SRF Sustainable Infrastructure Projects in Depth

IFA Sustainability Workshop

Breakout 1 – SRF Track

June 5, 2008

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American Council of Engineering Companies
of Indiana

ACEC Presenters for SRF Sustainable Infrastructure Projects

- Designing for Deconstruction – Steve Gress, P.E., Donohue & Associates, Inc.
- Beneficial Reuse of Biosolids – Gary Ruston, P.E., M.D. Wessler & Associates, Inc.
- Water Conservation – Don Larson, Commonwealth Engineers, Inc.

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Designing for Deconstruction

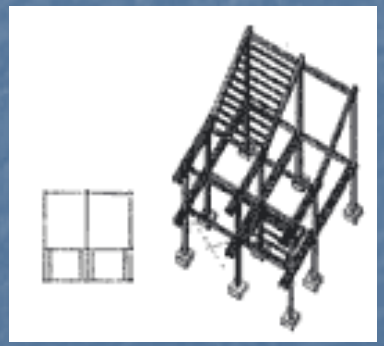
- **Deconstruction Description**: Selective dismantlement of facility components, specifically for reuse, recycling, and waste reduction
  - Differs from demolition where a site is cleared by the most expedient means
  - Focuses on giving the materials within a facility a new life once the facility as a whole can no longer continue
  - During design it is a strategy and practices that facilitate future deconstruction
- Intent: Design with consideration toward future structure disassembly so that resources can be reused when the structure has outlived its usefulness

Designing for Deconstruction

- Design Strategy (From O'Hare Modernization Program)
  - Evaluate potential future uses for the structure and building components
  - Consider the future value of materials and systems during selection
  - Use homogeneous materials whenever possible
  - Detail connections for disassembly
  - Provide a flexible structural system

Designing for Deconstruction

- Design and Construction Practices
  - Simple construction methods combined with high-grade, durable materials
  - Separate layers of a structure's infrastructure and make them visible
  - Make components within a system separable to dismantle materials quickly and efficiently
    - Use mechanical fasteners such as bolts instead of nails
    - Design for physical access to fasteners
    - Use standardized materials and assemble in a consistent manner
  - Avoid use of hazardous materials (not reusable)
  - Design for maximum flexibility of spatial configuration within a structure, as this preserves the facility as a whole
  - Use 3-dimensional drawings to aid the understanding of the future deconstruction process



Designing for Deconstruction

- Benefits
  - Sustainable reuse of materials for future projects, which reduces future secondary carbon footprint
  - Facilities are often easier to maintain and adapt to new uses
  - Reduces potential for piping, ductwork and equipment conflicts
  - Results in reduced use of hazardous materials
  - Conserves landfill space and reduces tipping fees for future projects
  - Saving the shell of a structure or adapting the interior to meet new needs is the ultimate choice in terms of environmental sustainability

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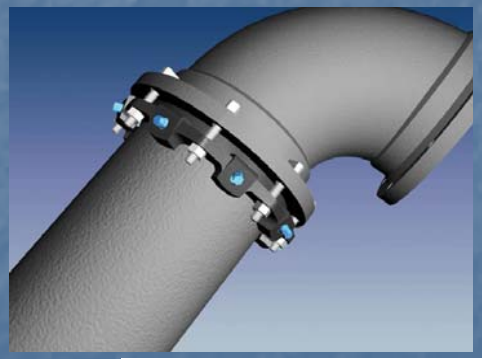
Designing for Deconstruction

- Natural hierarchy of waste minimization to consider when designing for deconstruction[1]
  1. Adaptive reuse of existing structures
  2. Design for adaptability and longevity of new structures
  3. Future reuse of structure elements/assemblies
  4. Future reuse of structure components
  5. Future recycling of structure materials
  6. Future reclamation of energy from structure elements, components or materials
  7. Landfill disposal at end of project service life

1. Design and Detailing for Deconstruction, Section 4.1, Scottish Ecological Design Association

Designing for Deconstruction

- Design Practice Examples
  - Modular facility design
  - Bolted rather than welded, adhesive or nailed joints
  - Use of homogeneous materials
    - Uniform material grade
    - Uniform member lengths
  - Cavity wall construction for masonry buildings
  - Use of restrained joints rather than concrete thrust blocks so that buried pipe fittings and valves can be salvaged



Designing for Deconstruction

- Structure Reuse Examples
  - Conversion of existing aeration & clarifier tankage to a new process use
    - Addition of excess wet weather flow storage
    - Addition of a nutrient removal process
  - Conversion of a chlorine contact tank to UV disinfection
  - Relocation and reuse of metal frame buildings

Beneficial Reuse of Biosolids

- Biosolids / Residuals / “Sludge”
  - Byproduct of wastewater treatment
    - Municipal
    - Industrial
    - Also water treatment (“residuals”)
- 2 Basic Categories for Reuse
  - Class A – “Exceptional Quality”
  - Class B
  - EPA 503 Regulations
  - Liquid, dewatered, or dried

Beneficial Reuse of Biosolids

- Class A
  - Extremely low to no pathogen content
  - Low metals (exceptional quality)
  - Little to no vector attraction
  - Non site-specific
  - Available to consumers
    - Marketing and distribution to general public

- Class B
  - Low pathogen content, vector attraction
  - Still suitable for reuse (limited mainly to ag land application)
  - Site-specific

Beneficial Reuse of Biosolids

- Beneficial Uses
  - Agricultural land application (most common)
  - Landfill cover material
  - Land reclamation
  - Composting
  - Other

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Beneficial Reuse of Biosolids

- Advantages
  - Nutritional benefits – N, P, K – soil vitamins!
    - Increases crop yield
  - Improves soil structure – reduced erosion
    - Absorbed into soil
  - Increased organic matter

Beneficial Reuse of Biosolids

- Disadvantages
  - High metals
  - Over application
  - Higher “production” costs
  - Odors
- Regulations provide strict control

Beneficial Reuse of Biosolids

- Benefits of Beneficial Reuse
  - Saves space in landfills
  - Reduces fertilizer use
    - Improved water quality
  - Reduced secondary carbon footprint
    - “Manufactured” locally!!
    - Reduced production and hauling of fertilizers
  - Some biosolids have lime additive

Beneficial Reuse of Biosolids

- SRF Incentives
  - Projects which result in beneficial reuse
    - Produce Class A or Class B biosolids **AND** beneficially reused
  - Bonus for utilizing new treatment processes which go beyond typical reduction (>60% reduction)
    - Less volume to dispose

Water Conservation in SRF Projects

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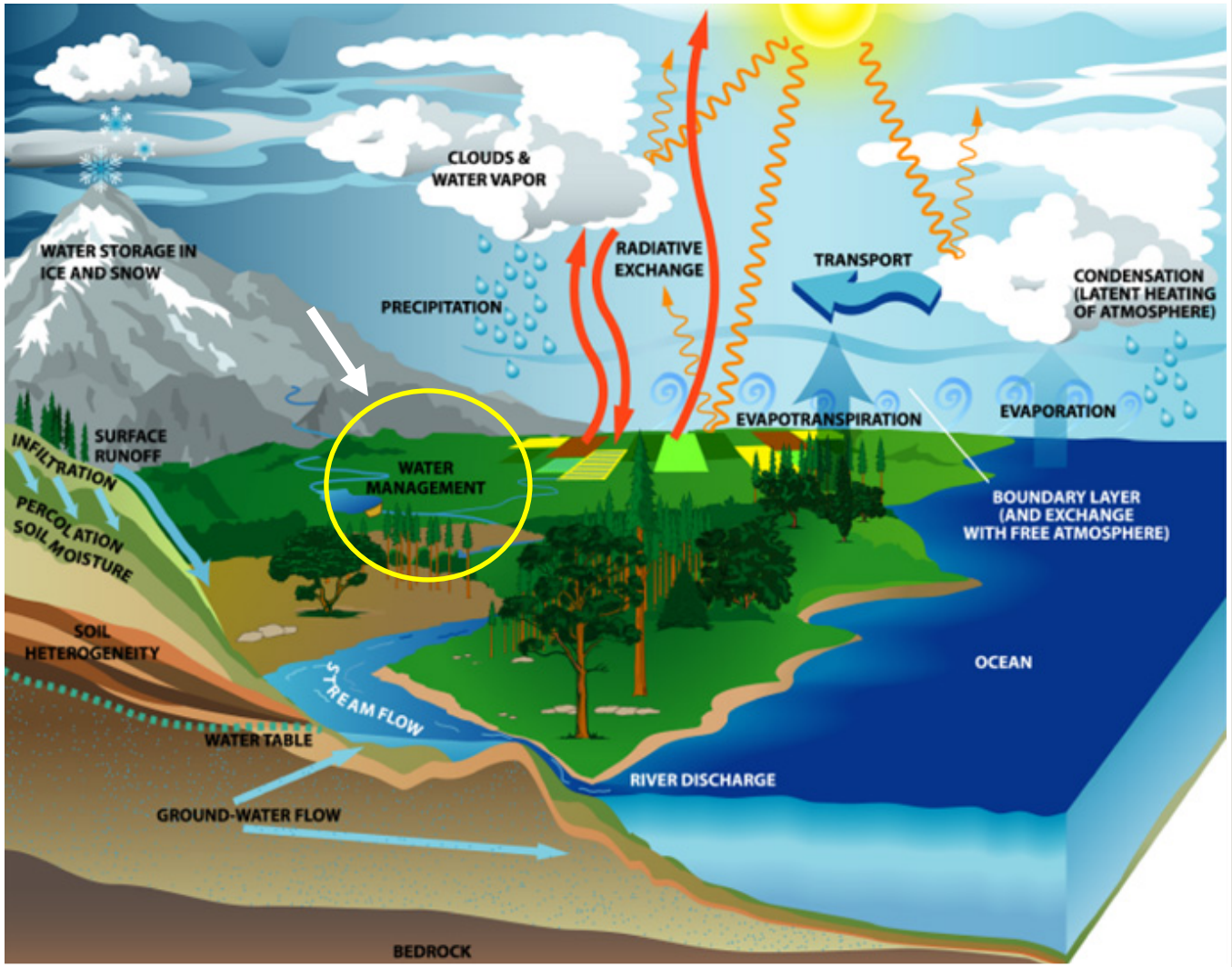

CLOUDS &
WATER VAPOR
WATER STORAGE IN
ICE AND SNOW
RADIATIVE
EXCHANGE
TRANSPORT
CONDENSATION
(LATENT HEATING
OF ATMOSPHERE)
PRECIPITATION
EVAPOTRANSPIRATION
EVAPORATION
SURFACE
RUNOFF
INFILTRATION
WATER
MANAGEMENT
PERCOLATION
SOIL MOISTURE
BOUNDARY LAYER
(AND EXCHANGE
WITH FREE ATMOSPHERE)
SOIL
HETEROGENEITY
OCEAN
STREAM FLOW
WATER TABLE
RIVER DISCHARGE
GROUND-WATER FLOW
BEDROCK

Water Cycle

Conservation Approaches Can Take the Form of:

- Passive Approaches - Incentives or Compliance Programs
  - Demand water softener replacement program
  - Sprinkling/car wash bans
- Infrastructure Approaches
- New EPA Program: A Voluntary Program
  - Draft new homes specifications announced May 22, 2008
  - www.epa.gov/watersense/index.htm

EPA WaterSense

EPA WaterSense Helpline:

866-987-7376

Examples to Consider for SRF Interest Rate Incentive

- Water Systems
- Wastewater Systems
- Stormwater Systems

Examples to Consider for SRF Interest Rate Incentive

- Water Systems

- **Wastewater Systems**
- **Stormwater Systems**

Water Systems

- Use of Water Conservation Fixtures
  - Low flow toilets
  - Sensor activated faucets
- Use of Water Conservation Systems
  - Pressure reducing valves where system pressure > 60 psi

Water Systems (Cont.)

- Proper Controls to Avoid Storage Tank Overflows
- Use of Backwash Water Holding Tanks
- Recycle supernatant to raw water supply (sub note: goes to sewer)[1]
- Allows for effective time management of disposed/recycle sequences and can reduce bleed rate of pollutants to the wastewater system.
- Return rate is limited to ≤ 10% of the raw water rate.

Examples to Consider for SRF Interest Rate Incentive

- Water Systems
- Wastewater Systems
- Stormwater Systems

Wastewater Systems

- Use of Water Conservation Fixtures
- Replacement of Tertiary Filters with Tertiary Clarifiers (reduces backwash and energy too!)
- Use of alternative sludge dewatering technology such as drying beds, geo-bags and centrifuges (all reduce or eliminate wash water)
- Use of treated effluent for ground water recharge. Note, this practice requires meeting ground water standards – nitrates ≤ 10 ppm

Wastewater Systems (Cont.)

- Use of Water Conservation Fixtures
- Use of treated effluent for WWTP non-potable uses:
  - Weir cleaning
  - Grounds watering
  - Polymer mix water for sludge thickening (add a filter)!
  - Non-potable water toilets (Verizon Wireless Music Center)

Wastewater Systems (Cont.)

- Use of Treated Effluent for Urban & Rural Agriculture Uses
  - Urban – Golf Course Watering (note: need land applicant permit with high exposure restriction – low TSS & disinfection)
  - Rural – Could solve a major problem to municipal waste stabilization lagoon system.
- 10:1 stream to effluent discharge requirements
- Winter ammonia – nitrogen limitations

Wastewater Systems (Cont.)

- Use of Treated Effluent for Urban & Rural Agriculture Uses
  - Allows for land application when stream flow is low and farmers need the moisture.
  - Possible benefits as Antidegradation rule is revised and implemented throughout Indiana.

<u>327 IAC 2-1.3:</u>
Antidegradation standards and implementation procedures

Examples to Consider for SRF Interest Rate Incentive

- Water Systems
- Wastewater Systems
- Stormwater Systems

Stormwater Systems

- MS4, CSO & SSO Benefits – redirects clean water flow off of Gray System & diverts to green, sustainable solutions.
- Benefits
  - Possible Cost Reduction
  - Provides wet weather relief in existing infrastructure
  - Esthetics

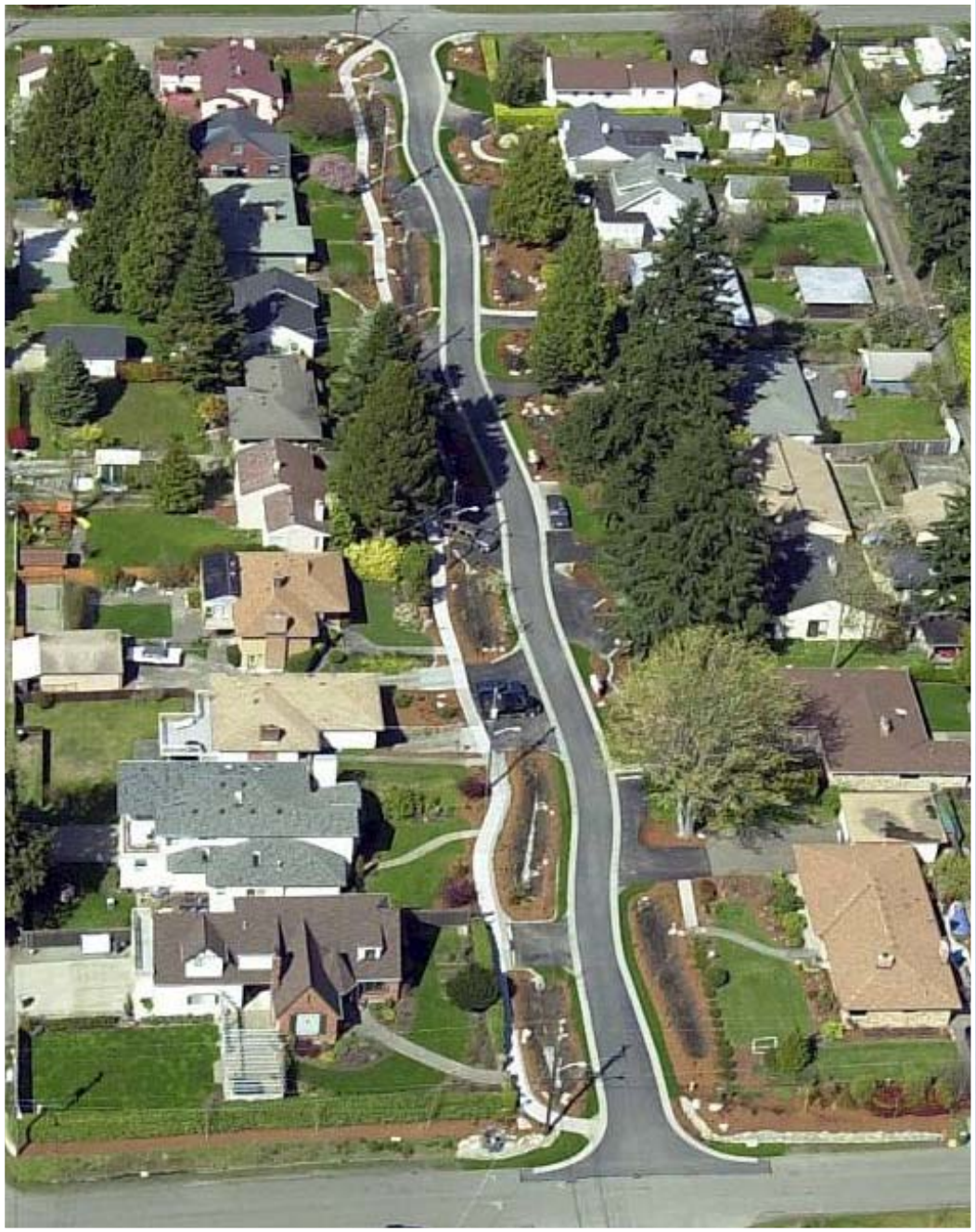
Green Infrastructure Can Reduce Runoff Volumes and Slow Delivery of Stormwater to Sewer Systems

EPA Stock Photos

EPA Stock Photos

Street Retrofits

Street Retrofits



98%

reduction in total runoff volume

EPA Stock Photos

Questions & Answers

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Reuse of Biosolids

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Water Conservation

-Don Larson, Vice President
Commonwealth Engineers, Inc.