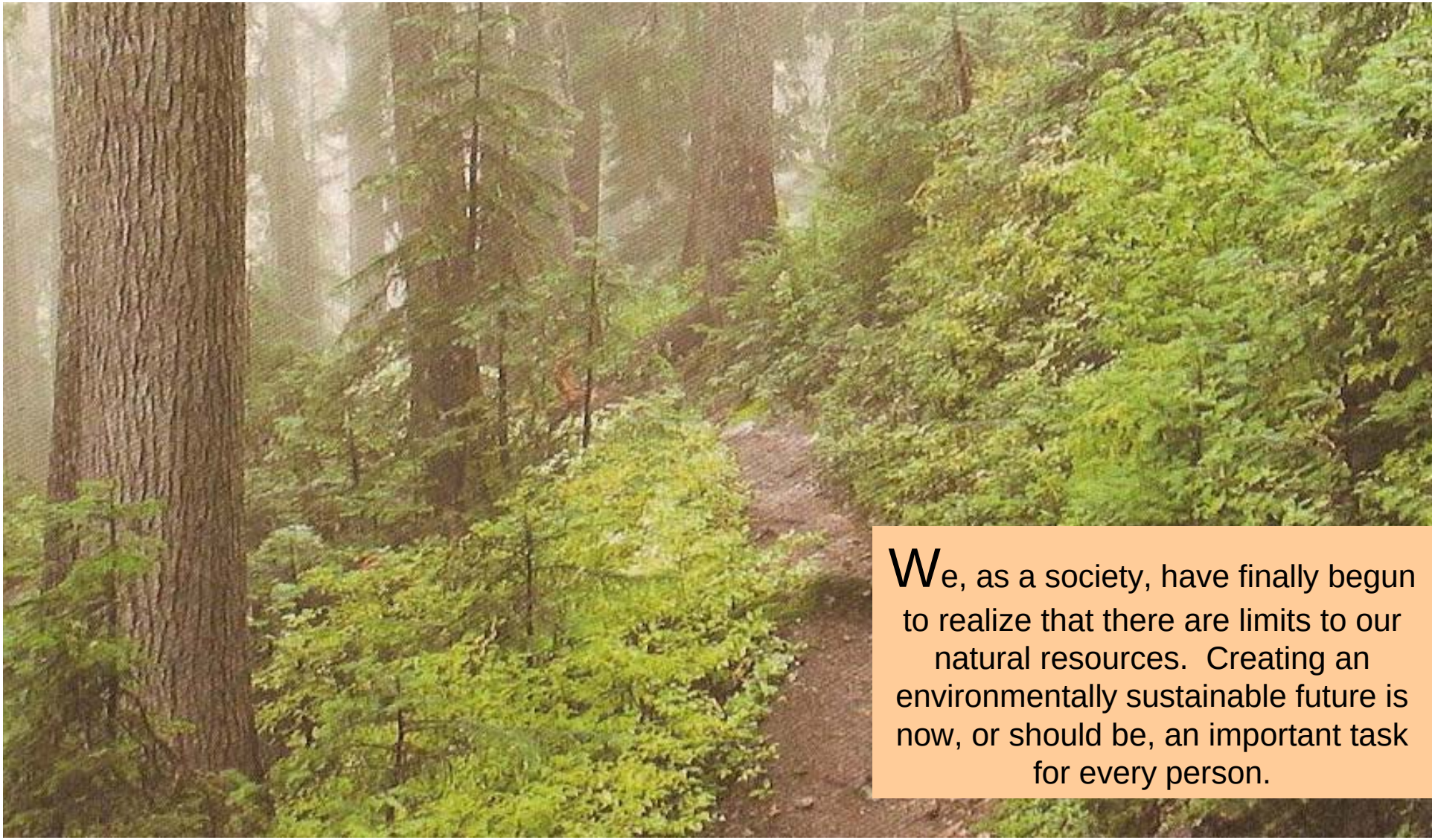


We, as a society, have finally begun to realize that there are limits to our natural resources. Creating an environmentally sustainable future is now, or should be, an important task for every person.

Green Building Opportunities for Infrastructure Projects

Principles, Practices, & Experiences

King County Water & Land Resource Division (WLRD) and Road Services are two Divisions that are striving to incorporate green building methods into King County infrastructure projects not suited to the standardized LEED approach.

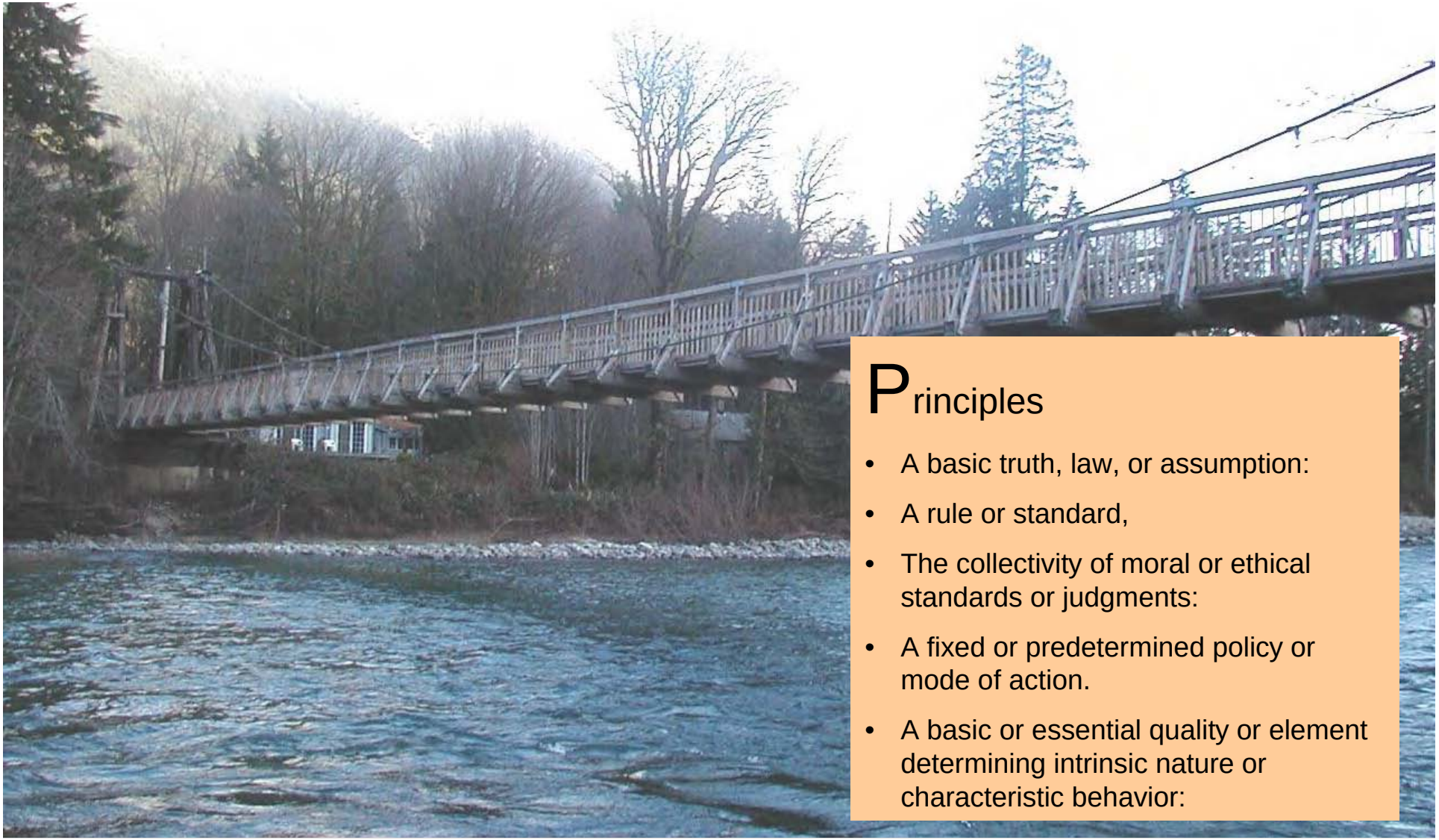
The focus of WLRD's efforts is on promoting alternative Stormwater facility design.

The focus of Road's efforts is on incorporating green building elements into their projects and striving to deliver High Performance, Cost Effective and Sustainable Transportation Projects.

Today we are here to talk about the approaches we are taking to adapt LEED Principles, Green Materials, and Low Impact Development to meet the needs of infrastructure design and construction.

WLRD & Road Services

Striving to Deliver High Performance, Cost Effective & Sustainable Infrastructure Projects



Principles

- A basic truth, law, or assumption:
- A rule or standard,
- The collectivity of moral or ethical standards or judgments:
- A fixed or predetermined policy or mode of action.
- A basic or essential quality or element determining intrinsic nature or characteristic behavior:

Principles

Give Preference to Design Alternatives that Minimize Impacts to Sensitive Site Elements.

Use Appropriate Erosion and Sedimentation Controls during Construction to Control Site Impacts.

Sustainable Site Principles 1

Rehabilitate Environmentally Damaged Sites.

Design for Alternative Transportation Methods (e.g. bike lanes and pedestrian facilities).

Reduced Site Disturbance or Minimize Disturbed Footprint of New Construction.

Conserve Existing Natural Areas.

Restore Damaged Areas to improve Habitat and promote Biodiversity.

Sustainable Site Principles 2

Limit or Eliminate the Use of Potable Water for Landscape Irrigation and Other Needs.

Use Captured Rain or Recycled Water from Site to Provide 50 to 100 % of Needs.

Use Indigenous Plants Requiring Minimal Water Use.

Use High Efficiency Drip Irrigation Systems.

Use Porous Surfacing to Reduce Runoff.

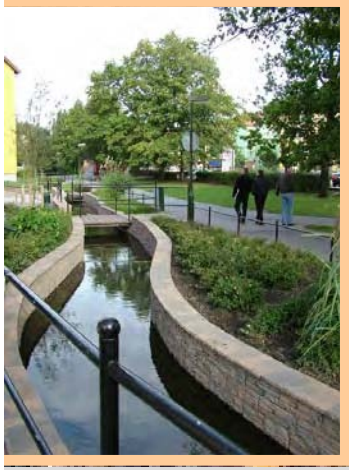
Protect Water Resources 1

Preserve as Much Native Vegetation as possible.

Install Bio-infiltration in Small Localized Systems vs. a Large Centralized System.

Recharge Local Aquifer.

Protect Water Resources 2



Restore Predevelopment Soil Characteristics.

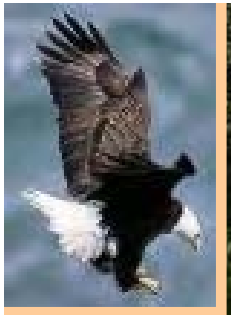
Maintain Natural Water Flows.

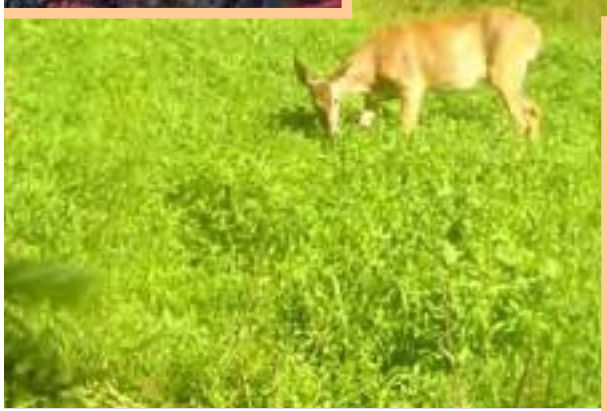
Minimize Site Stormwater Runoff.

Increase On Site Infiltration.

Reduce Contaminants.

LID & Stormwater Management Principles





Minimize the Disturbance of Sensitive Areas.

Create Natural Barriers to Protect Wildlife from Traffic.

Create Habitat Corridors or Green Crossings for Wildlife to allow safe Migration.

Provide Acoustic Buffering from Traffic.

Keep Streams Day lighted vs. Installing Long Dark Culverts.

Recycle Woody Debris from Project.

Protect Habitat

Reduce CO_2 Emissions using Cement Alternatives such as Slag, Fly Ash, Etc.

Reduce Dust from Construction Activities.

Employ Intelligent Traffic Systems to Keep Traffic Moving and to Reduce Vehicle Idling, Time, and Emissions.

Provide Facilities (HOV lanes, Sidewalks, Bike Lanes) that Encourage Use of Alternative Transportation Methods (Mass Transit, Bicycle, and Pedestrian).

Protect Air Quality & Protect the Atmosphere

Reduce Heat Islands (the difference in temperature between developed and undeveloped areas) to Minimize Impact on the Site Micro Climate.

Plant Trees to Shade Paving or use Open Grid Vegetated Surfaces.

Specify Light Colored Materials to Reduce Heat Absorption.

Micro Climates & Landscaping

Adopt Site Lighting Criteria to Provide Safe Levels of Lighting and to Avoid Night Sky Pollution.

Focus and Minimize Extraneous Site Lighting.

Reduce Outdoor Light Pollution

Minimize Energy Use During Construction and Long Term Operation/Use of Project.

Encourage Increased Levels of Self-Supplied Renewable Energy Technologies (Solar, Wind, Geothermal, Biomass, Bio-Gas, Bio-Diesel, and Low Impact Micro Hydro).

Take advantage of Net Metering.

Purchase Green Power (from Renewable Energy Systems).

Reduce Energy Use & Generate Renewable Energy

Facilitate the Reduction of Waste by Reusing Existing On Site Materials.

Extend the Life Cycle of Existing Infrastructure via Maintenance.

Purchase Recycled, Renewable Materials.

Encourage Use of Biodiesel or Alternative Fuels during Construction.

Responsible Material Selection

Establish Aggressive Recycling Goals for Projects.

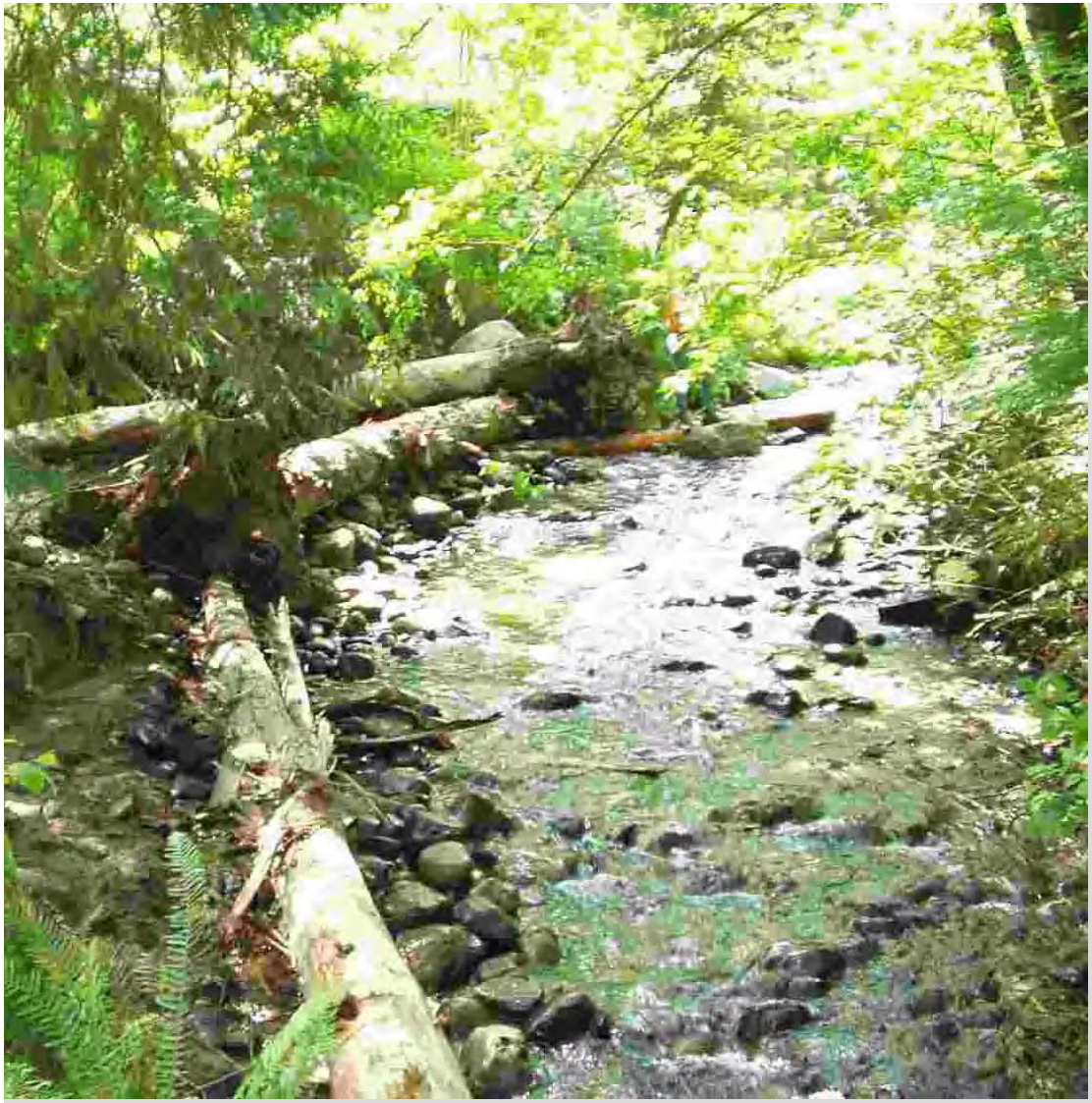
Divert Construction, Demolition, and Land Clearing Debris to Recyclers. Modify Design Elements or Standards (where appropriate) during the Design Process to Allow for the Reuse of Existing On Site Materials.

Identify Sorting, Storage, and Staging Areas to accommodate Recycling and Reuse of Existing Project Materials.

Develop Tracking Systems for Recycling and Reuse of Existing Project Materials.

Got Soil? Need Soil? Develop a Soil Trading Website.

Reduce & Manage Construction Waste



Reuse existing vegetation (where appropriate) for soil amendment or as ground cover by grinding on site.

Extend the Life Cycle of Targeted Materials by Reducing Environmental Impacts related to Materials Manufacturing and Transport.

Identify Design Opportunities to Salvage Materials.

When Existing Trees cannot be saved, turn them into Project Design Elements like Woody Debris or Benches.

Use Recycled Concrete, Asphalt, and Brick in Gabion Baskets.

Reuse Existing Resources

Reuse Existing Resources in New Ways. For example:

Rubber Sidewalks: Use of Recycled Rubber For Sidewalk Pavers around Trees.

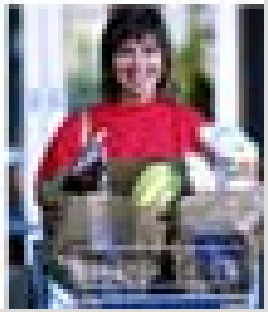
Rubberized Paving: Use Recycled Rubber in Paving.

Use Recycled Glass in Hilfiker Wall System SE 128th Street in Renton.

Recycled Glass for Pipe Bedding.

Glassphalt: Use Recycled Glass in Asphalt Paving for Parking Lots and Roads.

Resource Reuse



Increase Demand for Products with Recycled Content by Green Purchasing. This reduces impacts from extraction of new materials.

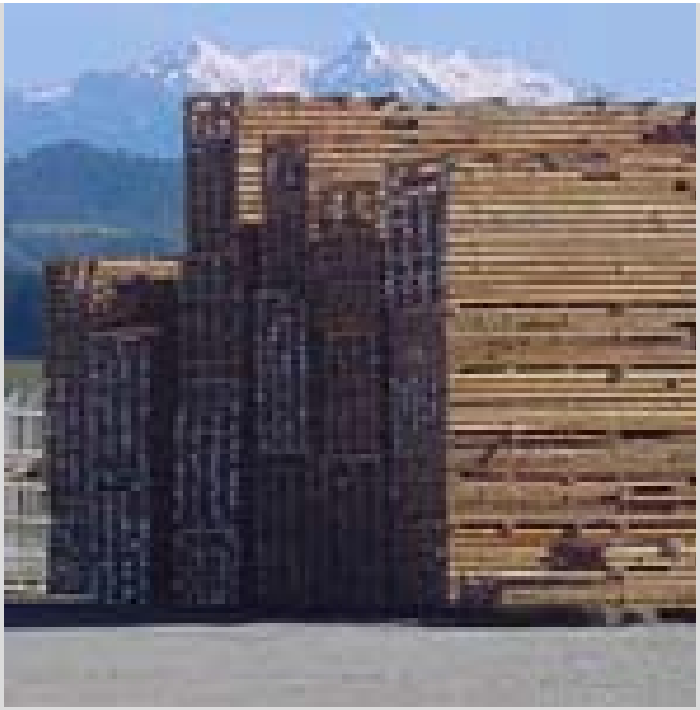
Use Products with Low Embodied Energy.

Use Low VOC and Non Toxic Materials.

Green Purchasing

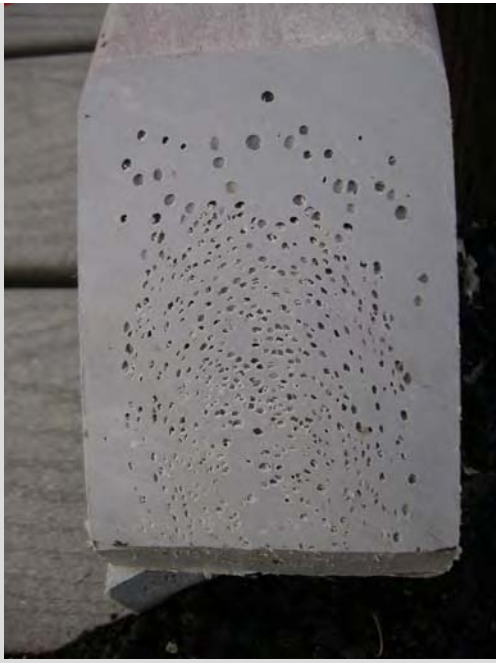
Increase Demand for Local & Regional Produced Materials (those manufactured within a radius of 500 miles)

Use Local/Regional Materials



Use Lumber from Renewable Managed and Certified (FSC) Forests for Beams, Boardwalks, Fences, Benches, etc.

FSC Certified Wood



Use Plastic Lumber in Applications such as Beams, Boardwalks, Fences, Benches.

Recycled Plastic Lumber

Eliminate or Reduce Pesticide Use.

Integrated Pest Management.

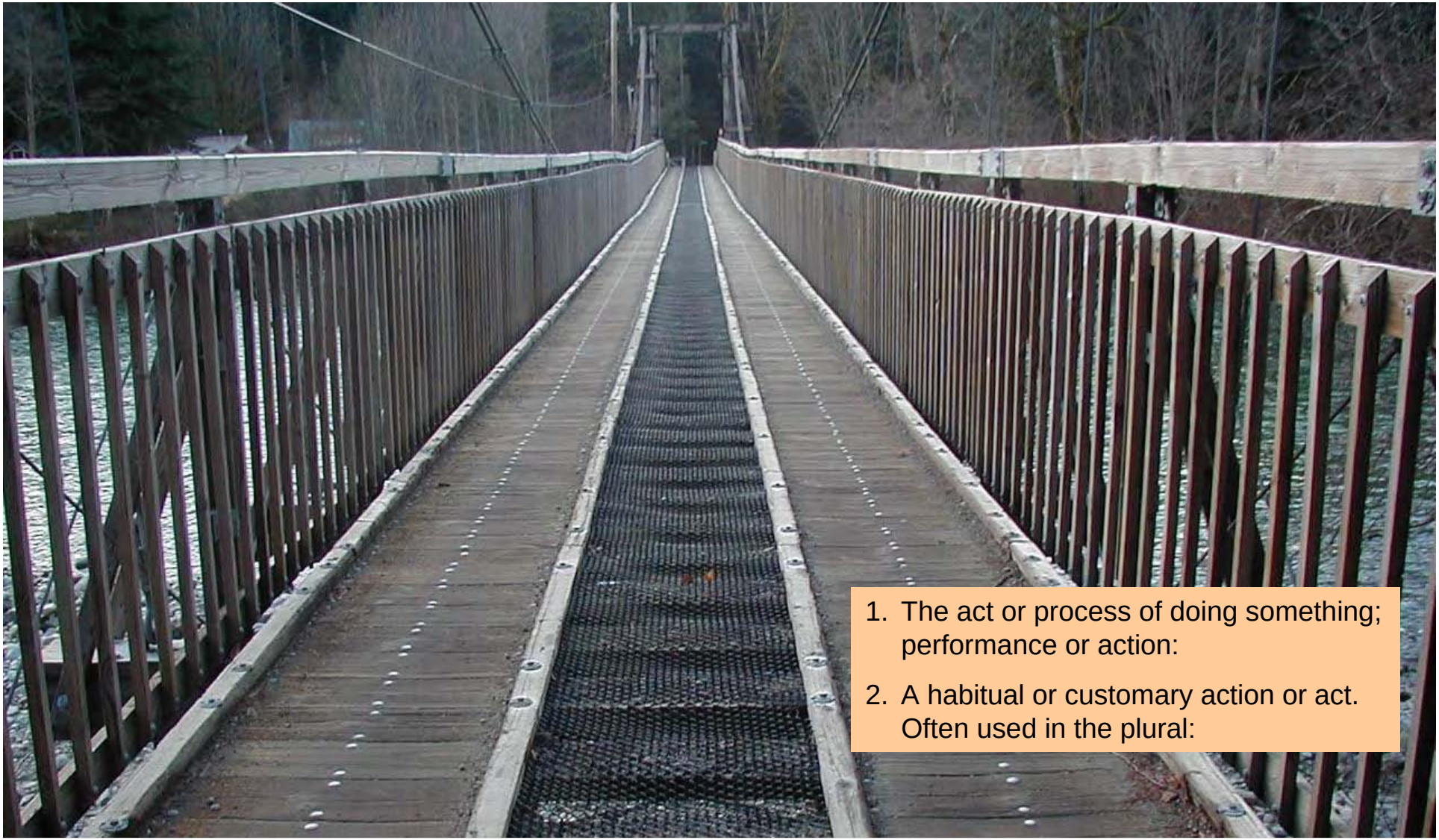
Use Durable Low Maintenance Materials.

Use Long-Life Low Energy Lamps and Fixtures.

Use Minimal Growth Sustainable Native Plant Selection.

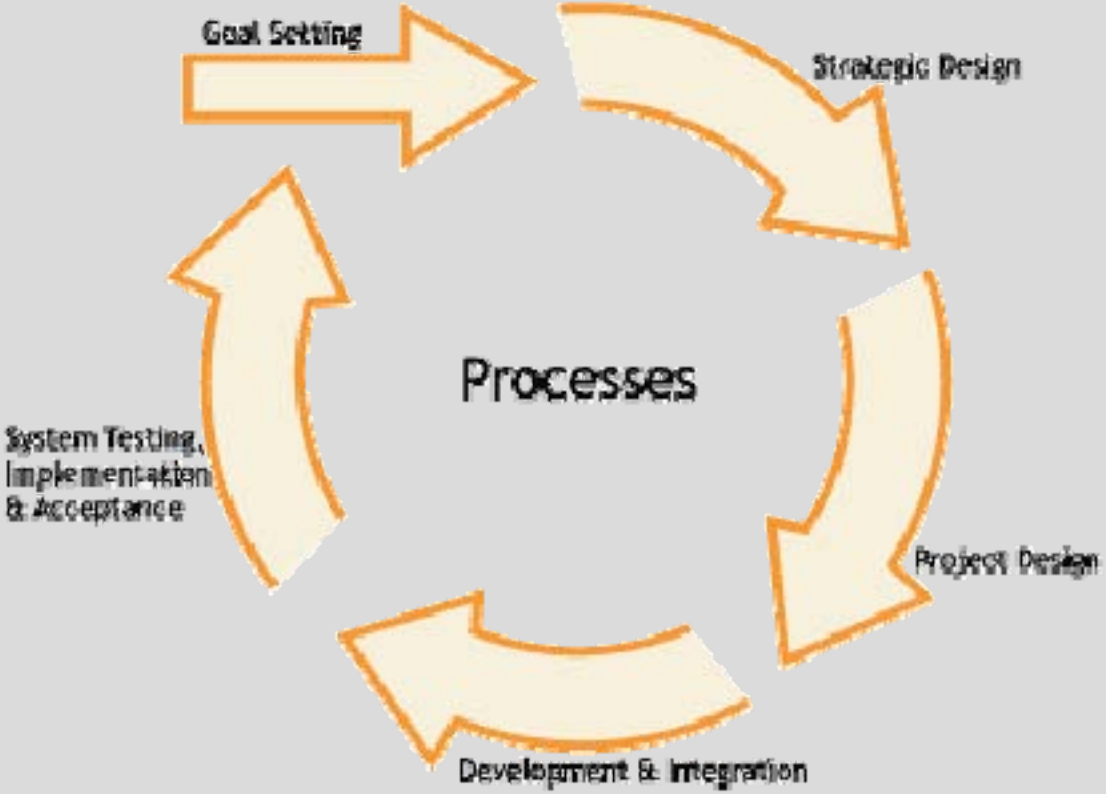
Reduce, Reuse, Recycle, Renew

Maintenance of Facilities



Practices

Strategies, Methods, & Procedures to Achieve Goals



Gaining Support for Green Building, Project Definition & Setting Goals

Financing Green Building

Design Strategies

Bidding Strategies

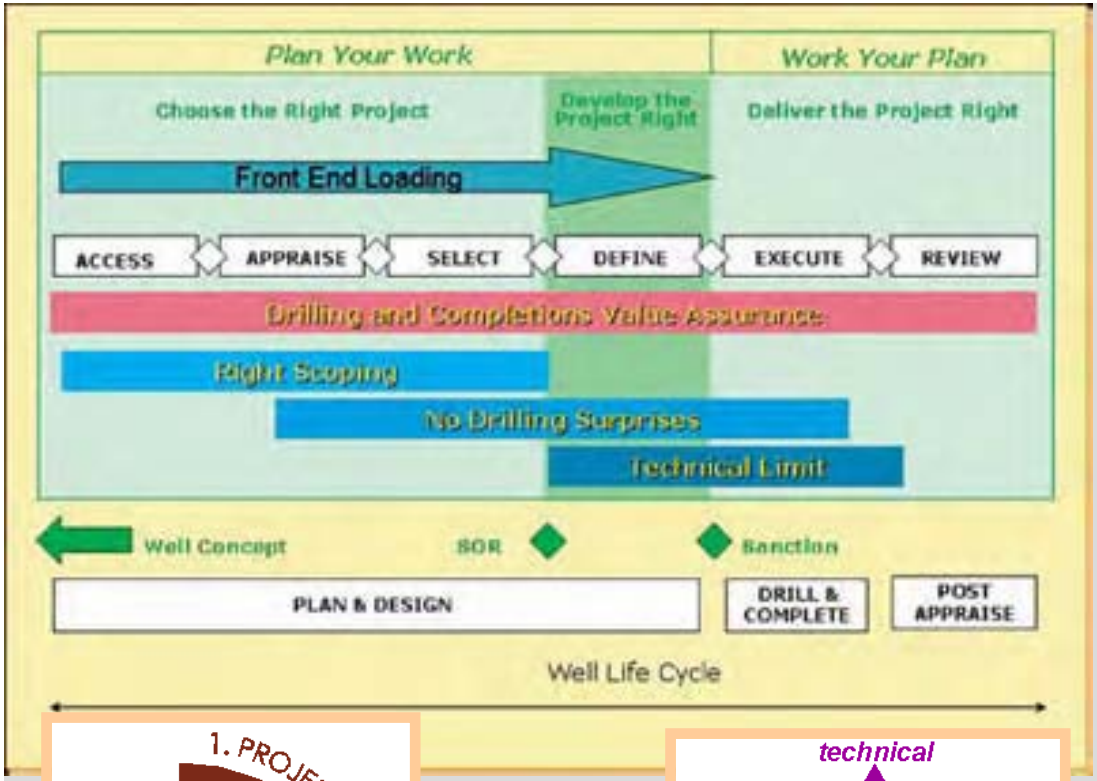
Construction Management Strategies

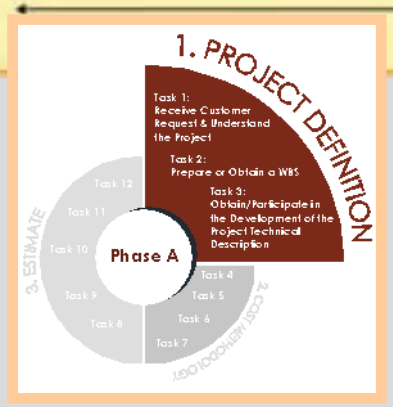
Maintenance & Operations Strategies

Public Education Strategies

Incorporating Green Building into Our Projects

A New Strategic Approach





Build Your Case for Employing LEED Principles to Your Project.

Decide to Apply LEED Principles to Your Infrastructure Project.

Use Green Building Principles to Redefine and Distinguish Your Project.

Set Your Budget and Goals. Focus on the Long Term Cost of the Project. Include Maintenance and Operations Costs when Evaluating Project Alternatives.

Access Risk, Life Cycle Cost Analysis of Alternatives.

Improve your Public Image with Your Stakeholders.

Project Definition & Financing Strategies

Design is about making the Best Choices for Your Project.

First Choose to Protect Resources and Do No Harm.

Then make a concerted effort to Minimize and Mitigate Impacts Past, Present, and Future.

Move on Enhance Habitat and Resources where possible to Reduce Impacts of Current and Past Projects.

Finally, Establish a Goal to Create an Award Winning WOW! Project.

Design Strategies 1

Analyze The Green Building Opportunities for Your Project and Your Site.

Select Team Members who Understand Your Green Building Goals. Hold a Design Charrette.

Focus on Minimizing the Long Term Cost and Environmental Impacts of the Project. Include Maintenance and Operations Costs when Evaluating Project Alternatives.

Improve your Public Image with Your Stakeholders.

Design Strategies 2

Communicate your Design Intent and Expectations in Project Contract Documents. Use Photos, 3D Graphics, etc.

Take the Time During Design to Listen and Learn from Contractors and the Trades.

Communicate Appropriately: Remember that Contractors, and Craftspeople are Visual Learners.

Hold Pre Bid Meetings To Discuss Specific Elements of the Project Design.

Hold Detailed Bid Evaluation Meetings and Interview Your Contractor Before you Hire Them.

Bidding Strategies

Establish Pay Items and Deliverables for Important Environmental Issues. (Established Tree Fees at Highpoint.)

Establish Project Environmental Milestones to Monitor Contractors Project Compliance and Progress.

Establish Specifications for Pre Planning Meetings to discuss and resolve Issues, Intents, and Expectations before each important environmentally sensitive aspect of the Work.

Require Certified Erosion Control Supervisors who have Real Authority to Monitor and Control the Work.

Require Project Bronze Plaques with Contractors Name and Date of Project.

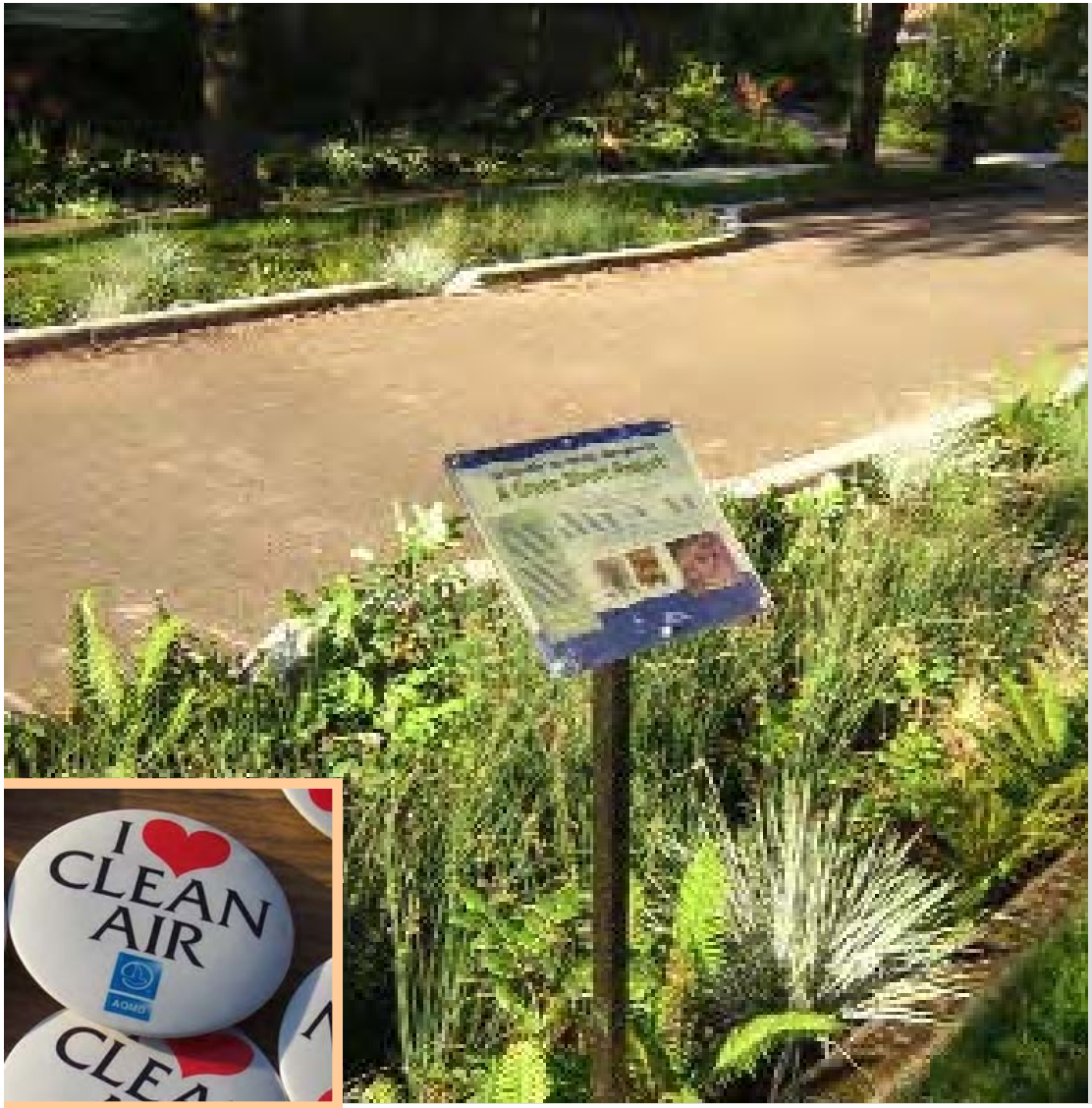
Construction Management Strategies

Reduce, Reuse, Recycle, Renew.

Involve Maintenance Crews in the Design of projects early on. Listen to and respect their input. They are the experts.

Use Biodiesel or Alternative Fuels.

Maintenance Strategies



Use Mailers and Signage as and Opportunity to Educate Citizens on Care and Maintenance of Green Facilities.

Involve Citizens in the Design Process.

Use Newsletters to Update Citizens on the Project Construction Schedule.

Public Education Strategies

Our Experiences

King County Glassphalt Demonstration Project.

Joint City of Seattle and King County Rubberized Paving Project.

Concrete Road Recycling on Avondale.

Pervious Pavement Shoulder on Woodinville Duvall Road and Pathway on North SPAR.

Recycled Glass Pipe Bedding and Recycled Glass Backfill for Hilfyker Walls.

LED Traffic Light Project

Intelligent Traffic System Projects

Slag Cement Materials Testing.

Full Depth Reclamation of Existing Roadway on 124th Ave NE.

Past Projects

A Historical Review of KC Green Road Infrastructure Experimentation

Waste Reduction & Tracking System for Projects

Renewable Energy Generation Test Project

Slag Cement Concrete Sidewalks

Pervious Concrete Sidewalks

Rubber Sidewalk Pavers

Bio-Infiltration Drainage Systems

Intelligent Traffic System Projects

Future Projects & Experimentation

On the Drawing Board

Any Questions?

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