Phytoremediation of Landfill Leachate

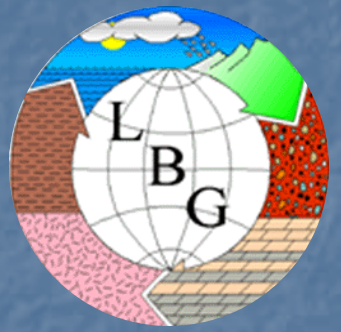
Using Vetiver

at the Leon, Mexico Landfill

PASA

Partnered

with

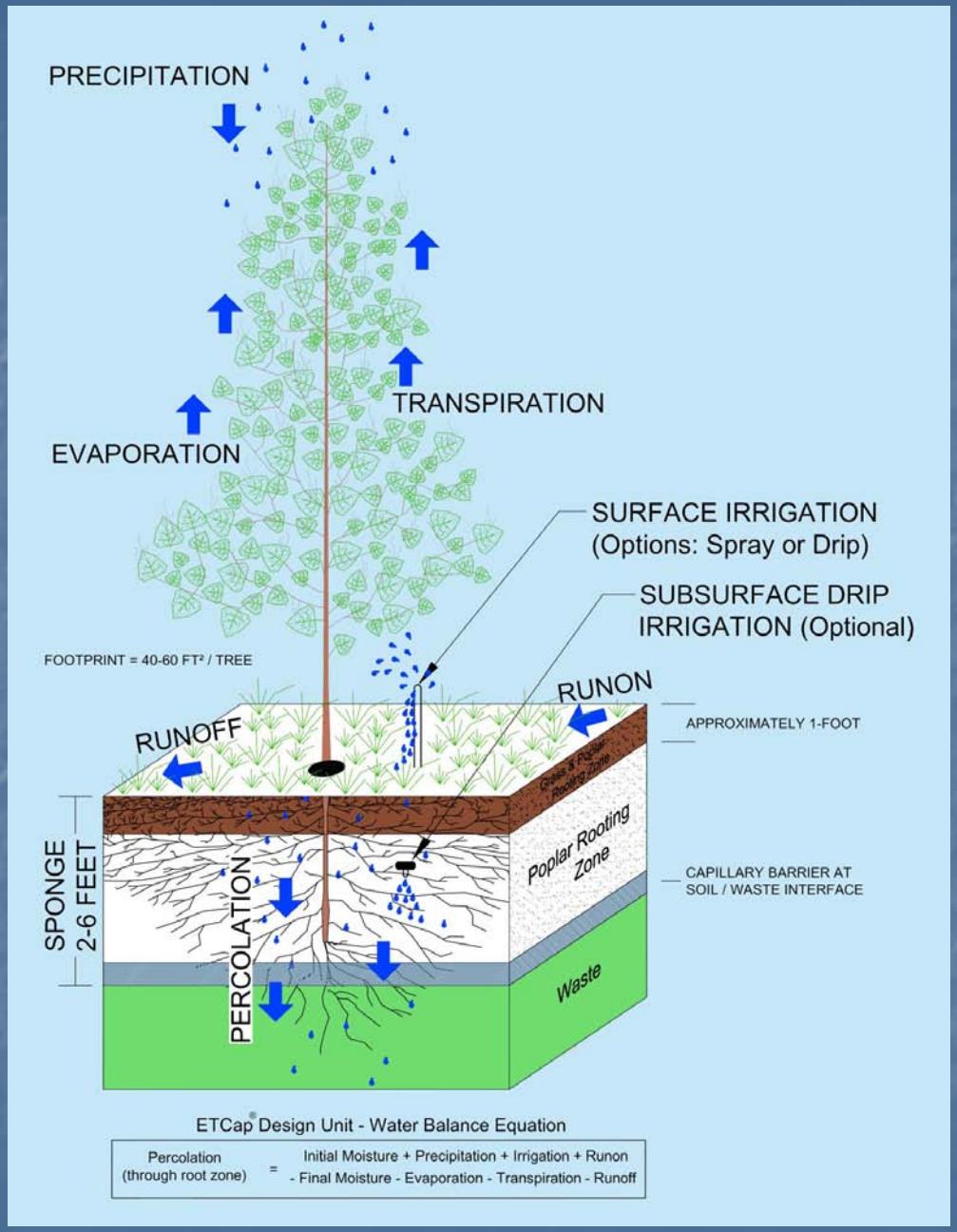


What Is Phytoremediation?

- Basically stated, phytoremediation is the use of plants to remove pollutants from the environment, or render risk to below acceptable thresholds

- Different plants used for different scenarios
  - Trees and Grasses

Ricardo Lopez, PASA Landfill Manager



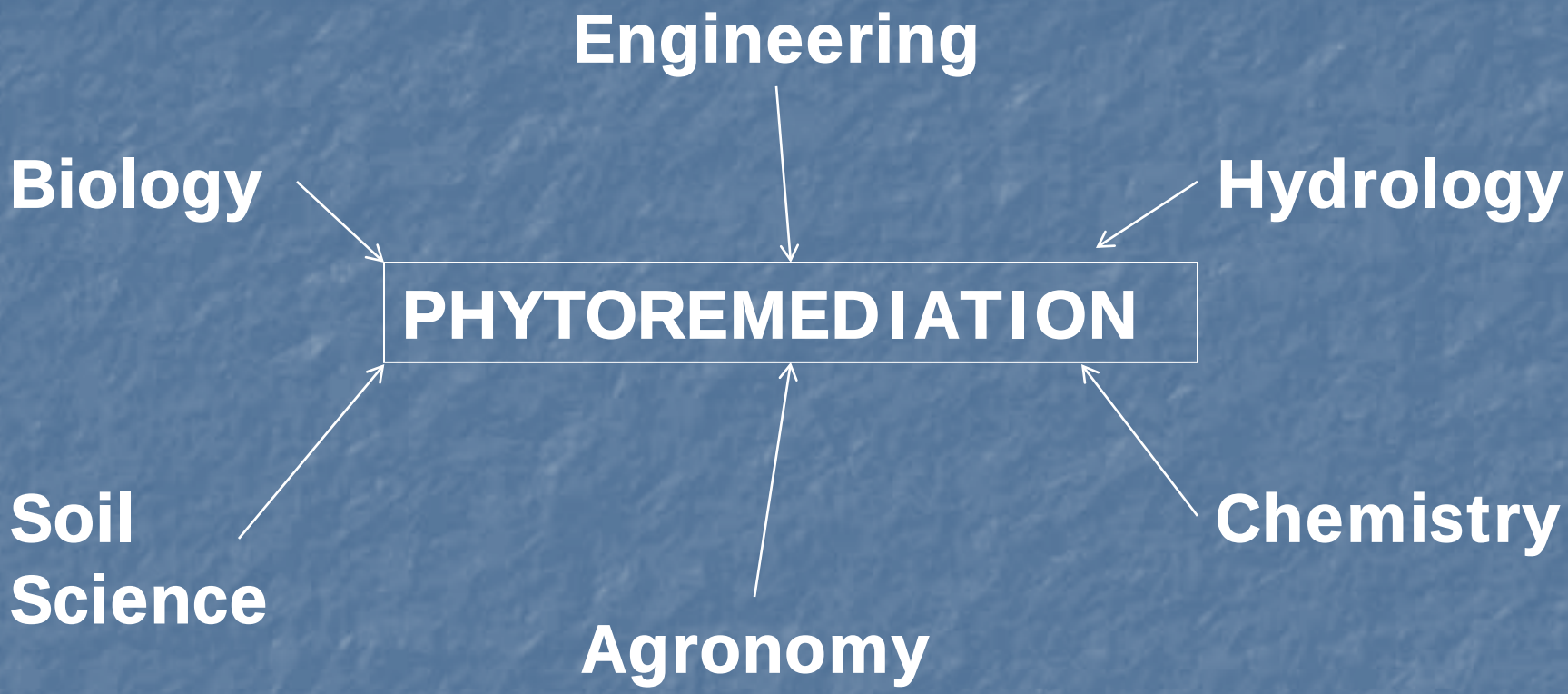
How Does It Work?

- Fundamentally Basic
- Technologically Complex

The Phytoremediation Process

Phytoremediation Processes

- Phytoextraction (translocation)
- Phytostabilization
- Rhizofiltration
- Phytodegradation
- Rhizodegradation
- Phytovolatilization
- Biodegradation



A Blend of Science, Technology and Nature to Solve Today's Problems

Vetiver Grass

Vetiver - A Different Breed of Grass

Massive, deep roots

Vetiver - A Different Breed of Grass

Tall, significant aboveground biomass

Vetiver – Characteristics

Studied For Decades

Physical Characteristics

- Massive, Fibrous Root System
- Very High Water Use Rate
- Typical Height 5 – 7’
- Typical Root Depth 7 – 10’
- Fast Growing, Perennial
- Dense, Clump Grass
- High Absorption of Nutrients
- Indefinite Life Span
- USDA Non-Invasive
- Used in Over 100 Countries for Numerous Purposes
- Strong Soil Stabilizer
- Significant Biomass = Biofuel

Vetiver – Characteristics

Studied For Decades

Can Tolerate Extreme Environmental Conditions

- pH Range from 3 – 10
- High Metals Concentrations
- High Nitrogen and Ammonia
- Very High Salinity (TDS)
- High VOCs
- High Phosphorous Levels

- Agricultural Chemicals
- Wide Variety of Soils
- Very Disease Resistant
- Few Pest Issues
- Drought Tolerant
- Steep Sideslopes

Landfill Leachate as a Resource

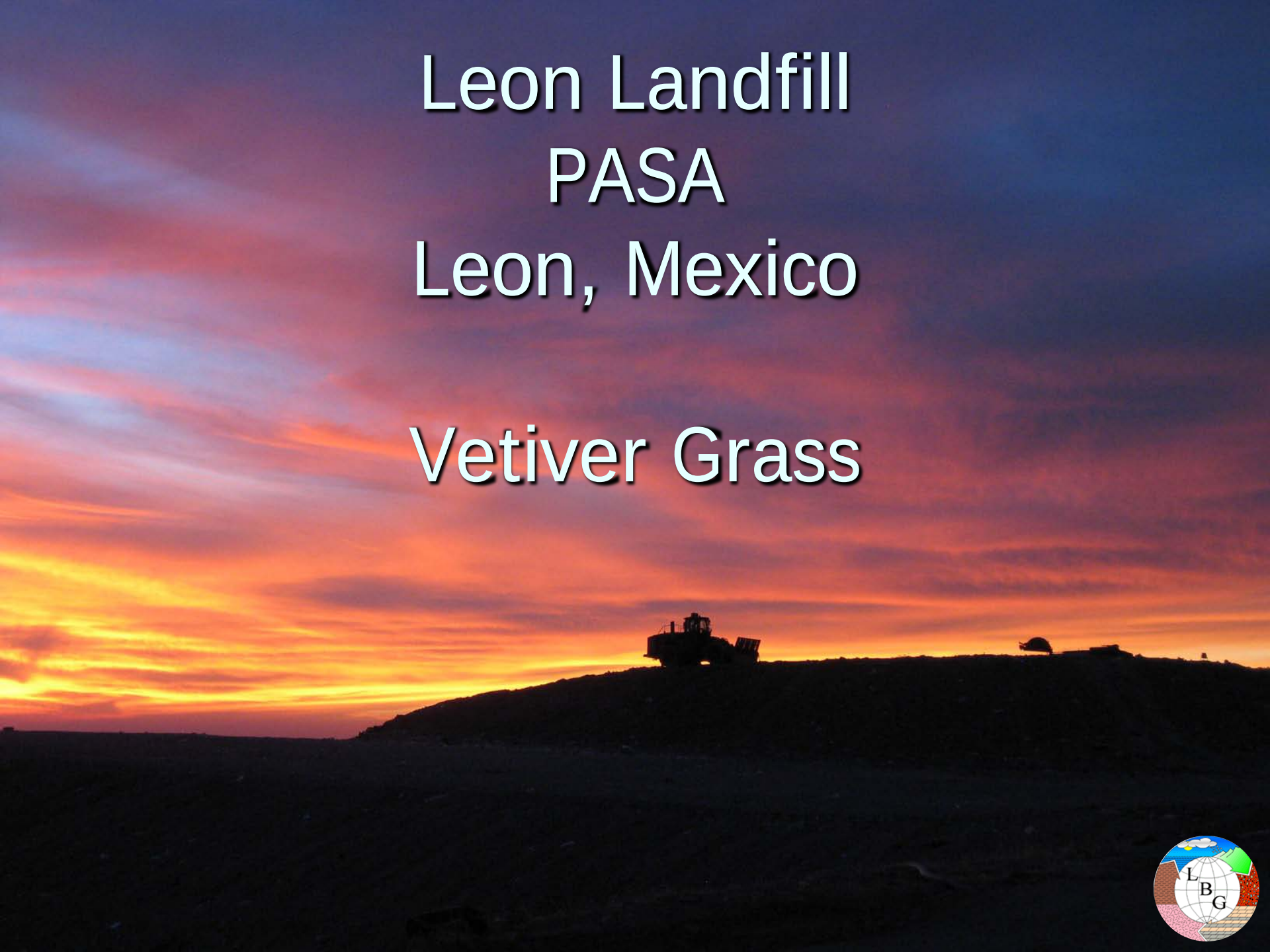
CONTAMINANTS = NUTRIENTS

Macro-Nutrients

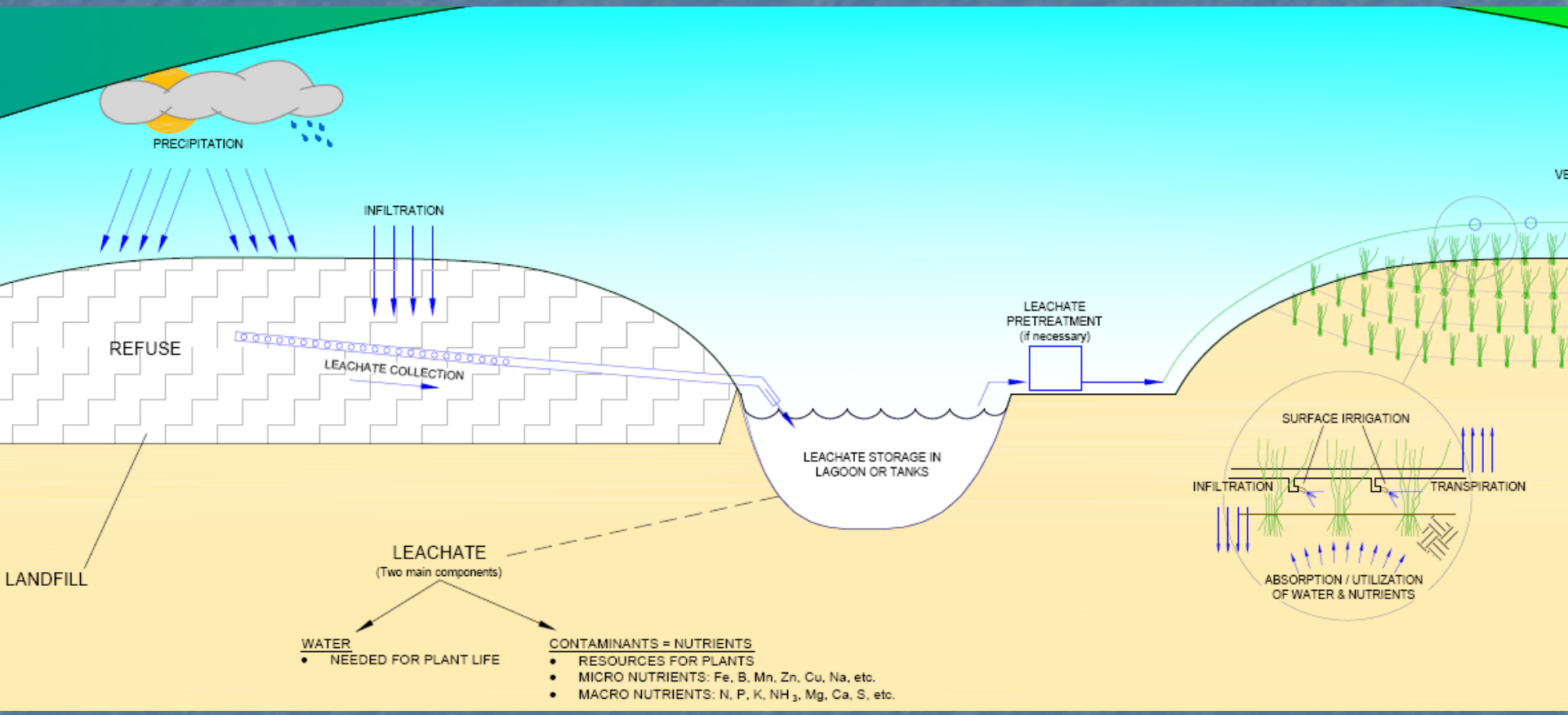
- Nitrogen (ammonia)
- Phosphorous
- Potassium
- Magnesium
- Sulfur
- Calcium
- Others

Micro-Nutrients

- Iron
- Boron
- Manganese
- Zinc
- Copper
- Sodium
- Others


Leon Landfill
PASA
Leon, Mexico
Vetiver Grass

Leon Project Concept



Pre-construction Conditions

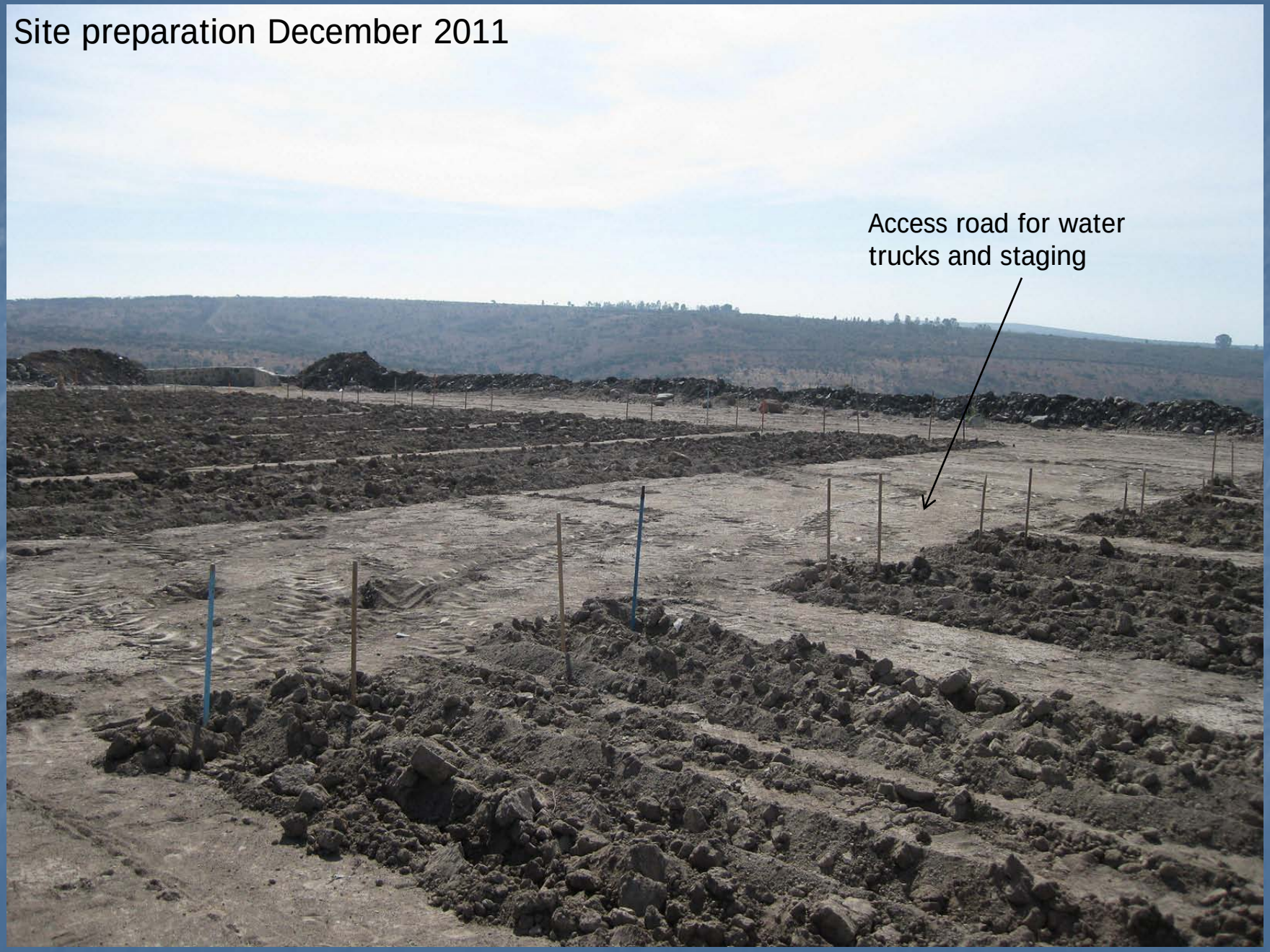
Pre-construction Conditions


PASA Leon landfill “methane land mine”

Site preparation December 2011

Tractor implement making 4 furrows ~20cm deep

Site preparation December 2011



Site preparation December 2011

Mixing of two types of fertilizer (superphosphate and urea) by hand

Fertilizer application


Initially flooded after planted


Access road left in for watering, which got filled in with planting rows
Space between double rows left in for maintenance of plants and irrigation piping

The "A Team" of Vetiver

Example of a 10-week old root system

Overview of Project

- 4.16 ha area
- ~34,000 m length of Vetiver rows
- ~270,000 Vetiver plants used
- ~17,100 m of drip tubing

Benefits of Phytoremediation

- A Truly GREEN Technology
- Utilizes Leachate as a Resource Rather Than Disposing as a Waste
- Year-Round Leachate Management (systems in place in St. Louis, Chicago, and Biloxi)
- Positive Public Relations
- Reduced Carbon Footprint
- On-site Treatment
- Sustainability
- Improves Public Safety by Taking Trucks off the Road

Benefits of Phytoremediation

- Carbon Fixation Through Biomass Production
- Less Truck Traffic
- Thousands of Fewer Miles Driven by Tanker Trucks
- Less Wear on Local Roads
- Reduced Greenhouse Gas Emissions (eliminates transportation)
- Habitat for Wildlife
- Aesthetic Improvement for Area
- New Alternative to Consider for Engineers and Regulatory Agencies


Phytoremediation
A Truly "Green" Technology