

# Using Compost for Erosion Control

Results from 2 Years of Observations of  
Compost Performance on a Highway  
Project in Monterey County, California



Caltrans Landscape Architecture Department

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# Prunedale Improvement Project



45,000 cubic yards of compost covering over 108 acres.

# Existing Site Conditions



Aromas Sand Soil - Highly erosive cross-bedded sand with clayey layers.

# Erosion Control Applications

Compost Blanket, Hydroseed, Coir Netting



# Erosion Control Applications

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Compost Blanket, Hydroseed, Coir Netting



Six Months Later

# Erosion Control Applications

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Compost Blanket, Blown Straw (Tacked)



# Erosion Control Applications

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Compost Blanket, Blown Straw (Tacked)



Six Months Later

# Erosion Control Applications

Compost Blanket, Blown Straw (Punched)



# Erosion Control Applications

## Compost Blanket and Chipped Material



# Erosion Control Applications

## Linear Sediment Barriers – Compost Berms



# Erosion Control Applications

## Linear Sediment Barriers – Compost Berms



Netting installed over the compost berm

# Erosion Control Applications

## Linear Sediment Barriers – Compost Socks



← Cotton Sock

← Burlap Sock



← 6 Months After Installation

# Erosion Control Applications

## Linear Sediment Barriers – Compost Socks



Staking required on  
“downhill side” of  
slope only

# Erosion Control Applications

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## Linear Sediment Barriers – Fiber Rolls



# Temporary Erosion Control Applications

## Fiber Rolls and BFM



# Erosion Control Performance Comparisons

Compost vs. BFM and Fiber Rolls



# Erosion Control Performance Comparisons

## BFM with and without Compost



# Permanent Erosion Control Failures

Subsurface seeps encounter clay soil lens



# Permanent Erosion Control Failures

Subsurface seeps encounter clay soil lens



Isolated failures represent less than 15%  
of the total large cut slope area.

# Permanent Erosion Control Failures

## Concentrated Flows



# Permanent Erosion Control Failures

## Concentrated Flows



# Restoration

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## Compost Incorporation



Before

# Restoration

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## Compost Incorporation



After Compost Incorporation

# Restoration

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## Compost Incorporation



Two Years Later

# Restoration

## Compost Incorporation



After



Before

# Invasive Weed Suppression

## Compost Incorporation



Compost



Herbicide

# Invasive Weed Suppression

## Compost Incorporation



# Scientific Characteristics of Compost

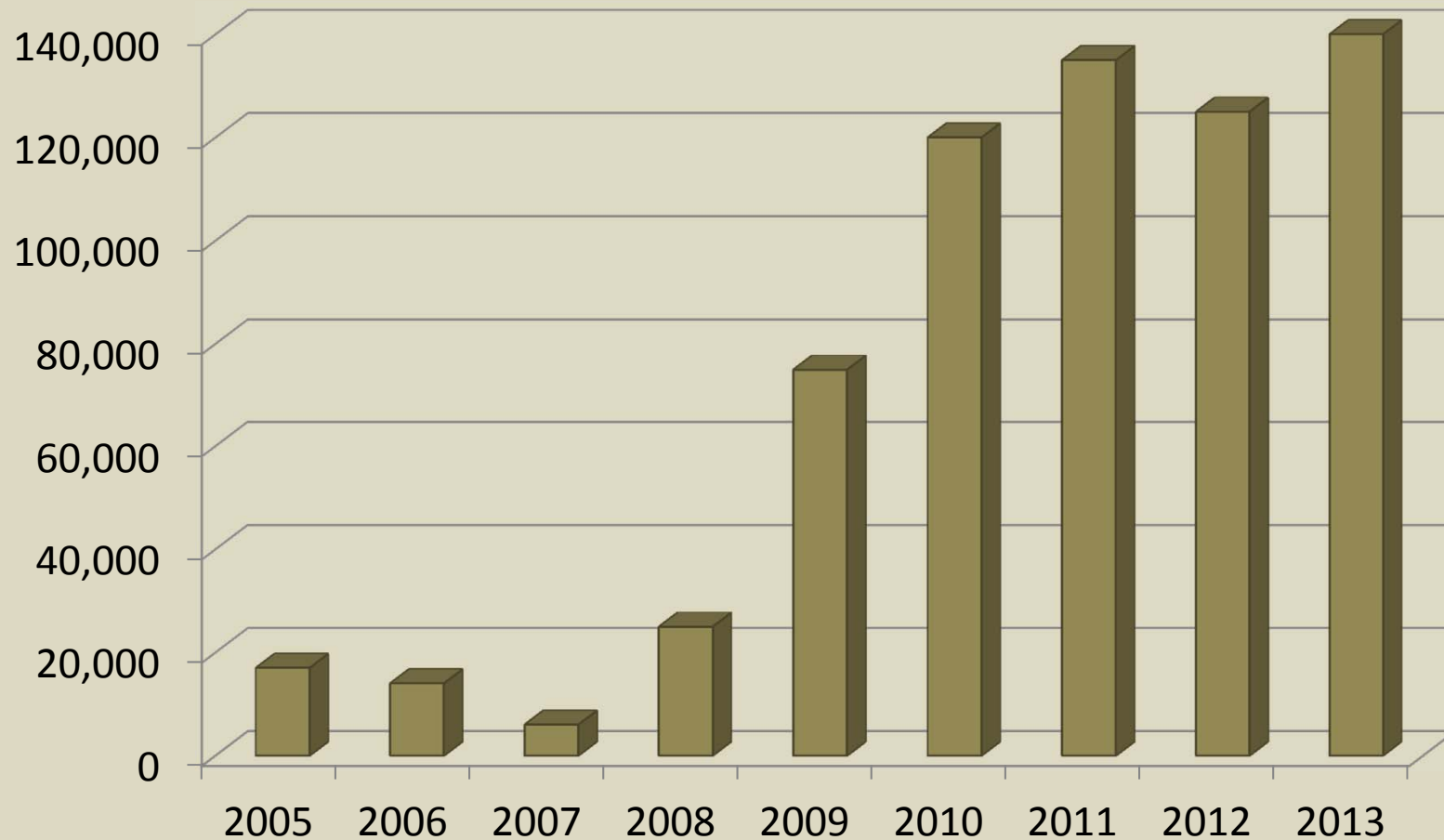
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- ❑ Reduces storm water runoff volume and velocity by:
  - Increasing infiltration rates.
  - Improving soil water holding capacity. Up to 4 inches per hour.
  - Enhancing soil structural properties - soil structure, porosity and texture.
  
- ❑ Promotes long term vegetation establishment by:
  - Improving plant rooting depth.
  - Improving soil chemical properties - providing proper pH, carbon, nitrogen, potassium and phosphorus levels.
  - Enhancing soil biology - activity by bacteria, mycorrhizal fungi, nematodes, protozoa, microarthropod and earthworms.
  - Increasing soil nutrient levels and nutrient cycling.

# Compost Use Trends

Cubic  
Yards

## Compost Use – Caltrans Division of Design



Over 540% increase in use from 2008.

# Material Specification

## 21-1.02M Compost

Compost must be derived from one or a combination of the following types of materials:

1. Green material consisting of chipped, shredded, or ground vegetation or clean, processed, recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost must not be derived from mixed municipal solid waste and must not contain paint, petroleum products, pesticides, or other chemical residues harmful to plant or animal life. Metal concentrations in compost must not exceed the maximum listed under 14 CA Code of Regs § 17868.2.

Process compost materials under 14 CA Code of Regs § 17868.3.

The quality characteristics of compost must have the values shown in the following table:

Compost		
Quality Characteristic	Test method <sup>a</sup>	Value
pH	TMECC 04.11-A	6–8.5
Soluble salts (dS/m)	TMECC 04.10-A	0–10
Moisture content (% wet weight)	TMECC 03.09-A	30–60
Organic matter content (% dry weight)	TMECC 05.07-A	30–70
Maturity (seed emergence) (% relative to positive control)	TMECC 05.05-A	80 or above
Maturity (seedling vigor) (% relative to positive control)	TMECC 05.05-A	80 or above
Stability (mg CO <sub>2</sub> -C/g OM per day)	TMECC 05.08-B	8 or below
Particle size for fine compost <sup>b</sup> dry weight	TMECC 02.02-B	
Pass 2-inch sieve (% min)		98
Pass 3/8-inch sieve (% min)		95
Particle size for medium compost <sup>b</sup> dry weight	TMECC 02.02-B	
Pass 2-inch sieve (% min)		90
Pass 3/8-inch sieve (% min)		50
Particle size for coarse compost <sup>b</sup> dry weight	TMECC 02.02-B	
Pass 2-inch sieve (% min)		90
Pass 3/8-inch sieve (% max)		30
Pathogen Salmonella (most probable number per 4 grams dry weight basis)	TMECC 07.01-B	< 3
Pathogen Fecal coliform (most probable number per gram dry weight basis)	TMECC 07.01-B	< 1,000
Physical contaminants (% dry weight) Plastic, glass, and metal	TMECC 02.02-C	combined total: < 0.5
Physical contaminants (% dry weight) Sharps	TMECC 02.02-C	None detected

<sup>a</sup> TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

<sup>b</sup> Maximum particle length must be 6 inches.

# Particle Size Specification

Property	Test method <sup>a</sup>	Requirement	
Particle size: <b>Fine Compost</b> For soil amendment and incorporation.	TMECC 02.02-B Sample sieving for aggregate Size classification % dry weight basis	Min	Max
	Pass 2"-inch sieve	98%	--
	Pass 3/8-inch sieve	95%	--
	Maximum particle length: 3 inches		
Particle size: <b>Medium Compost</b> For soil protection and native plant establishment.	TMECC 02.02-B sample sieving for aggregate Size classification % dry weight basis	Min	Max
	Pass 2-inch sieve	90%	--
	Pass 3/8-inch sieve (minimum 50% retained)	50%	75%
	Maximum particle length: 6 inches		
Particle size: <b>Coarse Compost</b> For filter sock and berm applications.	TMECC 02.02-B sample sieving for aggregate Size classification % dry weight basis	Min	Max
	Pass 2-inch sieve	90%	--
	Pass 3/8-inch sieve (minimum 70% retained)	--	30%
	Maximum particle length: 6 inches		


# Physical Contaminant Specification

Property	Test method <sup>a</sup>	Requirement
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification: Plastic, glass, and metal % > 4 mm fraction	combined total:  < 0.5%
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification: Sharps (sewing needles, straight pins and hypodermic needles) % > 4mm fraction	none detected



Compost can contain plastics and should be evaluated for use in environmentally sensitive areas.

# STA Certification



**US COMPOSTING COUNCIL**  
*Seal of Testing Assurance*

Z-Best Products  
Alex Sharpe  
980 State Highway 25  
Gilroy  
CA 95020

Date Sampled/Received: 13 Jan. 14 / 13 Jan. 14

*Product Identification* Compost  
1-2014 Z-Best Organic Compost

## COMPOST TECHNICAL DATA SHEET

LABORATORY: Soil Control Lab; 42 Hanger Way; Watsonville, CA 95076    tel: 831.724.5422    fax: 831.724.3188			
Compost Parameters	Reported as (units of measure)	Test Results	Test Results
Plant Nutrients:	%, weight basis	%, wet weight basis	%, dry weight basis
Nitrogen	Total N	0.86	1.5
Phosphorus	P <sub>2</sub> O <sub>5</sub>	0.30	0.55
Potassium	K <sub>2</sub> O	0.69	1.2
Calcium	Ca	1.3	2.3
Magnesium	Mg	0.42	0.74
Moisture Content	%, wet weight basis	43.7	
Organic Matter Content	%, dry weight basis	52.0	
pH	units	8.18	
Soluble Salts <small>(electrical conductivity EC<sub>1</sub>)</small>	dS/m (umhos/cm)	3.9	
Particle Size or Sieve Size	% under 9.5 mm, dw basis	100.0	
Stability Indicator (respirometry)		Stability Rating:	
CO <sub>2</sub> Evolution	mg CO <sub>2</sub> -C/g OM/day	2.9	Stable
	mg CO <sub>2</sub> -C/g TS/day	1.5	
Maturity Indicator (bioassay)			
Percent Emergence	average % of control	100.0	
Relative Seedling Vigor	average % of control	100.0	
Select Pathogens	PASS/FAIL per US EPA Class A standard, 40 CFR § 503.32(b)	Pass	Fecal coliform
		Pass	Salmonella
Trace Metals	PASS/FAIL per US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3	Pass	As, Cd, Cr, Cu, Pb, Hg Mo, Ni, Se, Zn

Participants in the US Composting Council's Seal of Testing Assurance Program have shown the commitment to test their compost products on a prescribed basis and provide this data, along with compost end use instructions, as a means to better serve the needs of their compost customers.

Laboratory Group:    Jan. 14 C	Laboratory Number:    4010316-2/2
Analyst:    Asaf Sadeh	www.compostlab.com

The US Composting Council's Seal of Testing Assurance Program ('STA') is a compost testing, labeling and information disclosure program.

# Recommendations

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- ❑ Compost Blanket With Coir Netting
  - Very effective and aggressive erosion control material combination for large steep slopes.
  - Install over compost berms when used.
  
- ❑ Compost Blanket With Blown Straw
  - Very reliable and more cost effective than punched straw.
  - Erosion control material combination that can be used in a variety of conditions.
  
- ❑ Hydroseed Application
  - Apply under netting and over compost to protect seeds and provide good germinating conditions.
  - Consider including seed in compost application to reduce application steps and equipment.
  
- ❑ Incorporating Compost
  - Rip soil 2 to 3 times the depth of compost applied.
  - Limit to slopes 4:1 or flatter.

# Recommendations

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- ❑ Compost Berms
  - Use as linear sediment barriers on slopes in lieu of fiber rolls.
  - Out perform fiber rolls, hands down!
  
- ❑ 12" Compost Socks
  - Install at the toe of slopes in lieu of fiber rolls or silt fence.
  - Excellent at capturing sediment.
  
- ❑ 8" Compost Socks in Vegetative Swales and Drainage Ditches.
  - Install in vegetative swales and drainage ditches as check dams.
  
- ❑ Fiber Rolls
  - Use primarily for temporary sediment control applications.

# Summary

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- ❑ Accelerates the natural systems required to restore sites.
- ❑ Builds healthy soils by mimicking the natural environment.
- ❑ Provides optimum vegetation growth.
- ❑ Protects the soil surface from splash erosion.
- ❑ Has a high water holding capacity which slows down and disperses the energy of sheet flow.
  - No runoff
  - No erosion
  - No pollutant discharges
- ❑ High carbon to nitrogen ratios result in low discharge of nitrogen.
- ❑ Has natural bio-filtration characteristics.

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