Sustainable Substation Solutions

IEEE Substation Conference

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Why Sustainable Sub?

LEED® - Like for Substation

- Trendy
- Benefits
- The Right Solution

Investigate Possibilities

- Partner with Northeast Utilities

Project Introduction

Sherwood Substation Overview

- 115-kV/13.8- kV Substation in Westport, Connecticut
- Built on existing residential property
- Site drains to existing wetlands
- Located adjacent to Metro North commuter rail line park-n-ride lot
- Study done in parallel with conventional design and construction
- Sherwood Substation built in 2011 using standard design criteria

Project Introduction

Sustainable Substation Initiative

- Concepts modeled after:
  - LEED® Reference Guide
  - Sustainable Sites Initiative
- Reasons for the Initiative
  - Lack of utility green building standards
  - Underutilization of sustainable building practices in substation design
  - Demand environmental responsibility

Overview

Sustainable Practices

- Site Development
- Stormwater Management
- Material Strategies
- Control Building Optimization
- Electric Vehicle Integration
- Public Education and Awareness

Site Development

Site Selection

- Select Brownfield/ Redevelopment Sites
- Avoid Sensitive Ecological Areas
  - Wetlands
  - Riparian Buffer Zones
  - Endangered/Protected Species Habitat

Site Development

Sustainable Site Development

- Minimize Area of Disturbance
  - Compact electrical configurations
  - Minimize disturbance to surrounding undeveloped and vegetated areas
- Provide Erosion Control BMPs
  - Prevent excessive sedimentation
- Shield Station Lighting
- Minimize Heat Island Effect

Site Development

Water Efficient Landscaping

- Choose Native Plants
- Specify Plant Types that Minimize Erosion

Stormwater Management

Goals

- Control stormwater rates
- Remove 80% or more of Total Suspended Solids
- Minimize erosion of developed areas
- Exceed minimum municipal or state regulations

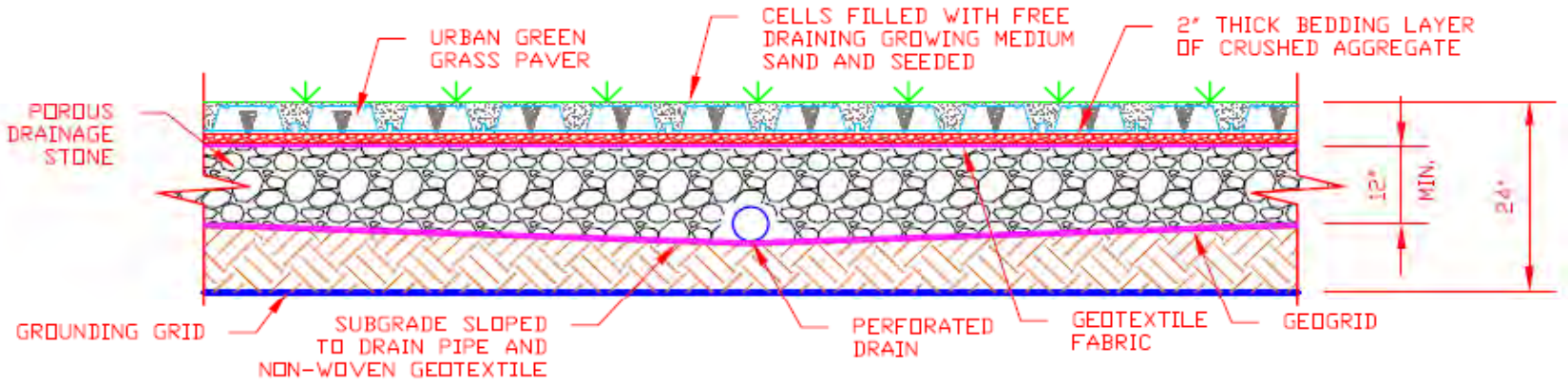
Pervious Pavement for Driveways

Sedimentation Basin

Stormwater Management

Stormwater Management Within Substation Fence

- Use Grass Pavers Where Practical
- Plant with Low Growing Native Vegetation



YARD SURFACING SECTION

(NTS)

Stormwater Management

Grass and Gravel Pavers

- Benefits
  - Reduce impervious areas
  - Promote infiltration
  - Stabilize drive surface
  - Reduce Heat Island effect
  - Improve aesthetics
- Drawbacks
  - Increase maintenance procedures inside substations

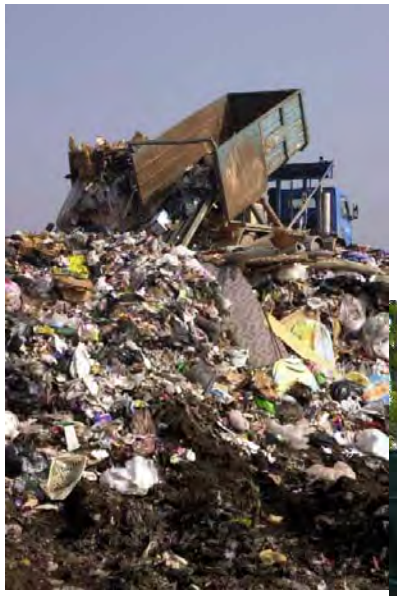
Stormwater Benefits

- Meet or Exceed Required Stormwater Design Requirements
- Purchase/Use Smaller Plots of Land
- Less Disturbance and Erosion Potential
- Simplify Permitting Approval Efforts with Smaller Footprints

Material Strategies

Construction Waste Management Plan

- Waste Recycling and Landfill Diversion
  - Wood
  - Metal
  - Concrete
  - Masonry
  - Asphalt
- Source Reduction
- Coordination Between All Contractors



Material Strategies

Recycled Content Building Materials

- Fly Ash in Concrete
- Reclaimed Crushed Concrete
- High Recycled Content Steel
- Recycled Plastics
  - Block retaining walls
  - Pipe
  - Geogrids and geotextiles

Material Strategies

Regional Materials and Local Suppliers

- Reduction in environmental impact of transportation/shipping

Vendor Selection

- Sustainable Manufacturing
- Responsible Business Practices

Control Building Optimization

Control Building Opportunities

- Building Envelope
  - Increased Insulation
  - Higher R-value
- HVAC
  - Geothermal Heat Pump
- Lighting System
  - High Efficiency Lighting
  - Led Lighting Fixtures
- Auxiliary Power
  - Photovoltaic Panels
  - Small Wind Turbines

Electric Vehicle Integration

Charging Stations

- Possible Installation Locations
  - Commuter Parking Lots
  - Parking Garages
  - Shopping Centers
  - Residential Buildings
  - Office Complexes

Types of Charging Stations

- Quick Charge – DC Charging Stations
- Slow Charge – AC Level II

Public Education and Awareness

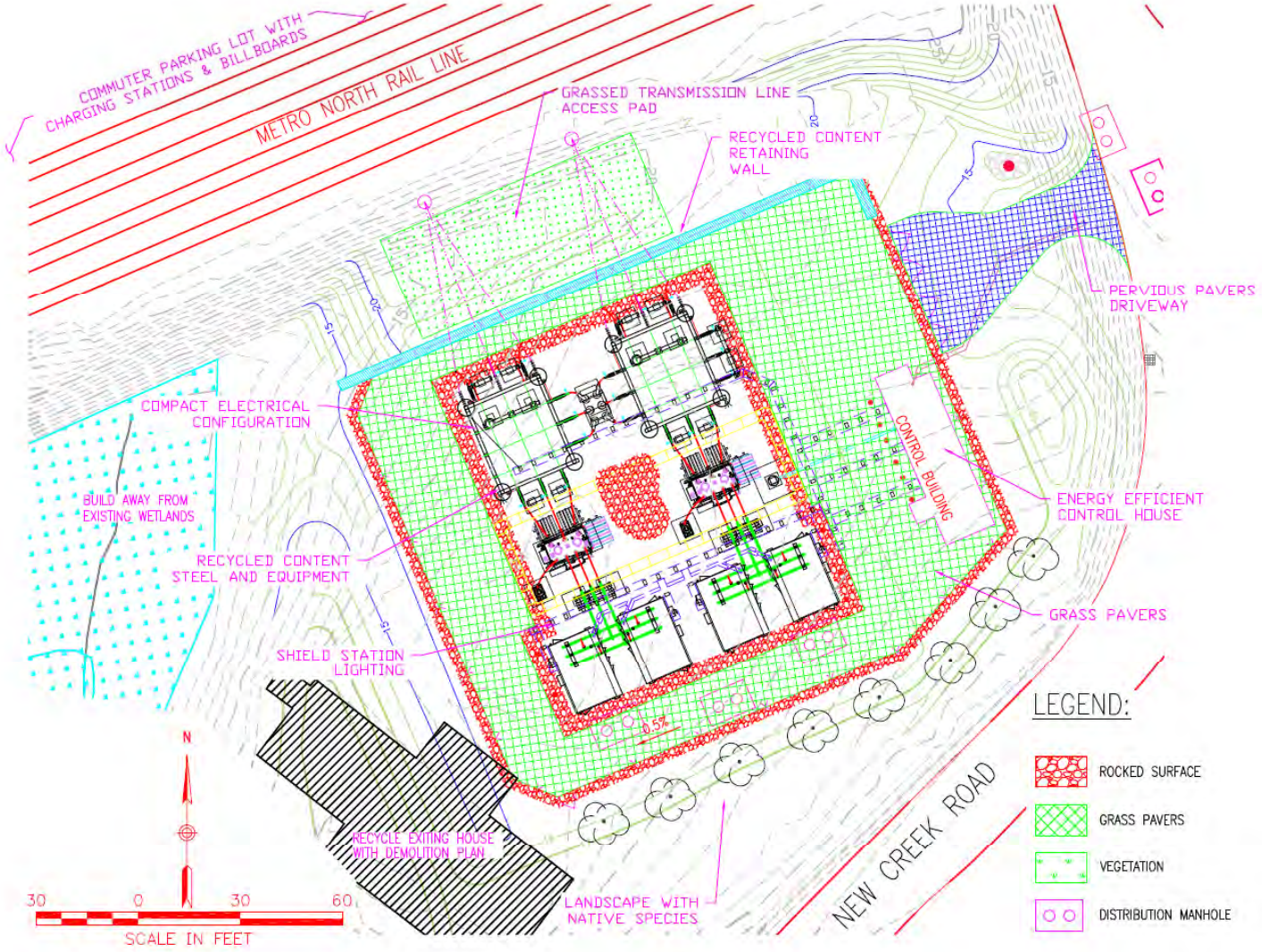
Partnership with Local Schools

- Utility Involvement in the Community Highlighting:
  - Substation purposes and need
  - Sustainable practices used in the substation
  - Renewable energy projects

Display Boards

- Locations
  - Substations
  - Charging station locations

Study Site Layout



Cost

- Est. Traditional Substation Cost: $9.2 mil
- Est. Sustainable Substation Cost: $9.35 mil
- Estimated Cost Increase: 1.0%

Next Steps

- Implementation
- Performance Review
- Cost Evaluation
- Bidding With This Design
- Request LEED Accreditation for Utility Projects

Questions?