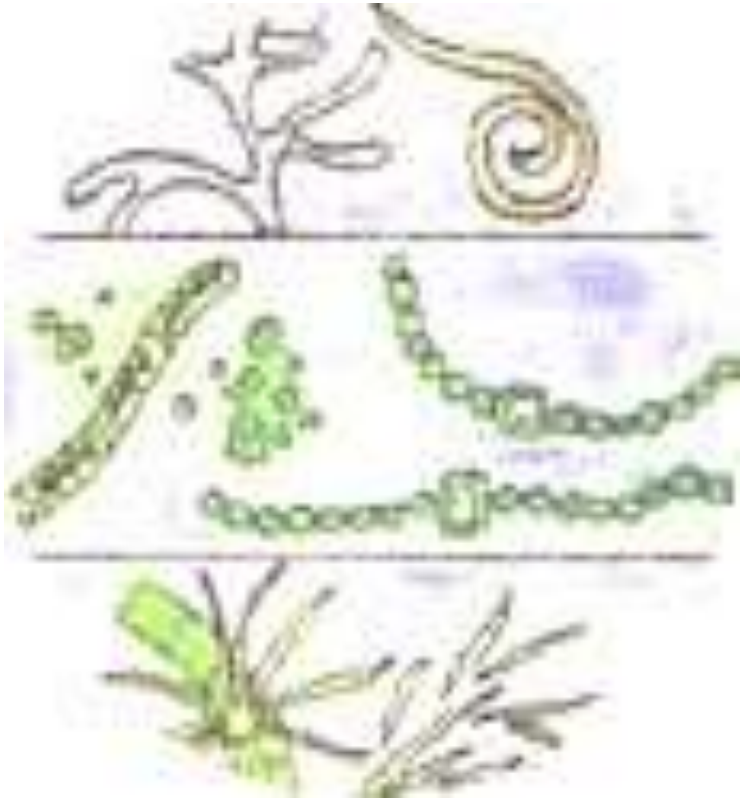
…”degradation of contaminants by micro-organisms involves the conversion of energy stored as a chemical – converts to water, carbon dioxide, cellular biomass, organic matters, organic acids and other beneficial inorganic compounds and elements.”



ProBiotics

Water Soil Plants

- Detoxify environments with organic buffering agents, highly available organic microbial residues, and elements which are required for environmental control
- The pro-biological approach uses beneficial organic materials to create an environment where micro-organisms can perform their natural remediation functions efficiently



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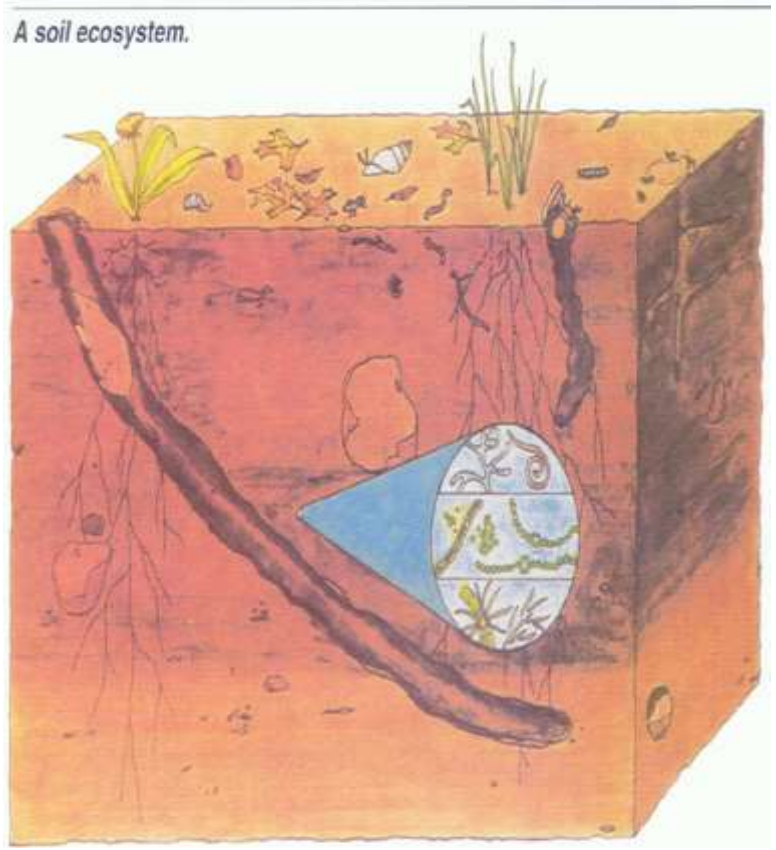
Beneficial Biology

Water Soil Plants

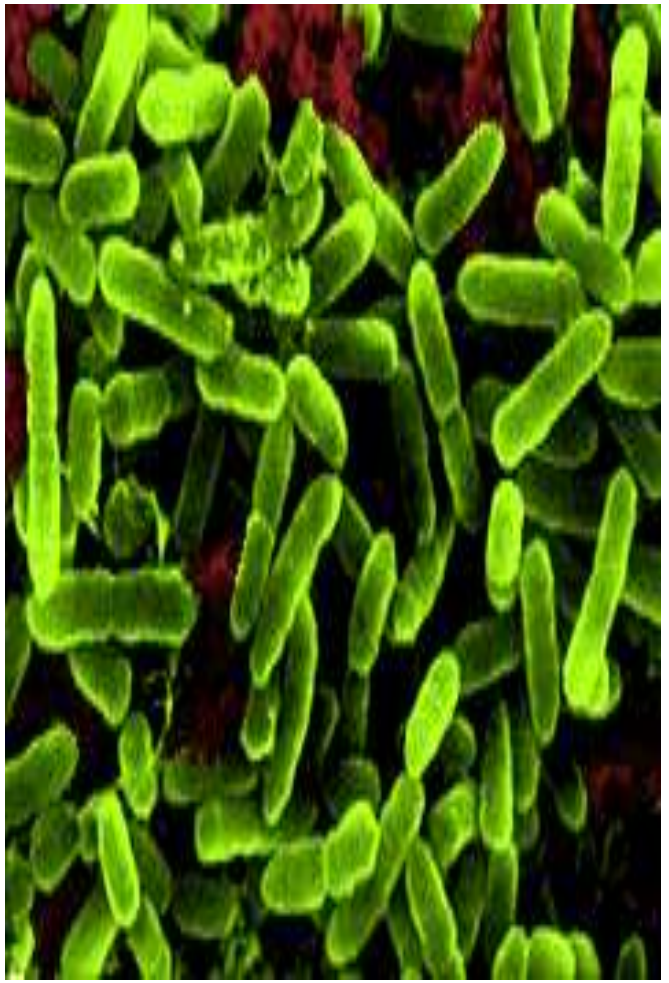
- Pro-biological compounds and techniques are used to increase, develop, support and sustain beneficial biological systems to correct problems associated with damaged environments.
- Probiotics are being used to correct nutrient deficiencies in crops and livestock, as well as mitigate contamination problems.



How Pro-Biotics Work

Water Soil Plants

- Enhances the natural function of beneficial microbes
- Essential amino acids aid growth and respiration of native microbes
- Restores the natural balance of nutrients that enable the natural biota to digest undesirable organics
- Generates large volumes of oxygen to speed up aerobic digestion of organics



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Chemical Degrade the Natural Biology

Water Soil Plants

- Contaminants weaken the microbiology
- Chlorines, Chlorides kill beneficial biology
- Chemicals create microbial deficiencies
- Many solutions for treatment are
  - Toxic to the environment
  - Difficult to remediate once introduced (Baraclear)
  - Create imbalances in the environment – by fixing one problem, a new one is created.

Waste Treatment Facilities

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Typical Problems

- Ph Swings
- Sludge Build-up
- Clogged Lines
- Sewage Flow
- Poor Water Quality

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BOD Producers

Water Soil Plants

- Refineries
- Pulp Mills
- Industrial Plants

… all have similar issues around how to handle waste.

Dig, Bury & Burn, or find another way to remove the waste?

Giant Refinery reduced 10’ of sludge in their industrial waste lagoons in 2 years.

Reduction of BOD & TSS

Water Soil Plants

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800-735-4489 • 406-252-6325 • 406-252-6069 fax • eli@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Jordan Town of
Project: MT0021385
Lab ID: B06110918-001
Client Sample ID: Lagoon Effluent

Report Date: 11/27/06
Collection Date: 11/13/06 13:30
DateReceived: 11/14/06
Matrix: Waste Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
Solids, Total Suspended TSS @ 105 C	104	mg/L		10		E160.2	11/14/06 13:28 / qed
AGGREGATE ORGANICS							
Oxygen Demand, Biochemical (BOD)	66	mg/L		2		A5210 B	11/14/06 15:38 / ldv

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LABORATORY ANALYTICAL REPORT

Client: Jordan Town of
Project: MT0021385
Lab ID: B06120772-001
Client Sample ID: Lagoon Effluent (Weekly)

Report Date: 12/26/06
Collection Date: 12/11/06 13:30
DateReceived: 12/12/06
Matrix: Waste Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
Solids, Total Suspended TSS @ 105 C	19	mg/L		10		E160.2	12/13/06 13:22 / qed
AGGREGATE ORGANICS							
Oxygen Demand, Biochemical (BOD)	12	mg/L		2		A5210 B	12/13/06 16:32 / ldv

11/13/06
TSS 104 mgL

BOD 66 mgL

12/11/06
TSS 19 mgL

BOD 12 mgL

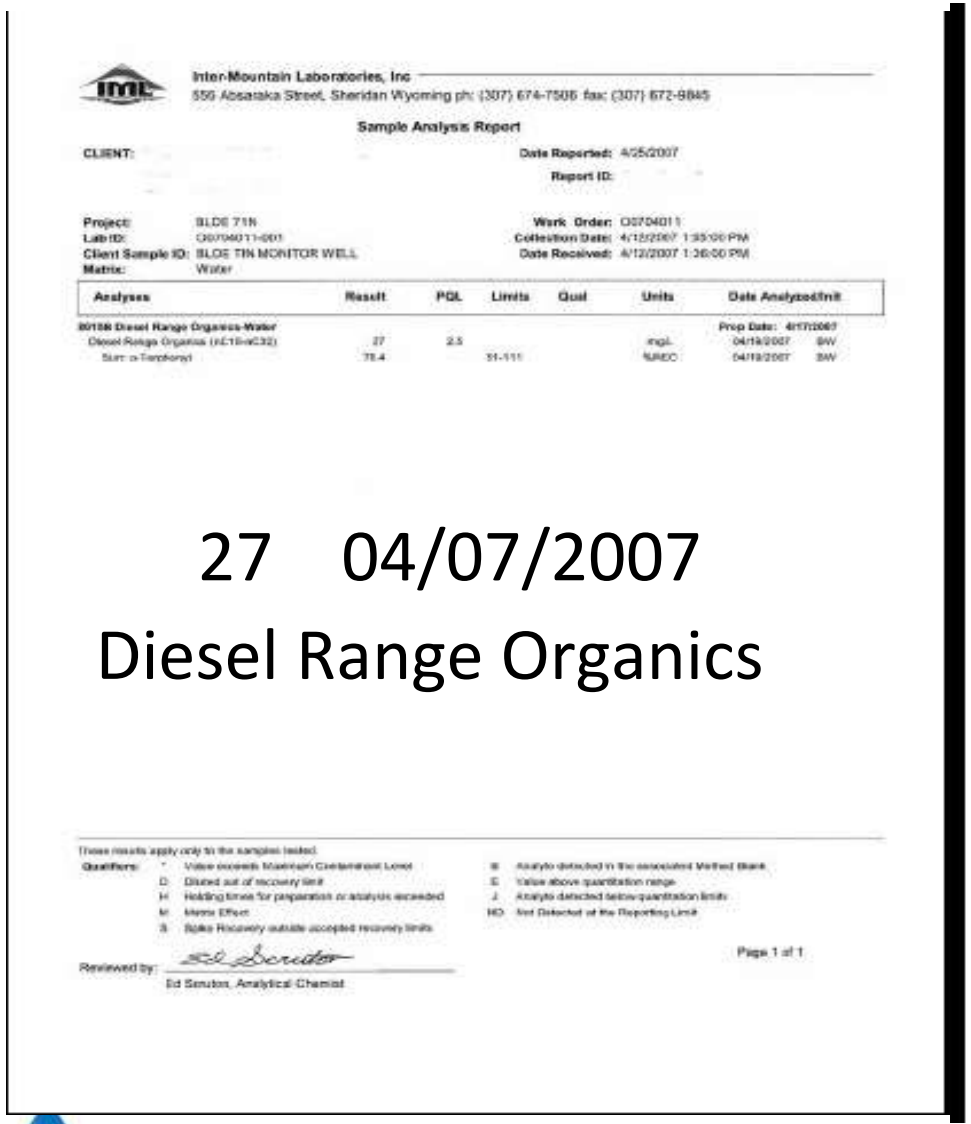
BioLynceus®

Unregulated Spills

Water Soil Plants

Diesel Fuel (In Situ)

Water | Soil | Plants



Inter-Mountain Laboratories, Inc
556 Absaraka Street, Sheridan Wyoming ph: (307) 674-7506 fax: (307) 672-8945

Sample Analysis Report

CLIENT:

Date Reported: 4/25/2007

Report ID:

Project: BLDE 71N
Lab ID: C0704011-001
Client Sample ID: BLDE 71N MONITOR WELL
Matrix: Water

Work Order: C0704011
Collection Date: 4/12/2007 1:35:00 PM
Date Received: 4/12/2007 1:36:00 PM

Analyses	Result	PQL	Limits	Qual	Units	Date Analyzed/Init
80158 Diesel Range Organics-Water						Prep Date: 4/17/2007
Diesel Range Organics (nC10-nC32)	27	2.5			mg/L	04/19/2007 BW
Surr: o-Terphenyl	78.4		51-111		%REC	04/19/2007 BW

These results apply only to the samples tested.

Qualifiers:
* Value exceeds Maximum Contaminant Level
D Diluted out of recovery limit
H Holding times for preparation or analysis exceeded
M Matrix Effect
N Spike Recovery outside accepted recovery limits
B Analyte detected in the associated Method Blank
E Value above quantitation range
J Analyte detected below quantitation limits
ND Not Detected at the Reporting Limit

Reviewed by: Ed Sarudor
Ed Sarudor, Analytical Chemist

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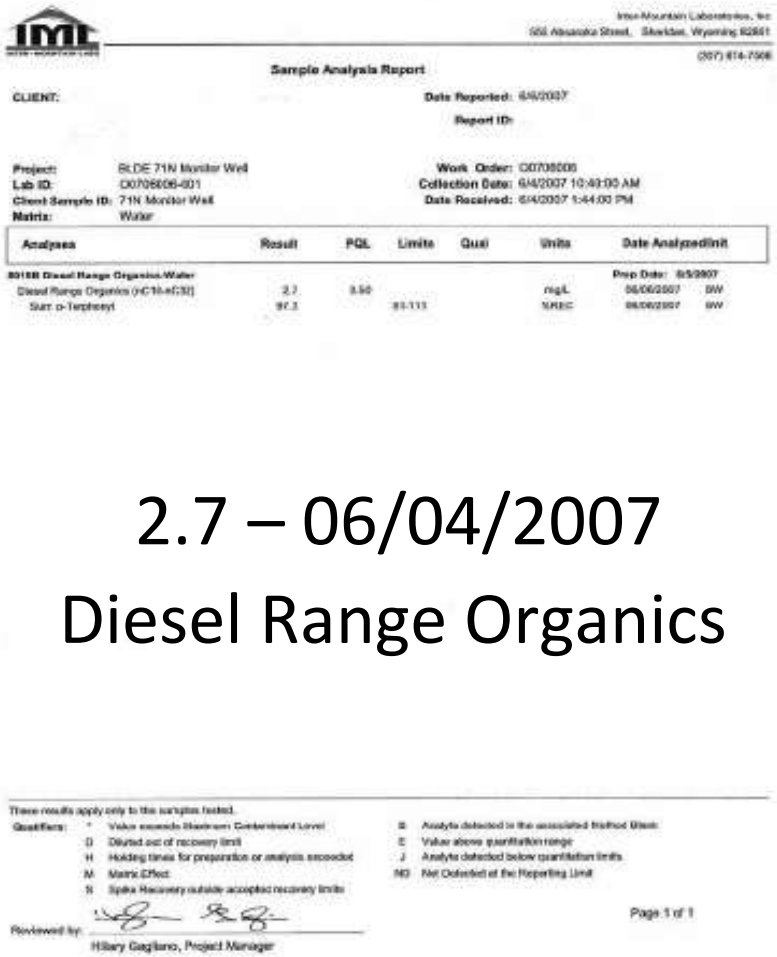
27 04/07/2007

Diesel Range Organics



Inter-Mountain Laboratories, Inc
556 Absaraka Street, Sheridan, Wyoming 82801
(307) 674-7506

Sample Analysis Report

CLIENT:

Date Reported: 6/4/2007

Report ID:

Project: BLDE 71N Monitor Well
Lab ID: C07060006-001
Client Sample ID: 71N Monitor Well
Matrix: Water

Work Order: C07060006
Collection Date: 6/4/2007 10:40:00 AM
Date Received: 6/4/2007 1:44:00 PM

Analyses	Result	PQL	Limits	Qual	Units	Date Analyzed/Init
80158 Diesel Range Organics-Water						Prep Date: 6/5/2007
Diesel Range Organics (nC10-nC32)	2.7	0.50			mg/L	06/06/2007 BW
Surr: o-Terphenyl	97.3		83-113		%REC	06/06/2007 BW

These results apply only to the samples tested.

Qualifiers:
* Value exceeds Maximum Contaminant Level
D Diluted out of recovery limit
H Holding times for preparation or analysis exceeded
M Matrix Effect
N Spike Recovery outside accepted recovery limits
B Analyte detected in the associated Method Blank
E Value above quantitation range
J Analyte detected below quantitation limits
ND Not Detected at the Reporting Limit

Reviewed by:
Hilary Gagliano, Project Manager

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2.7 – 06/04/2007

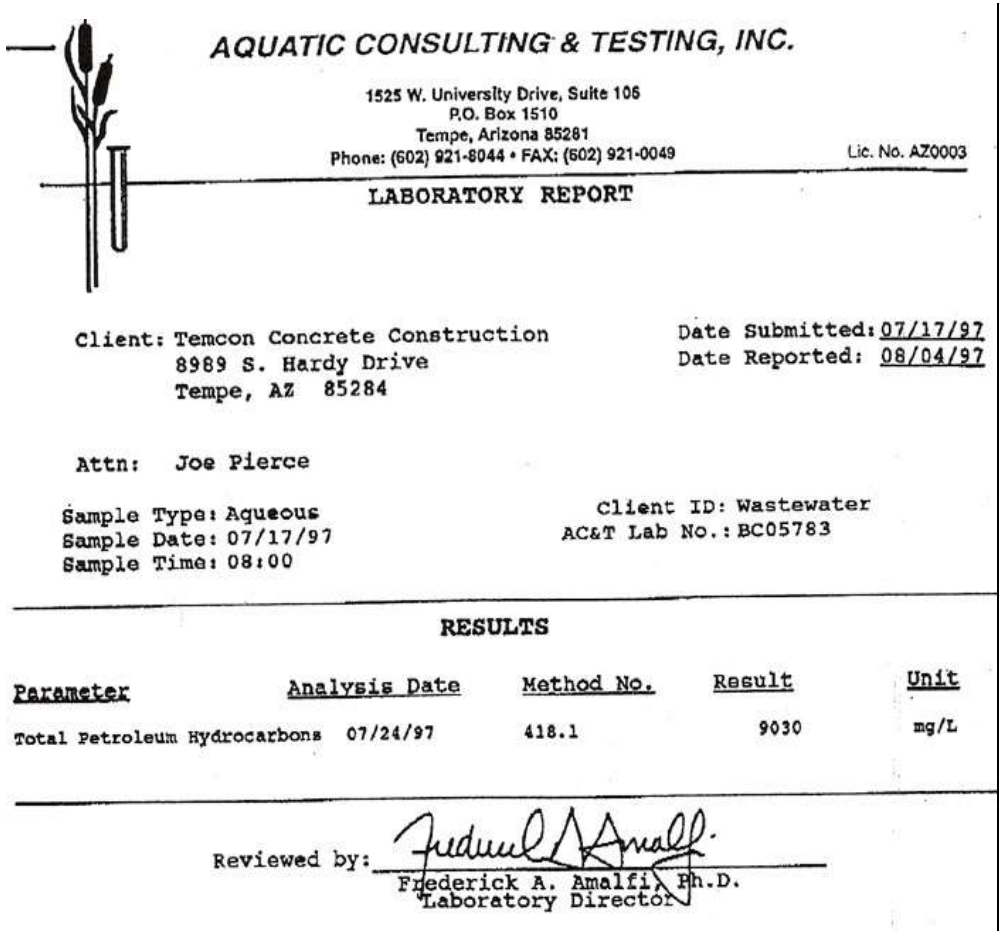
Diesel Range Organics

Opal & LaBarge

Reduction of TPH

Water Soil Plants

Before Treatment



AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 105
P.O. Box 1510
Tempe, Arizona 85281
Phone: (602) 921-8044 • FAX: (602) 921-0049 Lic. No. AZ0003

LABORATORY REPORT

Client: Temcon Concrete Construction
8989 S. Hardy Drive
Tempe, AZ 85284

Date Submitted: 07/17/97
Date Reported: 08/04/97

Attn: Joe Pierce

Sample Type: Aqueous
Sample Date: 07/17/97
Sample Time: 08:00

Client ID: Wastewater
AC&T Lab No.: BC05783

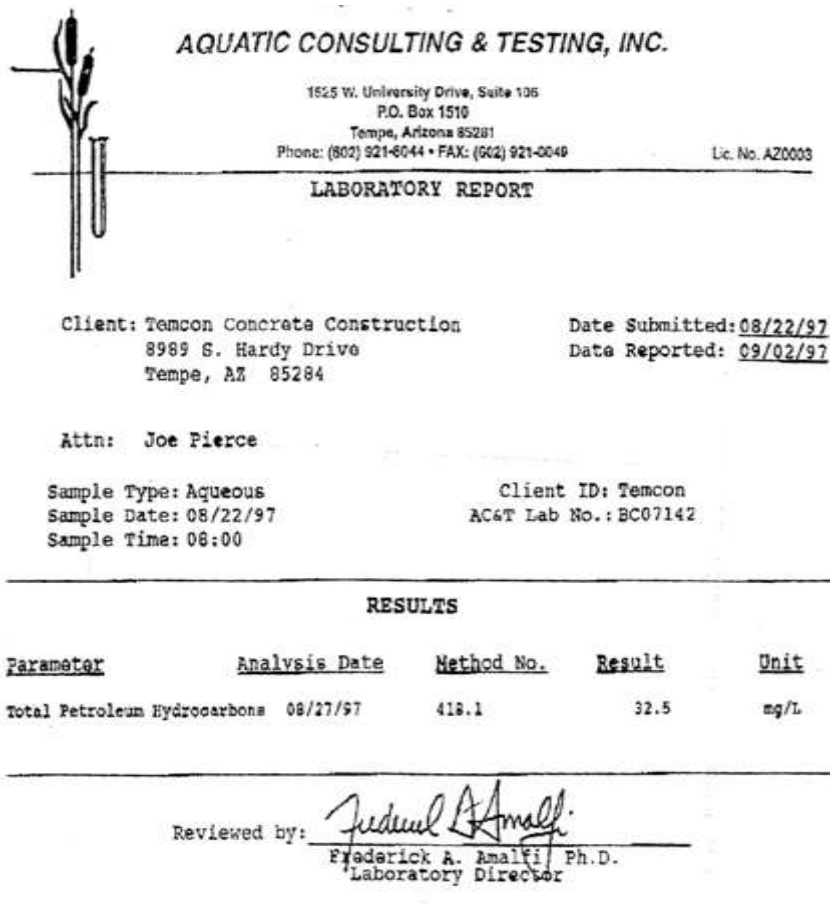
RESULTS

Parameter	Analysis Date	Method No.	Result	Unit
Total Petroleum Hydrocarbons	07/24/97	418.1	9030	mg/L

Reviewed by: Frederick A. Amalfi, Ph.D.
Laboratory Director

TPH = 9030

After Treatment



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P.O. Box 1510
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Phone: (602) 921-8044 • FAX: (602) 921-0049 Lic. No. AZ0003

LABORATORY REPORT

Client: Temcon Concrete Construction
8989 S. Hardy Drive
Tempe, AZ 85284

Date Submitted: 08/22/97
Date Reported: 09/02/97

Attn: Joe Pierce

Sample Type: Aqueous
Sample Date: 08/22/97
Sample Time: 08:00

Client ID: Temcon
AC&T Lab No.: BC07142

RESULTS

Parameter	Analysis Date	Method No.	Result	Unit
Total Petroleum Hydrocarbons	08/27/97	418.1	32.5	mg/L

Reviewed by: Frederick A. Amalfi, Ph.D.
Laboratory Director

TPH = 32.5

BioLynceus®

Final Word

Water Soil Plants

- Research & Analytical is growing to demonstrate efficacy of using ProBiotics to mitigate a variety of contaminants.
- EPA now recognizes use of Bio-Augmentation in WWTP as new & emerging technology
- Policies and Practices need to consider the balance of microbiology when using chemicals for treatment.
- ProBiotics can play an important role in the health of the environment and mitigating contaminants.

BioLynceus®

Final Word

Water Soil Plants

According to Water Industries Network (WIN) Costs related to Corrosion equal $45B /Year. These costs are a combination of operational, maintenance, Financial and Capital.

50% of all operating and maintenance costs may be related to corrosion.

System failures due to corrosion increase with system age.

Major barrier to progress in corrosion management is the absence of complete and up to date information on all water systems.

"Cost of Corrosion and Preventive Strategies in the United States“ Nace International, 2000. Data was based on figures from 1998.

BioLynceus®

You Want Solutions that:

Water Soil Plants

- Are not going to foul ejector station probes and level sensing tubes
- Will keep pump seal filters clear so pumps run cooler
- Don't inhibit waste digestion
- Don't negatively affect B.O.D. or oxygen demand when used
- Don't upset clarifiers
- Don't degrade effluent quality
- And for pro-biotics – have high CFU counts and diversity

BioLynceus®

Remember this …

Water Soil Plants

- Every Action = Reaction
- Chemicals Degrade Microbiology
- Wastewater Treatment Plants use what?
- Microbiology behaves like teenagers

Let us know how we can help!!

Please visit:

http://biolynceus.com/Free_Stuff.html for access to any of our educational information on-line!

If we can provide you some additional information please contact: sales@biolynceus.com

BioLynceus Environmental Solutions
www.BioLynceus.com 970-586-3391 888-823-7404