Green Infrastructure & Low Impact Development on Military Lands

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Center of Expertise

- **USACE and High Performance Sustainable Design**

  ”High performance sustainable design adapts a building to its climate zone and community, maximizing energy and water efficiency while achieving mission requirements. Additionally, the principles of sustainability create a healthy indoor environments for occupants and promote sustainable and energy efficient maintenance practices. Finally, sustainable construction practices reduce the negative impacts on the environment during the construction process and assure quality construction practices are utilized. “

The Neglected Ones

- Landscape function is neglected in design
  - Impact on altered hydrology
  - Impact on future development
  - Impact on Soldier training
- Mitigation of urban runoff
  - BMP choice, installation, removal and maintenance
    - Cookie cutter approach is not working

Smart Growth Planning

Maximize the utility of land areas. *The Army Strategy for the Environment* identifies that poor planning and use of resources can adversely impact the Army training mission.

- Promote Multiple Land-Use

Example: Utilize right-of-ways for biofuels.

Example: Integrating training on cantonment.

Example: Integrating stormwater management into development and promote greenways for access and overflow.

- Coordinate Master Plans with Neighbors

Example: Integrating on-post and off-post transportation plans.
Example: Integrating Recycling and Composting facilities.

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Integration of Green Design into Training Facilities

- Mitigation of carbon footprint
  - Reduced emissions, gas, time down, etc
  - Reduced facility cost for development & maintenance
- Increased training realism
  - Integrated Urban training
- Mitigation of urban runoff
  - Decreased runoff, increased infiltration

Greenwall Rendering by:
Sarah Murphy, Savannah District, USACE 2030

BT COF

Urban Agriculture Garden
Green Roof
Solar Panels
Trombe Wall
Basic Training
Company Operations Facility (BCOF)
Solar Evacuated Tubes
Green Wall
Terra-cotta Cladding

AIT Complex

Urban Agriculture Garden
Permeable Paving
Growth Season
PV Thin Film
FSC Certified Wood
Dormant Season
Advanced Individual Training (AIT)

Landscape

Locally Adaptive

- Locally adaptive
  - Conditioned to local environment
  - Increased establishment
  - Decreased watering requirements

- Maintenance – mowing
  - Vegetation height
  - Growth rate
  - Appearance

Vegetation Improvement

- Investigation of methods to improve native seed establishment
  - Pre-Germination Treatments
  - Germination and Dormancy identification by Varietal and Species
- Site appropriate Landscaping material and species
  - Locally adapted species and sources
- Seed Mix ID for Low-Growth
  - Improved Range Safety
  - Improved Range Quality
- Mowing maintenance
  - reduced labor & gas & maintenance

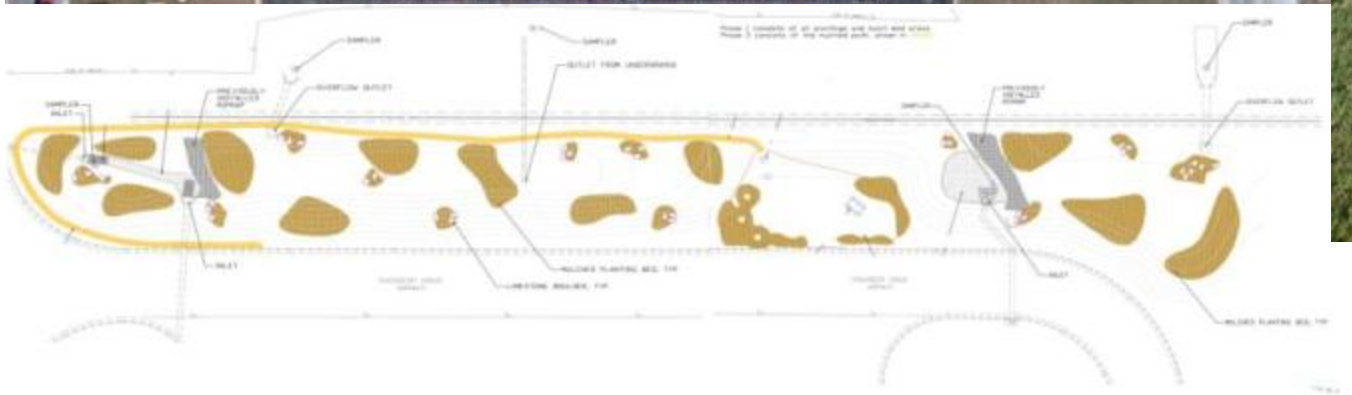
Bioswales

Alexandria, Virginia

Beaverton Lodge – AP Hill

Bioswales

- Demonstration of Bioswale
  - Fort Hood
  - Landscaped for DPW Engineering recreational use



Historic District Example:
Vegetative Swale in Parking Lot

Vegetative swale utilized in a parking lot in Fort Bragg Historic District (ERDC-CERL 2010).

- Demonstration of Modular Wetland:
  - Fort Hood Recycle Center
  - Installed 3 units July 2011

Company Claim:	
TSS "Sil-Co-Sil 106"	85%
Dissolved Copper	79%
Dissolved Lead	98%
Dissolved Zinc	78%
TPH	99%

Hood Results:	
TSS "Sil-Co-Sil 106"	69-79%
Dissolved Copper	80-89%
Dissolved Lead	98%
Dissolved Zinc	78-90%
TPH	99%*

Parking & Pavements

Alexandria, Virginia

Beaverton Lodge – AP Hill

Salisbury Plains - England

Historic District Example:
Pervious Surface

Vegetation integrated with pervious pathway and parking lot in Fort Bragg Historic District (ERDC-CERL 2010).

Constructed wetlands

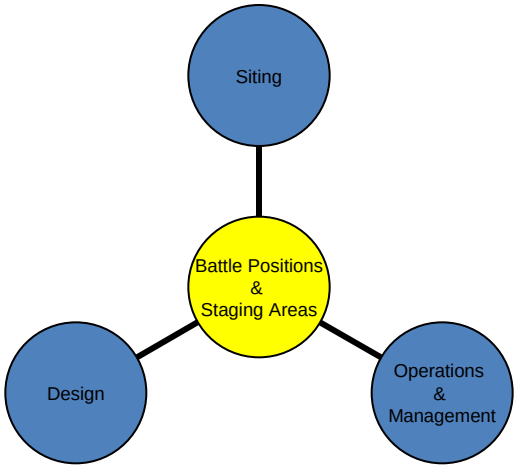
Living Greenwalls

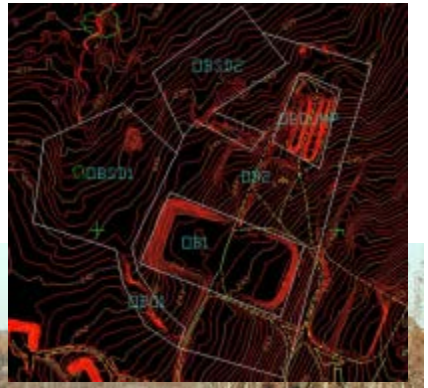
Soft Engineering

- Use of soft engineering or BMP's to:
  - Reduce off-site impacts
  - Decrease costs
  - Improve site stability

Principle Issues

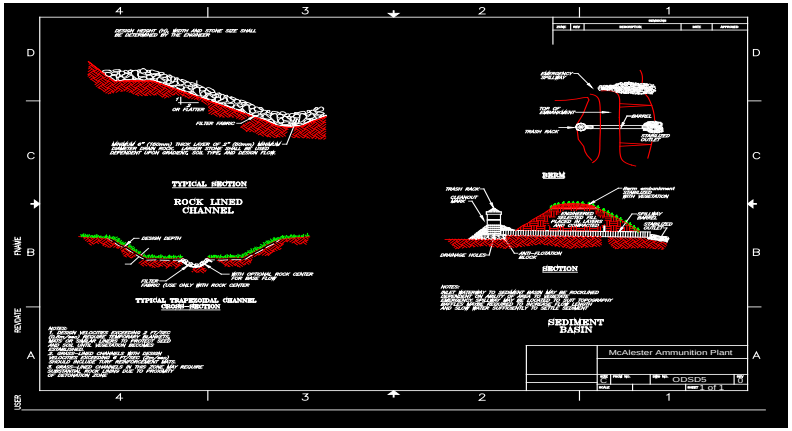
- Siting
  - Proximity to surface water/wetlands
  - Aspect and slope
  - Accessibility
- Design
  - Traffic density and type
  - Designated use of access road
- Operations & Maintenance
  - Inspection
  - Erosion
  - Structural Stability





Engineering Solutions

- Siting
  - Site away from critical habitat, water, & other sensitive areas
  - Do not site in “wet” areas
  - Select areas with gentle topography/slope
  - Careful selection of slope aspect
- Design
  - Current designs are not sufficient
  - Incorporation of layers and compaction
  - Incorporation of subsurface drainage
  - Incorporation of surface drainage
  - Incorporation of soil stabilizers
  - Address slope, creating gentle vs steep slopes faces
  - Addition of BMPs
    - Terraces, filter strips/buffers, mulch buffers, etc
  - Address vegetation establishment
  - Materials used could be improved
    - Composite materials to increase durability and longevity
    - Incorporation of stabilizers
- Operation and Maintenance
  - Maintenance is critical
  - Designs incorporate access to increase maintenance likelihood



Design Implications for Sustainable Technologies Implementation in Ranges

- Optimization of Range Design
  - Survey and review MOUT designs at 3 installations
  - Redesign MOUT to optimize and account for stormwater impacts
- Utilize stormwater LID technologies
  - Incorporate LID as part of training scenario

Low Water Crossings

- Unique approaches to LWX materials
- Site specific design and evaluation for ITAM-LRAM efforts:
  - Carson, Bragg, Bliss, Riley, etc

TVWF (Tactical Vehicle Wash Facilities)

- Invasive Species spread or introduction
  - Seed/mile
  - Seed/vehicle type
- Development of new systems & maintenance requirements
  - Portable systems
- Analysis of effectiveness of new systems
  - Deployment APHIS requirements

Questions

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