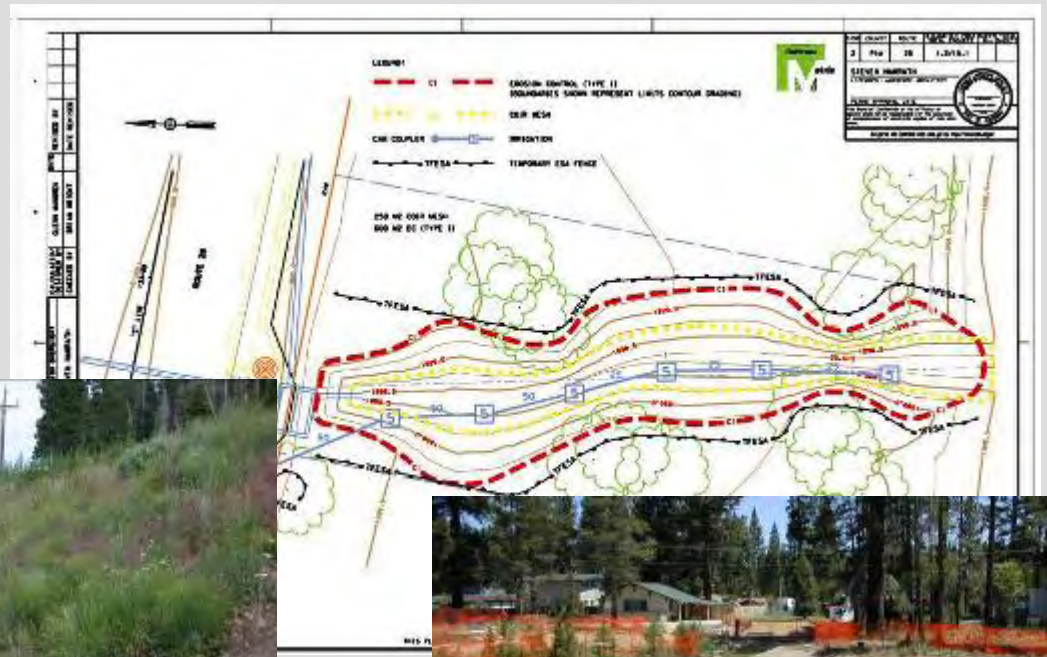
Designing Compost Into Highway Projects

Improving Roadside Vegetation Establishment and Erosion Control with Compost-Based Specifications



Presented By: Steven Nawrath
Landscape Architect , CPESC
CALTRANS North Region Office of Landscape Architecture

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OVERVIEW

1. Goals and Objectives
2. Methods
3. Plans, Specifications and Estimate
4. Case Studies/Lessons Learned
5. Questions

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GOALS AND OBJECTIVES

Goals

- **Soil Restoration and Long-Term Sustainable Revegetation of Disturbed Sites**
- **Improve Water Quality by Reducing Erosion and Improving Bio-Infiltration**

"Reconstruct Soils Using Compost…don't cover engineered non-soils with seed, fertilizer and straw……"

Objectives

- **Stabilize Slopes and Other Disturbed Sites**
- **Introduce Nutrients to Disturbed Soils**
- **Improve Infiltration and Permeability of Disturbed Soils**
- **Increase Water Holding Capacity of Disturbed Soils**
- **Introduce Microbial Activity, Nutrient Cycling and Fungi to Disturbed Soils**
- **Promote Deeper Rooting Depth of Plants**
- **Improve Conditions for Native Plants that Exclude Invasive Weed Species**

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METHODS

Erosion Control (Type M)- Compost Blanket

Pros

- **Relatively easy application process** (compost or snow blowers)
- **Quick growth first season** (long-term benefits not yet observed)

Cons

- **Does not improve underlying disturbed soils for long term vegetation establishment**

Erosion Control (Type I)- Compost Incorporation

Pros

- **Improved underlying soil conditions for long term vegetation establishment (perennial natives)**
- **Improves bio-infiltration properties of soil in swales and strips**

Cons

- **Cost prohibitive** (relative to other "Erosion Control" types)
- **Slower application time**
- **Difficult to apply on long steep slopes and other hard to access areas**
- **Must delineate on plans**

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Regulatory Requirements- Tahoe Basin

Lake Tahoe 303d Listed Water Body for Sediment

Lahontan Regional Water Quality Control Board

(401 Permit)

- Non-point source pollution (slopes and other disturbed soil areas must be revegetated)
- Mitigate impacted sensitive habitats (wetlands and jurisdictional waters mitigation)

Tahoe Regional Planning Agency

(TRPA Permit)

- Must meet "Scenic" threshold requirements (improve corridor and lake view scenic quality)
- Must meet "Water Quality" threshold requirements

  (Any new "Hardcover" must be offset by revegetation of "Soft Cover" areas)

  (Impacts to "Stream Environment Zones" or SEZ must be revegetated to pre-construction conditions)

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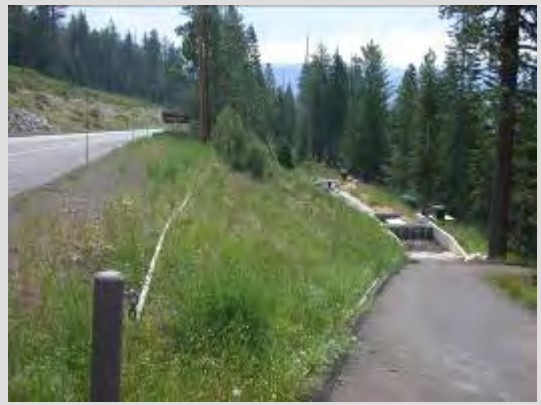
METHODS

Erosion Control (Type I)- Compost Incorporation

This process incorporates compost into disturbed soils areas associate with roadway construction and stormwater treatment BMPs. Deep incorporation of compost improves soil characteristics including:

- Infiltration and permeability
- Water holding capacity
- Texture
- Nutrient levels and cycling
- Micro-organism populations
- Rooting depth
- Oxygen exchange and air space
- Vegetation Coverage



APPLICATIONS

- Cut and Fill slopes
- Infiltration Basins
- Bio-swales and Strips
- Denuded Roadside Areas (soft cover)
- Environmental Restoration Sites

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PLANS, SPECS AND ESTIMATE

Specifics (for the Tahoe Basin)

- **Cost-** $3-10 m2 (transportation/application method drives costs)
- **Penetrometer-** 0-200 PSI at a minimum depth of 400 mm
- **Compost Type-** 50% Humic Fines/50% Wood Overs
- **Compost Depth-** 4" (100 mm) or 525yd3/acre
- **Incorporation Depth-** 18" (300-450mm) minimum
- **Specs-** Edit compost type and quantity, incorporation depth
- **Plans-** Show areas on plans to incorporate
- **Equipment-** Terrain and access will dictate equipment to be used for application
- **Resident Engineer/Inspector-** Must be trained to use penetrometer and visually inspect for mineral and compost soils during incorporation. Provide product information to RE file.

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PLANS, SPECS AND ESTIMATE

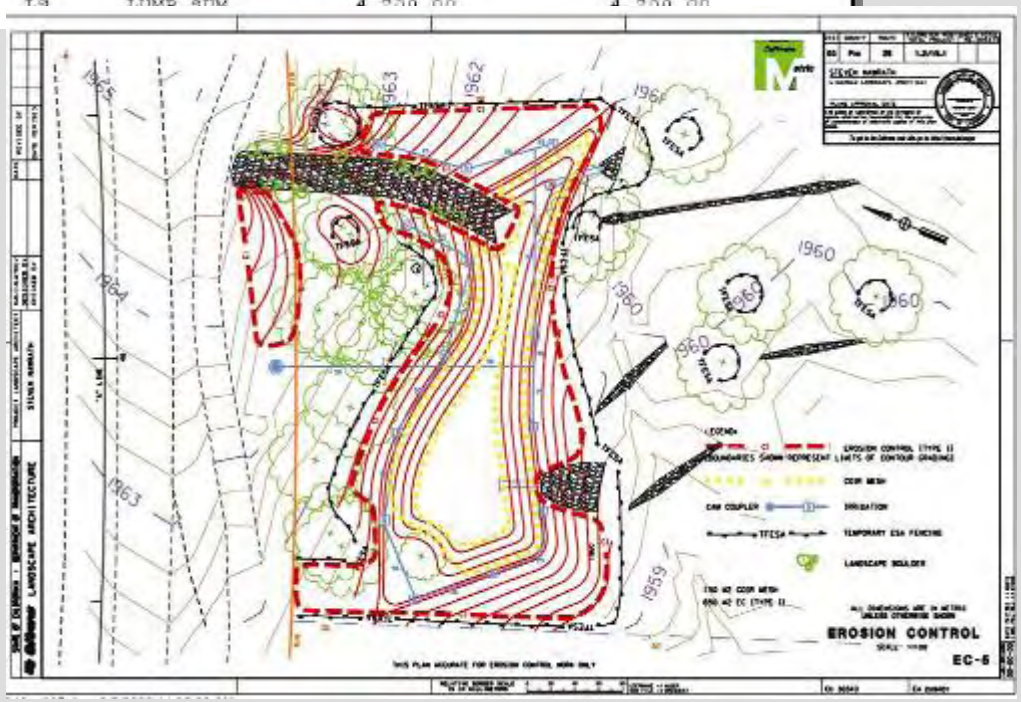
ITEM NO	ITEM CODE	ITEM DESCRIPTION	UNIT (ALT)	QUANTITY	PRICE	AMOUNT
55	203026 (8)	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	4	2,000.00	8,000.00
56	203045 (8)	PURE LIVE SEED (EROSION CONTROL)	KG	200	110.00	22,000.00
57	203056 (8)	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	5,600	2.00	11,200.00
58	203061 (8)	STABILIZING EMULSION (EROSION CONTROL)	KG	700	1.50	1,050.00
59	204051A	EROSION CONTROL (TYPE I)	M3	1,300	60.00	78,000.00
60	204052A	ROCK COLORATION	LS	LUMP SUM	2,000.00	2,000.00
61	204053A	CONCRETE COLORATION	LS	LUMP SUM	1,000.00	1,000.00
62	204099 (8)	PLANT ESTABLISHMENT WORK	LS	LUMP SUM	8,000.00	8,000.00
63	208000	IRRIGATION SYSTEM	LS	LUMP SUM	4,200.00	4,200.00

A. **10-1.__EROSION CONTROL (TYPE I)**

The Contractor shall dry apply compost over areas designated on the plans to receive compost. Compost shall be spread evenly over the prepared areas and placed to a uniform depth of not less than 75 mm.

B. Compost shall be incorporated to a depth of 300 mm to 450 mm. Incorporation shall loosen, incorporate and distribute compost with native mineral soils.

Surface soil receiving compost shall be visually inspected for mineral soil. Between 25%-35% mineral soil shall be visible at the surface of compost incorporated areas Once the percentage of mineral soil is inspected, soil density shall be measured using a Soil Penetrometer. Soil Penetrometer readings shall be 0-200 PSI at a minimum depth of 400 mm. The Engineer at random locations throughout the area to receive Erosion Control (Type I) shall take penetrometer readings to verify compaction and soil density. Prepared grade with incorporated material, shall be stabilized in such a manner as to retain the material as a viable growing medium.



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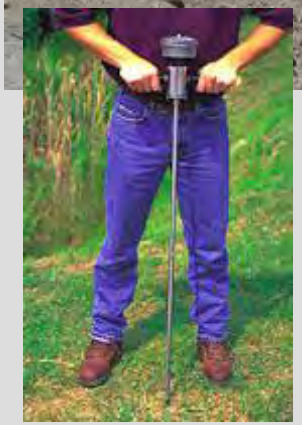
PLANS, SPECS AND ESTIMATE


Applied Compost


Incorporated Compost


Seed, Tack and Mulch Applied




Incorporation Process

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CASE STUDIES

Meyers Water Quality Improvement Project- 2003

Site:

- Granitic soils
- Compacted (off-shoulder parking)
- Poorly drained
- No nutrients

Specifications:

- 3” Duff and compost incorporated to 8-10 inches
- Erosion Control Type D (no straw)
- Pine Needle/ Wood Mulch Cover (1”)
- Temporary irrigation

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CASE STUDIES

Meyers Erosion Control Project- 2003

Observations:

- Excellent initial germination of seed species
- Difficult to dig holes for container plants
- Low water holding capacity in soil

Observations:

- Spacing reflects low water holding capacity in soil
- Slow woody plant growth
- Early dormancy of grass and forb species
- Drought stress in woody plants earlier in dry season

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CASE STUDIES

Brockway Summit Water Quality Improvement Project-2004

Incorporation


Finished Slope

Site:

- New Sliver Fill with 1:1.5 Slopes
- Compacted fill areas
- Granitic soils
- High elevation site

Specifications:

- 4” of compost incorporated to 15-18 inches
- Erosion Control Type D (no straw)
- Pine Needle/ Wood Mulch Cover (1”)
- No Irrigation

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CASE STUDIES

Brockway Summit Water Quality Improvement Project-2004

Observations:

- Excellent initial germination of seed species
- Some slip-outs due to drainage issues up-slope
- High water holding capacity in soil

Observations:

- Slope is stable and self-sustaining
- 80-90% cover (herbaceous and woody plants)
- Vigorous native plant growth (little Cheat Grass)

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NEXT STEPS

Urban Soils

Bio-Swales and Strips

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QUESTIONS

RESOURCES

- **CALTRANS (North Region Resources)**
  Monica Finn- Revegetation Specialist
  David Moffat- Landscape Architect

- **UC Davis**
  Vic Claussen- Soil Scientist

- **Consultant**
  Michael Hogan- Integrated Environmental Restoration

- **QUESTIONS**