Maximizing Green Remediation
Changing Paths - Greening Roadway Pavement Systems
Roadway Pavement Systems

- Sub-Base and Base Layers
- Asphalt
- Concrete Pavement
- Embankment Fill
- Utility Bedding
- Gravel
- Highway Striping
2002 FHWA Recycled Materials Policy

- Evaluated to assess economic, engineering and environmental benefits.
- Given first consideration in the materials section based on assessment outcomes.
- Should not be prohibited without technical basis.
Alternative Recyclable Materials

- Contaminated Soils
- Mining Wastes
- Foundry Sands
- Coal Bottom Ash
- Blast Furnace Slag
- Coal Fly Ash

- Construction Debris
- Waste Tire Products
- Glass
- Compost/Mulch
- Recycled Asphalt Pavement
Creating Opportunities & Overcoming Challenges

Application on Small, At-Risk Communities
Our Community

- Land area: 209 Square Miles
- Population: 159,358
- Nearly 1 million tourists
- U.S. Military Build-up Plans: Population surge of ~40,000 peaking within the next 8 years.
- Waste Disposal Options
  - 1 RCRA D MSWLF
  - 3 Hardfills
  - 0 Hazardous Waste Landfill
  - Waste incineration prohibited
## Creating Opportunities

### Conservation
- Natural Resources
- Energy

### Economic Benefits
- New Business-Cottage Industry Development
- Waste Processing Cost Reduction
- Waste Disposal Cost Reduction
- Transport Cost Reduction
Overcoming Challenges

- Economic Diversion Incentives
  - Materials Processing Equipment
- Risk Assessment on Some Materials
- Develop Standard Framework for Materials Suitability
- Composting Invasive Species
  - Rhinoceros Beetle Treatment
Navigating the Green Road
Implementation Overview
Major Components

- Community Engagement
- Identify Readily Available Recyclable Materials
- Quantify Benefits & Limitations
- Evaluate the Economics of Using Recycled Materials
Community Engagement

- Identify Primary Stakeholders
  - Construction Companies
  - Construction Material Suppliers
  - Recyclers
  - Regulators
  - Policy-Makers
  - Village Mayors
Identify Recyclable Materials

• Assessment of Solid Waste
  • Paper
  • Glass
  • Tires
  • Green Waste
Beneficial Use

- Permitting Exemptions
- Montana – Approved Beneficial Use Policy on Post-Consumer Glass in Roadway Base

Quantify Benefits & Disadvantages
Evaluate Economics

- Cost of Materials Purchase
- Cost for Local Processing
- Existing Local Markets
- Installation Cost
- Life-Cycle Cost
  - Annual Effective Cost
  - Capital Recovery
  - Annual Maintenance Cost
**Scrap Tires**

### Status
- Guam – 159,000 tires/year (approx. 2000 tons; 2012)
- 2011 – 1,024 Tons Shipped
- Tires banned from landfill
- Recycling Revolving Fund

### Green Roads
- Construction Fill Material
- Aggregate Substitute
- Asphalt Modifier
- Other Applications
- FHWA and State Transportation Standards
## Glass

### Status
- Approximately 7,000 Tons/Year.
- Negligible Quantities Recycled
- No Glass – Bottling Production

### Green Roads
- Sub-base & Base Layers
- Asphalt or Concrete Pavement
- Embankment Fill
- Utility Bedding
- Fiberglass & Sandblasting
- Gravel Substitute
- Highway Striping & Reflective Sources
### Compost-Mulch

#### Status
- 21,000 Tons/Year = Yard Waste (2012); 14% of Waste Stream
- 21,000 Tons/Year = Wood Waste
- Mobile Grinders Available

#### Green Roads
- Compost Product Materials in Roadway Applications - > 30 State Transportation Departments
  - Erosion Control
  - Soil Additive
# Contaminated Soil

## Status

- Requires physical & chemical analysis to determine suitability
- Blending often necessary to meet gradation requirements
- Available at sites nationwide for free!

## Green Roads

- ADEM: Approved use of PCB-impacted soils in roadway base
- Cal-EPA/DTSC: Allows use of TPH & metals impacted soils
- Many other states also allow
Breaking Through
....the Green Infrastructure Barrier
First Things First

- Confer with Stakeholders to Identify and Prioritize Targeted Recyclable Materials – 3 Months
- Quantify Benefits and Limitations – 3 Months
- Economic Analysis – 6 Months
- Develop and Vet Supplemental Requirements – 1 Year
Overcoming Barriers

- Investment Incentives - Procurement of Equipment
  - Tax Exemptions
  - Mandate Use of Recyclable Materials in Public Projects
  - Purchase-Lease Options

- Product Testing

- Invasive Species - Quarantine and Treatment
Summary
Benefits & Impacts
Diversion Potential

- Annual Diversion Potential
  - Tires: up to 1000 tons
  - Glass: up to 1000 tons
  - Yard waste: from 1000 to 6000 tons

- Incentives have potential to increase diversion
• Traditional recyclables processing: ~ one job/1,000 tons managed
• Organics processing: ~ one job/1,000 tons managed
• New jobs on Guam
  • Three by 2015
  • Six by 2030
Human Health & Environment Impacts

- Conserves existing natural resources
- Reduces air and water pollution
  - Reduces greenhouse gas emissions
  - Cooler than traditional pavement in summer; improves air quality by radiating less heat
- Extends lifetime of existing landfill
  - Preserves further habitat from being disturbed
Avoided Disposal Costs

Green Paving Initiative

- $350,000
- $300,000
- $250,000
- $200,000
- $150,000
- $100,000
- $50,000
- $0

- 2012
- 2015
- 2020
- 2025
- 2030

Avoided Tipping Fees
Thank You!

Conchita SN Taitano, Guam Environmental Protection Agency
Julie A. Carver, P.E., Vice President Matrix Design Group