THE GREENROADS METRIC AND ROADWAY SUSTAINABILITY
TODAY’S TOPICS

1. WHY SUSTAINABILITY HAS BECOME A BIG BUZZ WORD
2. WHAT A SUSTAINABLE ROADWAY PROJECT LOOKS LIKE
3. LOOK AT A ROADWAY SUSTAINABILITY METRIC - GREENROADS
4. WHAT WE LEARNED FROM UA’s GREENROADS EXPERIENCE
5. HOW TO EASILY MAKE ROADWAY PROJECTS SUSTAINABLE
SUSTAINABILITY

We all hear about it, but what does it mean in terms of roadway projects?
Sustainable Construction Projects

A construction project that will meet the needs of the present without compromising the ability of future generations to meet their own needs.

HOW DOES THE NEED FOR SUSTAINABILITY APPLY TO ROADWAY PROJECTS?
ROADWAYS REQUIRE THE USE OF LOTS OF NON-RENEWABLE MATERIALS EVERY YEAR

<table>
<thead>
<tr>
<th>Individual materials</th>
<th>Amount Used per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>1,300 million tons</td>
</tr>
<tr>
<td>Asphalt</td>
<td>40 million tons</td>
</tr>
<tr>
<td>Hot mix asphalt (HMA)</td>
<td>600 million tons</td>
</tr>
</tbody>
</table>
Non-Renewable Roadway Aggregates

Origins of the roadway aggregate used in the United States.

- 94% from virgin aggregate
- 6% from recycled aggregate
Construction Waste is a big contributor to the municipal waste stream.

Most estimates place construction waste at between 20 and 40% of the municipal waste stream.
Recycling HMA and PCC as part of road construction has steadily increased.

Asphalt and Concrete Recycled 1999 to 2004

HMA/PCC recycling = 51% of waste material
We need to reduce the amounts taken to landfills and increase the amounts reused for roadway construction.
DIESEL EXHAUST

- Construction: 18%
- Heavy Duty on-road: 29%
- Marine Vessels: 20%
- Industrial: 3%
- Lawn and Garden: 1%
- Locomotives: 8%
- Logging: 2%
- Railroad Maintenance: 0%
- Recreational: 0%
- Light Duty on-road: 1%
- Agricultural: 12%
- Airport Service: 0%
- Boats: 0%
- Commercial: 3%

Industrial/Commercial/Residential Oil: 3%
So what does a more sustainable roadway look like?
Use Pervious Pavements For Stormwater Control

Design Extended Life Pavements

Utilize local materials

Provide pedestrian/bicycle access

Recycle pavement materials

Utilize Warm Mix Asphalt

Control Stormwater Runoff
THE

GREENROADS

ROADWAY

SUSTAINABILITY

METRIC

Developed by the University of Washington Civil Engineering Department
WHAT IS A SUSTAINABILITY METRIC?

A Metric is a rating system that quantifies the degree of sustainability achieved by a construction project by awarding credits for sustainable choices made during the project’s planning, design and construction phases.

HOW CAN THE GREENROADS METRIC BE USED?

The Greenroads Metric can be used to determine if a project qualifies for Greenroads certification.

The Greenroads Metric can also be used to learn how to design and construction a sustainable project.
What are the major goals of the Greenroads metric?

- Reduce project life cycle costs.
- Reduce project fossil fuel use.
- Reduce runoff rates & volumes.
- Reduce project energy use.
- Reduce project exhaust emissions.
- Encourage Context Sensitive solutions.
- Encourage use of recycled materials especially existing pavement materials.
THE GREENROADS MANUAL

• Sustainability approaches are divided into two areas:

  • 11 Mandatory Requirements that all projects must meet.

  • 118 types of Voluntary Credits with varying credit values covering 38 different types of “green” design and construction approaches.

• 32 Voluntary Credits are required to certify a project as a Greenroads Project.
The Mandatory Requirements
## The Mandatory Credit Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description / Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR-1</td>
<td>Environmental Review Process Reviewed a 6-page WS D of E environmental checklist</td>
</tr>
<tr>
<td>PR-2</td>
<td>Life Cycle Cost Analysis (LCCA) Performed LCCA using FHWA RealCost software</td>
</tr>
<tr>
<td>PR-3</td>
<td>Life Cycle Inventory (LCI) Performed LCI using modified PaLATE software</td>
</tr>
<tr>
<td>PR-4</td>
<td>Construction QC Plan Prepared an example contractor QC plan</td>
</tr>
<tr>
<td>PR-5</td>
<td>Noise Mitigation Plan Prepared a construction noise mitigation plan</td>
</tr>
<tr>
<td>PR-6</td>
<td>Waste Management Plan Identified waste material recycling opportunities</td>
</tr>
<tr>
<td>PR-7</td>
<td>Pollution Prevention Plan Prepared a SWPPP template useful for all UA projects</td>
</tr>
<tr>
<td>PR-8</td>
<td>Low-Impact Development Review of ways to potentially reduce runoff volumes</td>
</tr>
<tr>
<td>PR-9</td>
<td>Pavement Mgmt. System Made sure that the City’s PMS program meets the requirements of</td>
</tr>
<tr>
<td></td>
<td>the Greenroads program</td>
</tr>
<tr>
<td>PR-10</td>
<td>Site Maintenance Plan Identified the future maintenance needs for each of the</td>
</tr>
<tr>
<td></td>
<td>constructed items over the life of the project</td>
</tr>
<tr>
<td>PR-11</td>
<td>Educational Outreach Performing on-going Greenroads &amp; project publicity</td>
</tr>
</tbody>
</table>
The Voluntary Credits
## Voluntary Credits

<table>
<thead>
<tr>
<th>Voluntary Credit Types</th>
<th>Potential Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EW Environment &amp; Water</td>
<td>21</td>
</tr>
<tr>
<td>AE Access &amp; Equity</td>
<td>30</td>
</tr>
<tr>
<td>CA Construction Activities</td>
<td>14</td>
</tr>
<tr>
<td>MR Material &amp; Resources</td>
<td>23</td>
</tr>
<tr>
<td>PT Pavement Technologies</td>
<td>20</td>
</tr>
<tr>
<td>CC Custom Credits</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total Voluntary Credits</strong></td>
<td><strong>118</strong></td>
</tr>
<tr>
<td>Voluntary Credit</td>
<td>Points</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
</tr>
<tr>
<td>MR-1 Life Cycle Assessment (LCA)</td>
<td>2</td>
</tr>
<tr>
<td>MR-2 Pavement Reuse</td>
<td>4 – 5</td>
</tr>
<tr>
<td>MR-3 Earthwork Balance</td>
<td>1</td>
</tr>
<tr>
<td>MR-4 Recycled Materials</td>
<td>1 – 5</td>
</tr>
<tr>
<td>MR-5 Regional Materials</td>
<td>1 – 5</td>
</tr>
<tr>
<td>MR-6 Energy Efficiency</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total Materials & Resources Credits**  7 - 16  Likely To Earn 13 Credits
## Pavement Technologies

<table>
<thead>
<tr>
<th>Voluntary Credit</th>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT-1 Long-Life Pavement</td>
<td>5</td>
<td>Designed new long-life (40-year) pavement section designs for residential, collector &amp; arterial streets</td>
</tr>
<tr>
<td>PT-2 Permeable Pavement</td>
<td>3</td>
<td>Use permeable pavement as a LID technique</td>
</tr>
<tr>
<td>PT-3 Warm Mix Asphalt (WMA)</td>
<td>3</td>
<td>Utilized WMA in place of HMA</td>
</tr>
<tr>
<td>PT-4 Cool Pavement</td>
<td>5</td>
<td>Contribute less to urban heat island effect</td>
</tr>
<tr>
<td>PT-5 Quiet Pavement</td>
<td>2 - 3</td>
<td>Use a quiet pavement to reduce noise</td>
</tr>
<tr>
<td>PT-6 Pavmt. Performance Tracking</td>
<td>1</td>
<td>City will perform future reviews of pavement condition to monitor pavement performance</td>
</tr>
</tbody>
</table>

**Total Pavement Technology Credits**: 9 - 9 Likely To Earn 9 Credits
## Construction Activities

<table>
<thead>
<tr>
<th>Voluntary Credit</th>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA-1 Quality Management System</td>
<td>2</td>
<td>ISO 9001 cert. or eq. for general contractor</td>
</tr>
<tr>
<td>CA-2 Environmental Training</td>
<td>1</td>
<td>Provided contractor environmental training</td>
</tr>
<tr>
<td>CA-3 Site Recycling Plan</td>
<td>1</td>
<td>Required on-site recycling and trash collection</td>
</tr>
<tr>
<td>CA-4 Fossil Fuel Use Reduction</td>
<td>1 – 2</td>
<td>Use alt. fuels in construction equipment</td>
</tr>
<tr>
<td>CA-5 Eqpt. Emission Reduction</td>
<td>1 – 2</td>
<td>Meet EPA Tier 4 stds. for nonroad equipment</td>
</tr>
<tr>
<td>CA-6 Paver Emission Reduction</td>
<td>1</td>
<td>Required pavers to meet NIOSH requirements</td>
</tr>
<tr>
<td>CA-7 Water Use Tracking</td>
<td>2</td>
<td>Required contractor to document the use and disposal of potable water used for construction</td>
</tr>
<tr>
<td>CA-8 Contractor Warranty</td>
<td>3</td>
<td>Required 3 year project warranty</td>
</tr>
</tbody>
</table>

**Total Construction Activity Credits** 8 Likely To Earn 8 Credits
Certification Levels

- **Green Road certified**: 32-42 credits
- **Silver**: 43-53 credits
- **Gold**: 54-63 credits
- **Evergreen**: 64+ credits
THE PROBLEM WITH SUSTAINABILITY METRICS

Considerable effort, cost and fees are required

Infrastructure metrics compete with each other
Infrastructure Sustainability Initiative
New York City Infrastructure Manual

Currently there are no requirements to utilize metrics
DIRECTION WILL BE TOWARDS MORE SUSTAINABILITY

Will a national Energy Policy be the new Clean Water Act?

Infrastructure funding will place more value on sustainable approaches
  - Increased competition will make sustainability points important

How do we prepare for increased sustainability requirements?
  - Upper Arlington’s GREENROADS experience provided some answers
UPPER ARLINGTON’S
GREENROADS EXPERIENCE
The City of Upper Arlington designed, bid and re-constructed five City streets able to be certified as Greenroads projects.

WHAT DID WE LEARN?

We learned that it is not necessary to pursue a metric certification to know whether or not a roadway project is sustainable.

Being sustainable doesn’t mean HAVING to use certain types of “GREEN” construction approaches such as pervious pavement.

What makes a project Sustainable is the project’s THOUGHT PROCESS.

ONCE SET UP, THIS THOUGHT PROCESS CAN EASILY BE APPLIED TO ANY FUTURE INFRASTRUCTURE PROJECT.
WHAT ARE THE DESIGN STAGE THOUGHT PROCESSES?

Involve & Educate the Public about Sustainability
- show that Public funds are being spent as cost-effectively as possible.

Request input from both public & private entities
- make sure project is meeting as many goals as possible.

Review a Specific List of Stormwater Control Options
- related to runoff volume, runoff peak flow and pollutant reduction.

Review Material Reuse or Recycling Options
- for each and every component of the project.

Perform VERY BASIC Life Cycle Cost Evaluations
- to insure alternative cost-effectiveness.
SUSTAINABLE ROADWAY APPROACHES

1. Design pavements for increased design life.
2. Identify materials that could be reused on-site.
3. Identify materials that could be recycled off-site.
4. Identify materials that will have to be landfilled.
5. Consider ability to recycle/reuse installed materials.
6. Make balancing materials on-site a priority.
7. Consider using higher RAP percentages
8. Specify the use of Warm Mix Asphalt
SUSTAINABLE ROADWAY APPROACHES

STORMWATER CONSIDERATIONS

1. Review list of ways to reduce runoff volumes
2. Review list of ways to reduce runoff peak flowrates
3. Review list of ways to reduce runoff pollutant quantities

Pervious pavements generally relate to stormwater controls
ROADWAY CONSTRUCTION STAGE

Sustainable approaches & practices must be specified.

Roadway specifications should include:

- Immediate revegetation of disturbed areas
- Contractor Quality Control Plan
- Extended contractor warranty
- Contractor employee sustainability training
- Motivation to expedite construction
PRESENTATION SUMMARY

USING A SUSTAINABILITY METRIC REQUIRES A LOT OF WORK

BEING SUSTAINABLE DOES NOT REQUIRE OBTAINING A CERTIFICATION

BEING SUSTAINABLE DOES NOT MEAN HAVING TO USE GREEN METHODS

BEING SUSTAINABLE ONLY REQUIRES USING A SPECIFIC THOUGHT PROCESS

THIS THOUGHT PROCESS REQUIRES AN EFFORT TO ESTABLISH
BUT CAN BE SIMPLE TO FOLLOW

IF THIS THOUGHT PROCESS IS FOLLOWED YOUR PROJECT
CAN BE CONSIDERED TO BE A SUSTAINABLE PROJECT