Practical Sustainability

how pavement and road sustainability are done at the local level

Steve Muench

NWPMA Conference
Vancouver, WA
Wednesday, 21 October 2015

Greenroads
BRONZE CERTIFIED

Questions

- What does sustainability mean?
  - What do people think of sustainability?
- What can we do to make roads more sustainable?
  - What can we do with pavements?
  - Which practices save money?
  - What practices actually get done?
- What can we learn from Greenroads projects?
  - Do local agencies have a chance?

What does “sustainability” mean?


“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
-from the United Nations Report titled World Commission on Environment and Development: Our Common Future (1987)

Our Definition:
Sustainability is a system characteristic that reflects the system's capacity to support natural laws and human values.

From K.H. Robert's *The Natural Step*

Natural Laws

1. **Ecology**. Don't break the earth.
    a. Do not take stuff out of the earth at a faster pace than their slow redeposit and reintegration into the earth.
    b. Do not produce stuff at a faster pace than it can be broken down and integrated into nature at its current equilibrium.
    c. Do not alter the productive capacity and diversity of ecosystems because our health and prosperity depend on them.

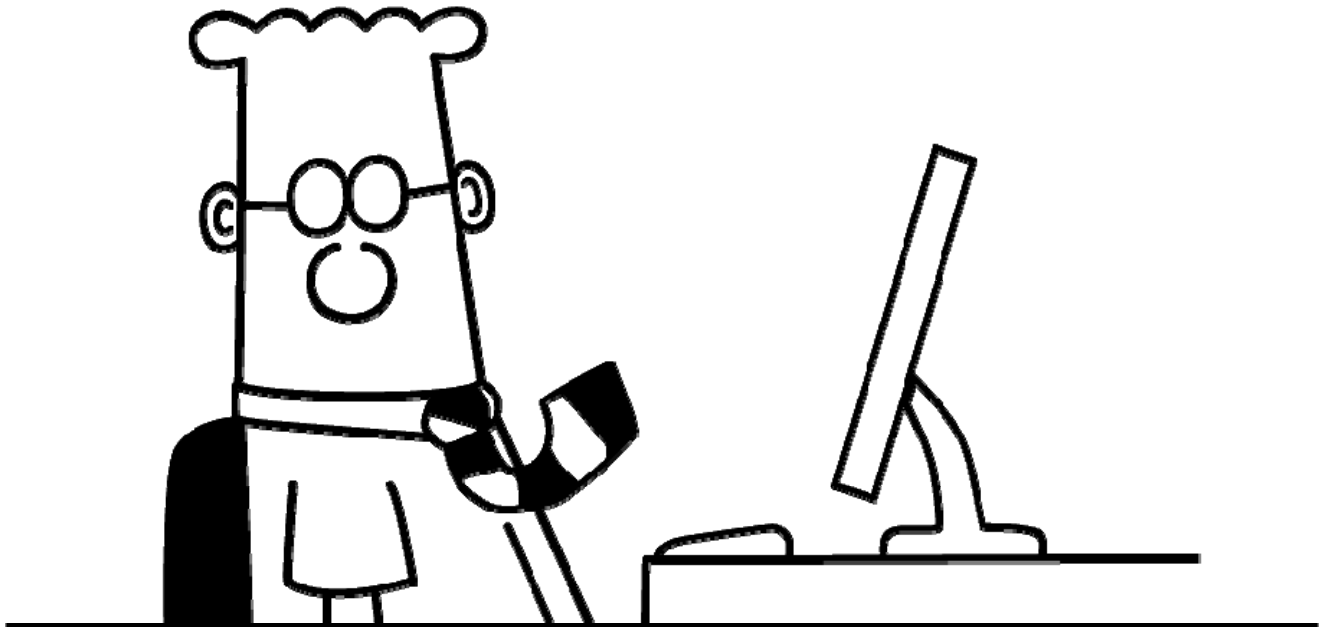
Human Values

2. **Equity**. Meet fundamental human needs – seek quality of life
    subsistence, protection, affection, understanding, participation, leisure, creation, identity and freedom
3. **Economy**. Manage resources wisely.
    Financial, human, manufactured and natural capital

Our Definition:
Sustainability is a system characteristic that reflects the system's capacity to support natural laws and human values.

The 5 simple sustainability rules:

1. Don't take stuff from the earth faster than it will go back in.
2. Don't produce stuff faster than it can be broken down.
3. Don't alter ecosystems.
4. Seek quality of life for all.
5. Manage resources wisely.

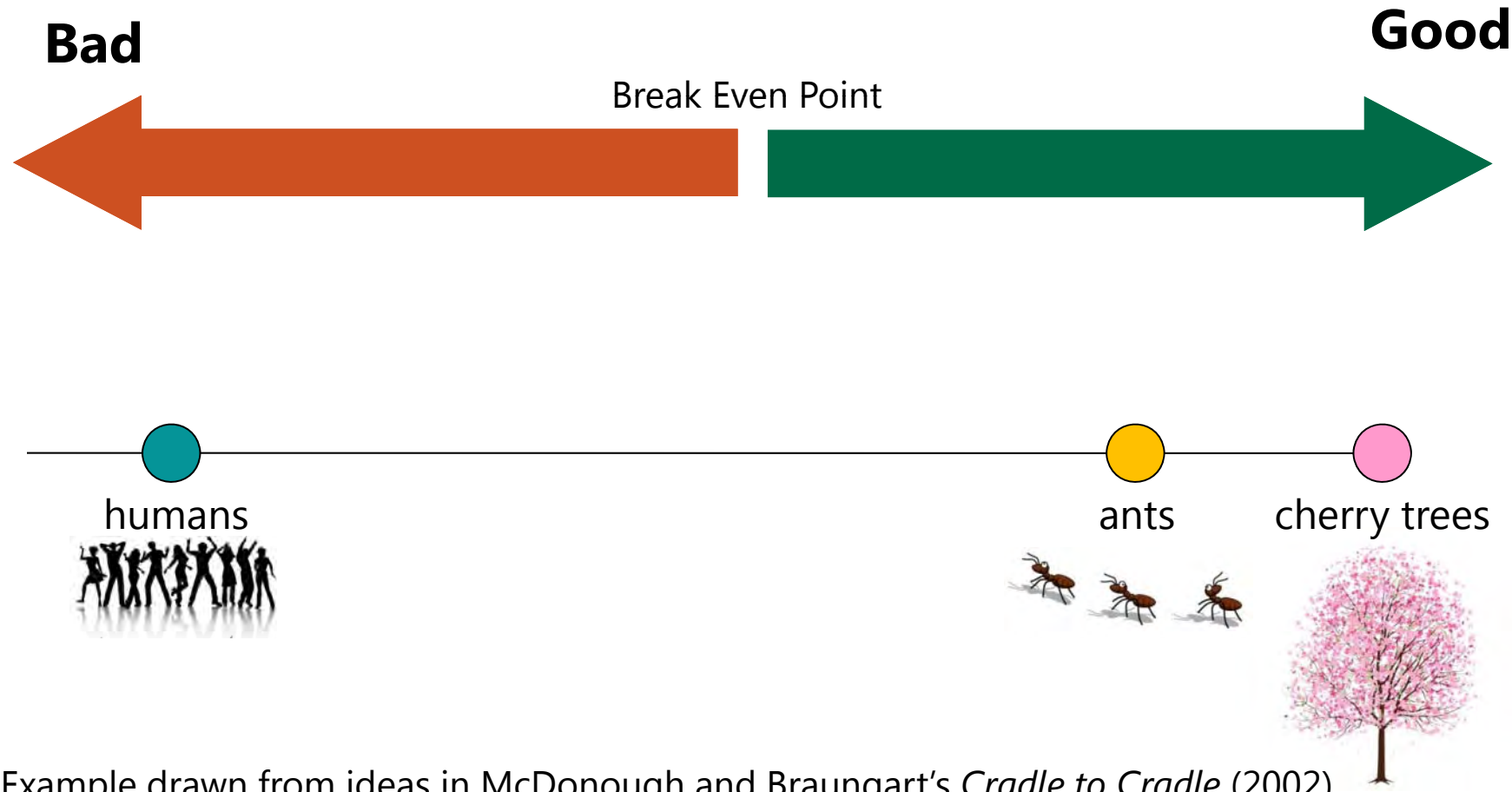


Sustainability

"I think of it as living the life you want, with as much Earth-wise efficiency as your time and budget reasonably allow."

-Scott Adams, How I (Almost) Saved the Earth, *WSJ*, 21 August 2010

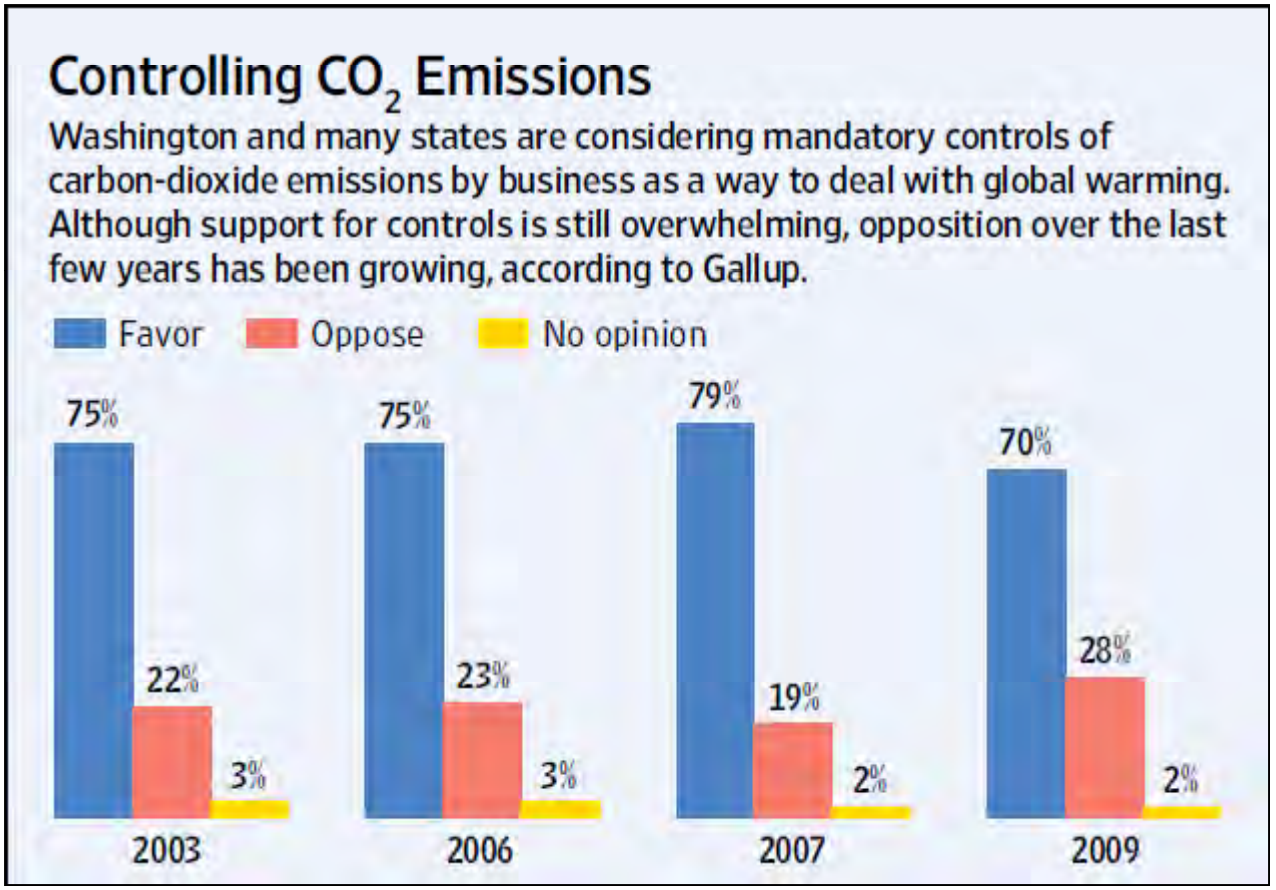
We are really talking about being “more sustainable” than we were.
We are going for “do less bad”. The goal is “do good”.



Example drawn from ideas in McDonough and Braungart’s *Cradle to Cradle* (2002)

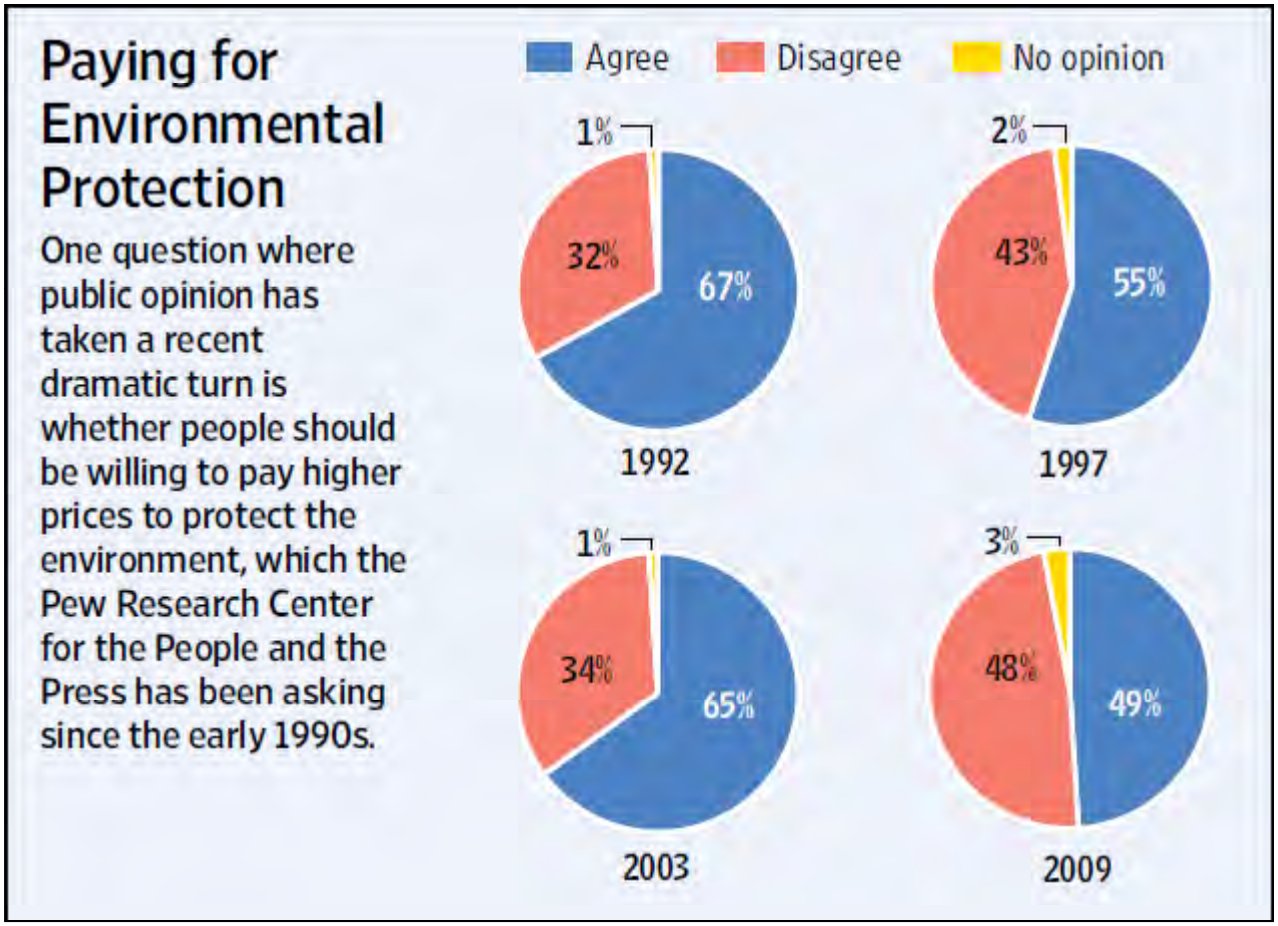
What do people think of sustainability?

We want to be more sustainable…



From: Chernova, Y. (8 Sep 2009). A Matter of Opinion: Polls show regional differences on some energy issues. *Wall Street Journal*.

…but we are not willing to pay extra.



From: Chernova, Y. (8 Sep 2009). A Matter of Opinion: Polls show regional differences on some energy issues. *Wall Street Journal*.

The to-do list:
What can we do to make roads more sustainable?

We looked at a bunch of sustainability rating systems and used them to make a to-do list of sustainable things.

- A sustainability rating system is a set of sustainability best practices with an associated common metric.
- Currently, there are about 10-20 systems that relate to roads in some way.

Status	Road Systems	Infrastructure Systems
Operational Released v1 Rated 1+ projects	Greenroads GreenLITES INVEST Infrastructure Sustainability STARS	LEED ND CEEQUAL Sustainable Sites CEEQUAL International Envision
Development Not yet v1 Early stages Internal pilots Research	BE^{2}ST-in-Highways Green Guide for Roads GreenPAVE I-LAST STEED INVEST VicRoads SUNRA (EU)	

We call this list the…

Global Framework for Roadway Sustainability Rating Systems

Human

Category	Indicator	Typical Rating System Topics
Basic Needs	Access	Modal access (ped, bike, HOV)
Health	Healthy Life	Livability Noise reduction
	Safety	Worker/jobsite safety Traffic/road user safety Infrastructure resiliency
	Culture and History	Cultural preservation/outreach Historical preservation
	Aesthetics	Scenic views Aesthetics of earthwork and structures
Personal & Social Development	Education	Job training
	Equality	Environmental justice Gender diversity
	Income Distribution	Prevailing wages
	Good Governance	Context Sensitive Solutions Anti-corruption/collusion

Economy

Category	Indicator	Typical Rating System Topics
Transition	Transition	Climate change adaptation Electric vehicles infrastructure
Economy	Financial Impact	Local economy
	Employment	Local employment
	Cost-Benefit	Cost-benefit

Veeravigrom, M.; Muench, S.T. and Kosonen, H. (2015). A Global Framework for Sustainable Roadway Rating Systems. *Transportation Research Board 94th Annual Meeting*, 11-15 January 2015, National Research Council, Washington, D.C.

Environment

Category	Indicator	Typical Rating System Topics
Nature & Environment	Clean Air	Construction Equip. Emissions Materials Transport Emissions Materials Production Emissions Traffic Emissions
	Clean Water	Clean water Stormwater runoff quality Groundwater quality
	Clean Land	Contaminated soil – brownfield Waste management/minimize
	Ecological Resources	Habitat creation Habitat preserve/conserve Wildlife conservation Stormwater runoff volume/flow Ecological connectivity Light pollution & glare Non-hazardous materials
Natural Resources	Water Resources	Water use Renewable water resources
	Consumption	Material reuse Material recycling Minimize materials Local materials Durable structures Quality control Reduce non-renew. energy use Fuel use
Climate & Energy	Renewable Energy	Encourage renewable energy
	GHG Emissions	Lifecycle assessment (LCA) Greenhouse gas emissions

Global Framework for Roadway Sustainability Rating Systems

What Roadway Rating Systems Nearly Always Address

Human

Category	Indicator	Typical Rating System Topics
Basic Needs	Access	Modal access (ped, bike, HOV)
Health	Healthy Life	Livability Noise reduction
	Safety	
	Culture and History	
	Aesthetics	
Personal & Social Development	Education	
	Equality	
	Income Distribution	
	Good Governance	

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Category	Indicator	Typical Rating System Topics
Transition	Transition	
Economy	Financial Impact	
	Employment	
	Cost-Benefit	

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Global Framework for Roadway Sustainability Rating Systems

What Roadway Rating Systems Rarely Address

Human

Category	Indicator	Typical Rating System Topics
Basic Needs	Access	
Health	Healthy Life	
	Safety	Worker/jobsite safety Infrastructure resiliency
	Culture and History	
	Aesthetics	
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	Clean Land	
	Ecological Resources	Habitat creation Non-hazardous materials
Natural Resources	Water Resources	
	Consumption	Durable structures Quality control
Climate & Energy	Renewable Energy	
	GHG Emissions	Lifecycle assessment (LCA)

To-do list summary

- There are 51 identified topics on the list
- There are 17 topics common to most rating systems
  - Things most recognize as “sustainable” things
  - e.g., reduce energy, minimize materials, recycling
- There are 19 topics not addressed very often
  - Things few recognize as “sustainable” things
  - e.g., durability (long-life pavement), training, LCCA

What can we do with pavements?

These 11 road-related rating systems have 19 common sustainability practices associated with pavement.

Item	Number of Systems
Materials Production	
Materials Production Emissions	4
Reduce energy consumption	11
Pavement Design	
Durable structures (long life)	3
Minimize materials (reduce)	10
Construction	
Construction Equipment Emissions	7
Materials Transport Emissions	5
Waste Management/minimization	11
Noise reduction (construction noise)	8
Fuel use	7
Worker/jobsite safety	3
Job training	4
Local employment	4
Quality control	3

Item	Number of Systems
Use	
Stormwater runoff quality	8
Stormwater runoff volume/flow	8
LCCA and/or cost-benefit	4
Noise reduction	9
Maintenance & Rehabilitation	
(included in other phases)	
End-of-Life	
Material recycling	10
Material reuse (existing pavement)	10

11 road-related rating systems reviewed

CEEQUAL, Envision, GreenLITES, Greenroads, INVEST VicRoads, INVEST, IS, LEED-ND, I-LAST, STARS, STEED

Analysis from dissertation work by
M. Veeravigrom, University of Washington, 2015

Which sustainability practices save money?

All of these items save money.

Item	Number of Systems
Materials Production	
Materials Production Emissions	4
Reduce energy consumption	11
Pavement Design	
Durable structures (long life)	3
Minimize materials (reduce)	10
Construction	
Construction Equipment Emissions	7
Materials Transport Emissions	5
Waste Management/minimization	11
Noise reduction (construction noise)	8
Fuel use	7
Worker/jobsite safety	3
Job training	4
Local employment	4
Quality control	3

Item	Number of Systems
Use	
Stormwater runoff quality	8
Stormwater runoff volume/flow	8
LCCA and/or cost-benefit	4
Noise reduction	9
Maintenance & Rehabilitation	
(included in other phases)	
End-of-Life	
Material recycling	10
Material reuse (existing pavement)	10

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Many of these items have been emphasized by the pavement industry for years.

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Materials Production	
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Waste Management/minimization	11
Noise reduction (construction noise)	8
Fuel use	7
Worker/jobsite safety	3
Job training	4
Local employment	4
Quality control	3

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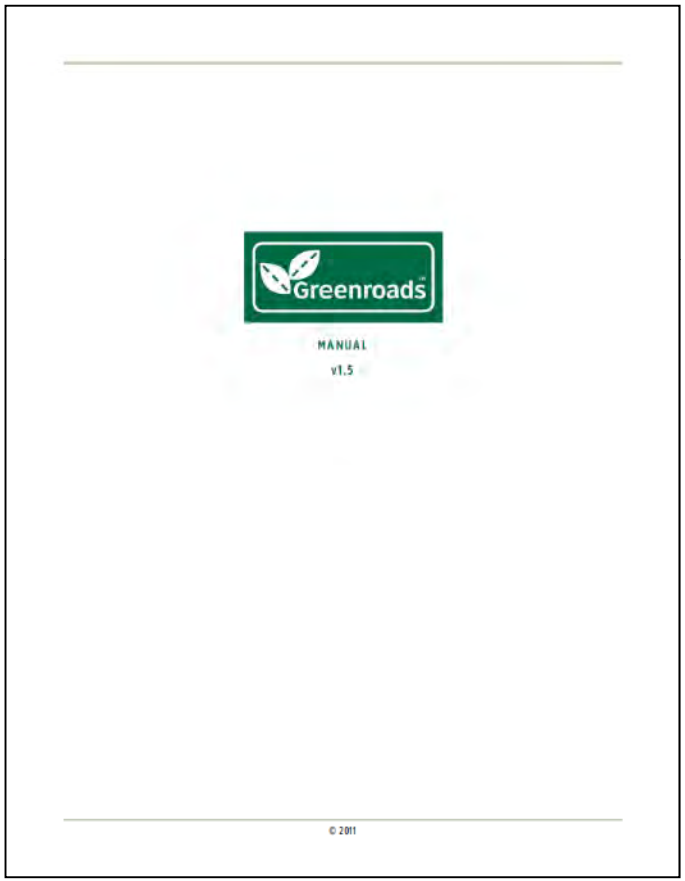
What pavement sustainability practices are typically done?

Example: Credits Achieved in Greenroads



Some results from a survey of 105 roadway projects across the U.S. that assessed the state-of-the-practice in roadway sustainability.

Reference

Anderson, J. and Muench, S.T (2013). Sustainability Trends Measured by Greenroads Rating System. *Transportation Research Record 2357*. TRB, National Research Council, Washington, D.C., pp. 24-32.

Achievement Summary

- Generally, projects advertised as “green” if they have:
  - LID drainage (e.g., rain gardens, pervious pavement, etc.)
  - Bike and pedestrian facilities
- Fundamental pavement sustainability ideas are not done at any greater rate for green projects vs. regular projects
  - Long-lasting pavement, quality construction, reuse and recycling
  - They are not recognized as sustainable best practices…but they are
- Rate of accomplishment should be higher
  - LCCA and long-life pavement infrequent (only done 25% of the time)
  - Construction activities generally do not contribute (12% average)
- Contractors and materials suppliers cannot participate
  - Excluded by the use of standard specifications that limit their options

GREENROADS ACHIEVEMENT

What we know from analyzing Greenroads projects

A brief review of Greenroads

U.S. 97: Lava Butte – S. Century Dr.

Oregon Department of Transportation

What is Greenroads?

An independent 3rd party sustainability rating system for transportation design and construction. It awards points for more sustainable practices and can help quantify and communicate the sustainable attributes of a transport project.

It is like LEED® for roads.

Camp Garcia Entrance Road, Vieques Island NWR, PR

U.S. Fish and Wildlife Service, FHWA Federal Lands Highway

What can Greenroads do for you?

- ✓ Define sustainable features on your project
- ✓ Benchmark and manage sustainability
- ✓ Communicate sustainability efforts to key stakeholders
- ✓ Stimulate the market for green transportation

It helps improve transportation project sustainability.

Photos from Concrete Works of Colorado, Inc. (prime contractor)

What does Greenroads Address?

Greenroads is a project-oriented system focusing on design and construction, which is a conscious scope choice. Planning/operations/maintenance are mega-important; this tool is meant to address the design/construction piece.

Greenroads addresses design and construction.

Does Greenroads work for my project?

Greenroads works for all roadway projects and more. It is applicable to a wide range of project sizes and scopes. It works for huge billion dollar mega-projects and for routine pavement overlay projects and everything in between.

Greenroads works for all types and sizes of surface transportation projects.

Greenroads v1.5
Now deprecated, but used for data analysis

Greenroads Version 1.5: Overview

Category	Description	Points
Project Requirements (11)	Minimum requirements for a Greenroad	Req.
Voluntary Credits (37)		
Environment & Water	Stormwater, habitat, vegetation	21
Access & Equity	Modal access, culture, aesthetics, safety	30
Construction Activities	Construction equipment, processes, quality	14
Materials & Resources	Material extraction, processing, transport	23
Pavement Technology	Pavement design, material use, function	20
	Total Voluntary Credit Points	108
Custom Credits	Write your own credit for approval	10
	Total Points	**118**

Project Requirements

Requirement		Description
PR-1	Environmental Review Process	Complete and environmental review process
PR-2	Life Cycle Cost Analysis (LCCA)	Perform LCCA for pavement section
PR-3	Life Cycle Inventory (LCI)	Perform LCI of pavement section with computer tool
PR-4	Quality Control Plan	Have a formal contractor quality control plan
PR-5	Noise Mitigation Plan	Have a construction noise mitigation plan
PR-6	Waste Management Plan	Have a formal plan to divert C&D waste from landfill
PR-7	Pollution Prevention Plan	Have a TESC/SWPPP
PR-8	Low-Impact Development (LID)	Feasibility study for LID stormwater management
PR-9	Pavement Mgmt. System	Have a pavement management system
PR-10	Site Maintenance Plan	Have a site maintenance plan
PR-11	Educational Outreach	Publicize sustainability information for project

Environment & Water

Voluntary Credit		Points	Description
EW-1	Environmental Mgmt. Sys.	2	ISO 14001 or eq. cert. for general contractor
EW-2	Runoff Flow Control	3	Capture stormwater/reduce runoff quantity
EW-3	Runoff Quality	3	Treat stormwater to a higher level of quality
EW-4	Stormwater Cost Analysis	1	Conduct an LCCA for stormwater BMP/LID
EW-5	Site Vegetation	3	Use native low/no water vegetation
EW-6	Habitat Restoration	3	Create new habitat beyond what is required
EW-7	Ecological Connectivity	3	Connect habitat across roadways
EW-8	Light Pollution	3	Discourage light pollution
Total		**21**	

Access & Equity

Voluntary Credit		Points	Description
AE-1	Safety Audit	2	Perform roadway safety audit
AE-2	Intelligent Transp. Sys. (ITS)	5	Implement ITS solutions
AE-3	Context Sensitive Planning	5	Plan for context sensitive solutions
AE-4	Traffic Emissions Reduction	5	Reduce VMT or SOV travelers
AE-5	Pedestrian Access	2	Provide/improve pedestrian accessibility
AE-6	Bicycle Access	2	Provide/improve bicycle accessibility
AE-7	Transit/HOV Access	5	Provide/improve transit/HOV accessibility
AE-8	Scenic Views	2	Provide views of scenery or vistas
AE-9	Cultural Outreach	2	Promote art/culture/community values
Total		**30**	

Construction Activities

Voluntary Credit		Points	Description
CA-1	Quality Management System	2	ISO 9001 cert. or eq. for general contractor
CA-2	Environmental Training	1	Provide environmental training
CA-3	Site Recycling Plan	1	On-site recycling and trash collection
CA-4	Fossil Fuel Use Reduction	2	Use alt. fuels in construction equipment
CA-5	Eqpt. Emission Reduction	2	Meet EPA Tier 4 stds. for nonroad equipment
CA-6	Paver Emission Reduction	1	Use pavers that meet NIOSH requirements
CA-7	Water Use Tracking	2	Develop data on water use in construction
CA-8	Contractor Warranty	3	Warranty on the constructed pavement
Total		**14**	

Materials & Resources

Voluntary Credit		Points	Description
MR-1	Life Cycle Assessment (LCA)	2	Conduct a detailed LCA of the entire project
MR-2	Pavement Reuse	5	Reuse existing pavement sections
MR-3	Earthwork Balance	1	Balance cut/fill quantities
MR-4	Recycled Materials	5	Use recycled materials for new pavement
MR-5	Regional Materials	5	Use regional materials
MR-6	Energy Efficiency	5	Improve energy eff. of operational systems
Total		**23**	

Pavement Technologies

Voluntary Credit		Points	Description
PT-1	Long-Life Pavement	5	Design pavements for long-life
PT-2	Permeable Pavement	3	Use permeable pavement as a LID technique
PT-3	Warm Mix Asphalt (WMA)	3	Use WMA in place of HMA
PT-4	Cool Pavement	5	Contribute less to urban heat island effect
PT-5	Quiet Pavement	3	Use a quiet pavement to reduce noise
PT-6	Pvmt. Performance Tracking	1	Relate construction to performance data
Total		**20**	

Total: 49% of points are pavement-related

A moment on Greenroads v2

Side by Side – Rating System Elements

Greenroads v1.5

Category Name	*Credits*	*Points*
Project Requirements (PR)	11	0
Environment & Water (EW)	8	21
Access & Equity (AE)	9	30
Construction Activities (CA)	8	14
Materials & Resources (MR)	6	23
Pavement Technologies (PT)	6	20
Custom Credits	9	10
Total Main Categories	48	**108**
Total w/ CE	57	**118**

Certification Award Levels	**PRs**	**Points**
Bronze	All 11	**32**
Silver	All 11	**43**
Gold	All 11	**54**
Evergreen	All 11	**64**

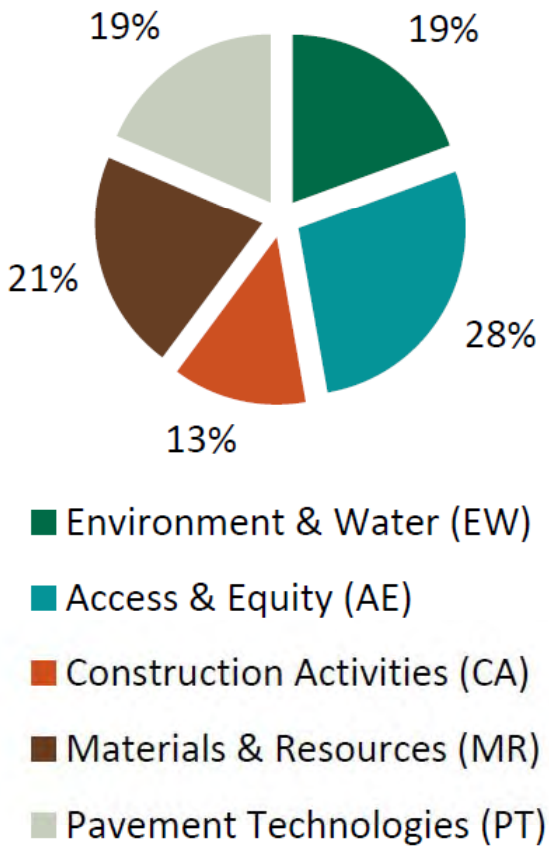
Greenroads v2

Category Name	*Credits*	*Points*
Project Requirements (PR)	12	0
Environment & Water (EW)	10	30
Construction Activities (CA)	11	20
Materials & Design (MD)	6	24
Utilities & Controls (UC)	8	20
Access & Livability (AL)	10	21
Creativity & Effort (CE)	4	15
Total Main Categories	57	**115**
Total w/ CE	61	**130**

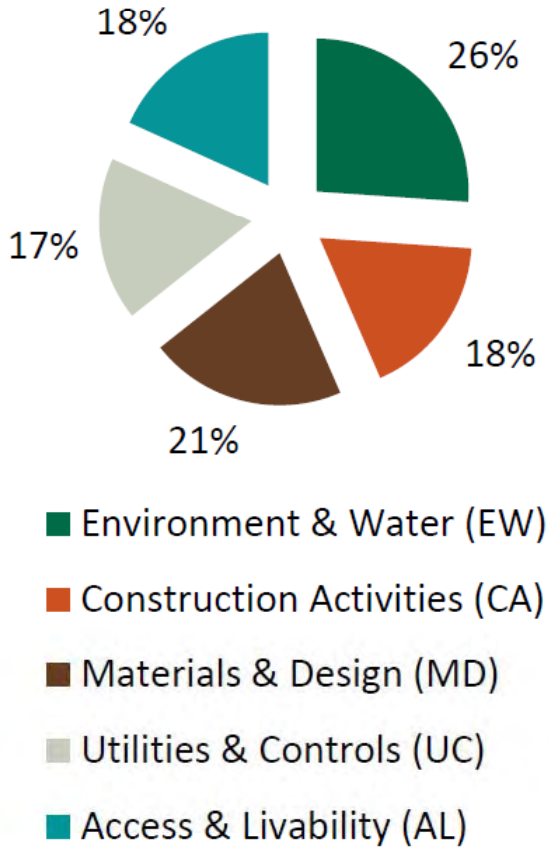
Certification Award Levels	**PRs**	**Points**
Bronze	All 12	**40**
Silver	All 12	**50**
Gold	All 12	**60**
Evergreen	All 12	**80**

Side by Side – Category Weights

Greenroads v1.5 Points



Greenroads v2 Points

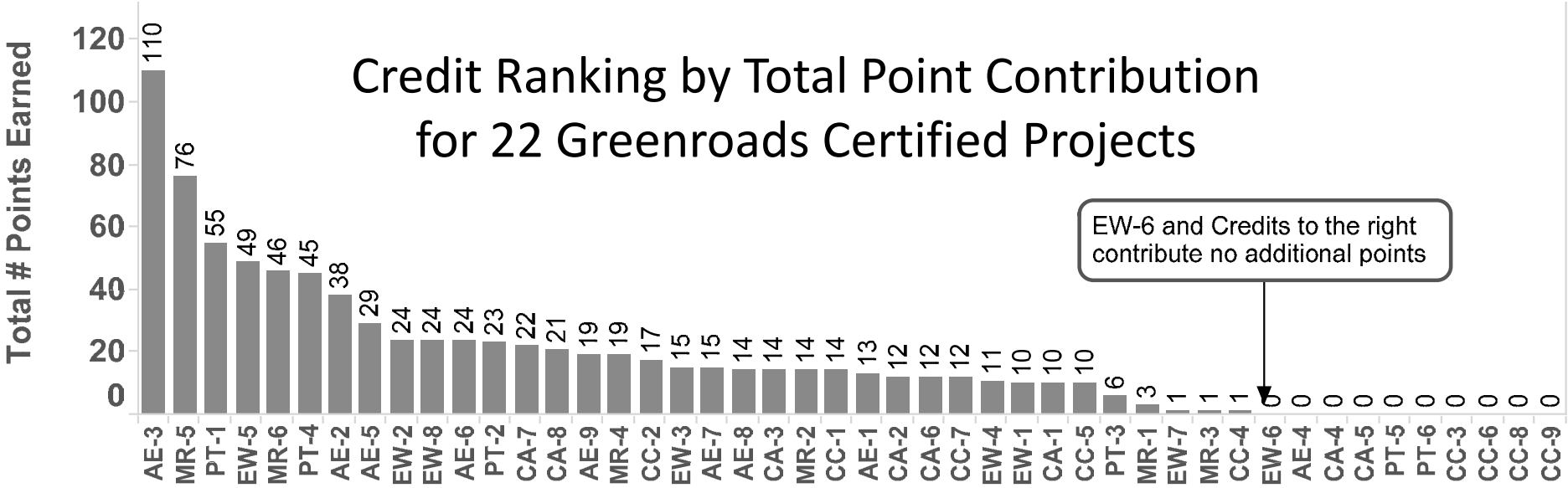


Analysis of the first 22 projects certified by Greenroads v1.5

Project List

1	Meador Kansas Ellis Trail	WA
2	Southeast Pioneer Way Reconstruction	WA
3	South Division Street Promenade	WA
4	Cheney Stadium Sustainable Stormwater Project	WA
5	Alaska Street Improvements	WA
6	Asotin Court	WA
7	2010 STP Monterey Road Rehabilitation	CA
8	Bagby Street Reconstruction	TX
9	Wapato Lake Drive	WA
10	14th Street: Market to Colfax	CO
11	Transportation Gateway: S 216th Street	WA
12	*SFPR: Terminus in Delta to HWY-99 Interchange	BC
13	*SFPR: HWY-99 Interchange to HWY-91 Connector	BC
14	*SFPR: HWY-91 Connector to Delta/Surrey Border	BC
15	*SFPR: Delta/Surrey Border to Port Mann Bridge	BC
16	*SFPR: Port Mann Bridge to Terminus in Surrey	BC
17	Bristol Street Widening Phase II	CA
18	*Presidio Parkway: Ruckman Bridge Replacement	CA
19	*Presidio Parkway: Southbound High Viaduct	CA
20	*Presidio Parkway: Southbound Battery Tunnel	CA
21	NE 120th Street Extension	WA
22	SR 522 Bothell Crossroads	WA

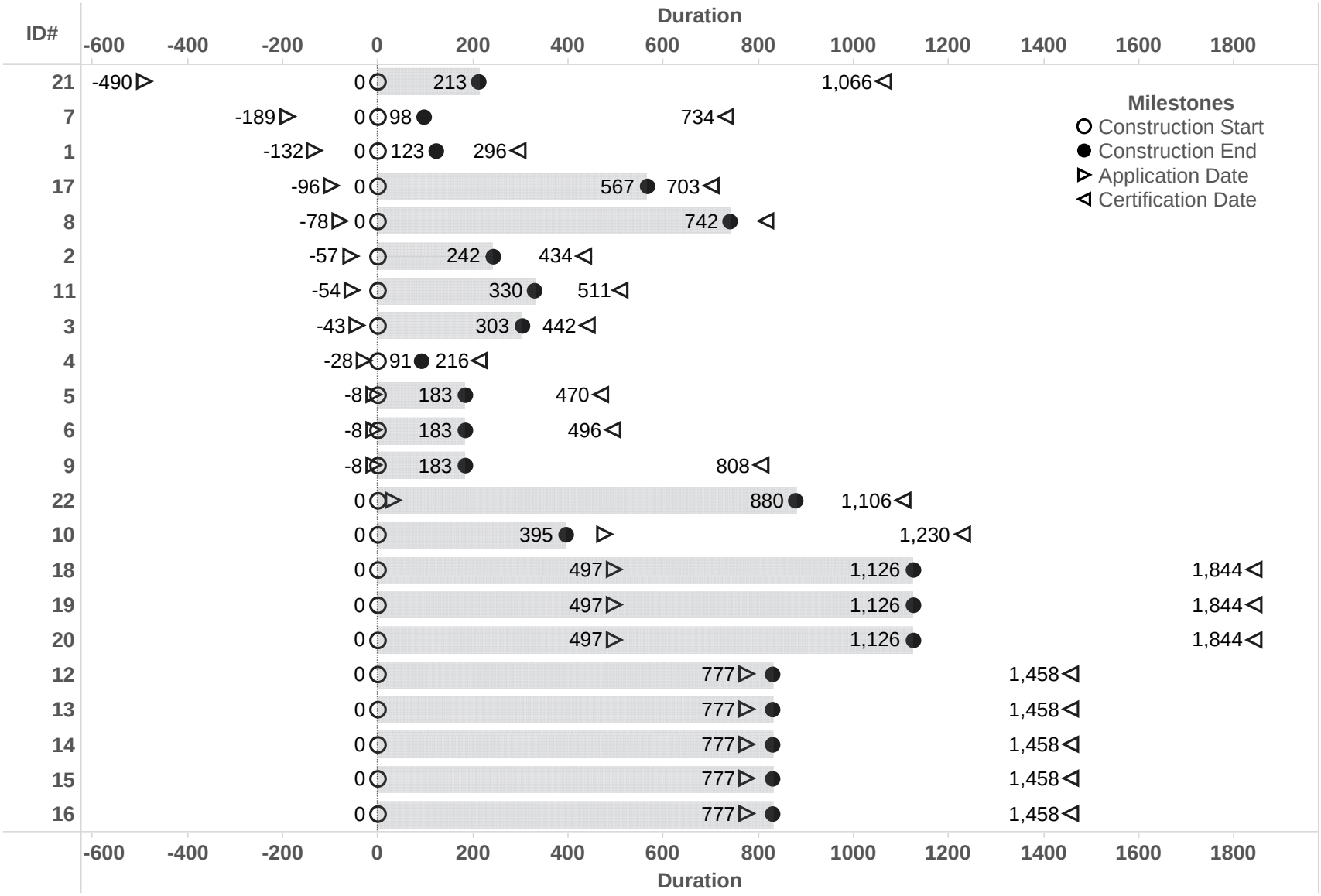
Projects rely heavily on a few common credits. Some credits are never attempted.



ID	Name	% of total points
AE-3	Context Sensitive Solutions	13%
MR-5	Regional Materials	9%
PT-1	Long-Life Pavement	7%
EW-5	Site Vegetation	6%
MR-6	Energy Efficiency	6%
PT-4	Cool Pavement	5%
AE-2	Intelligent Transportation Systems	5%

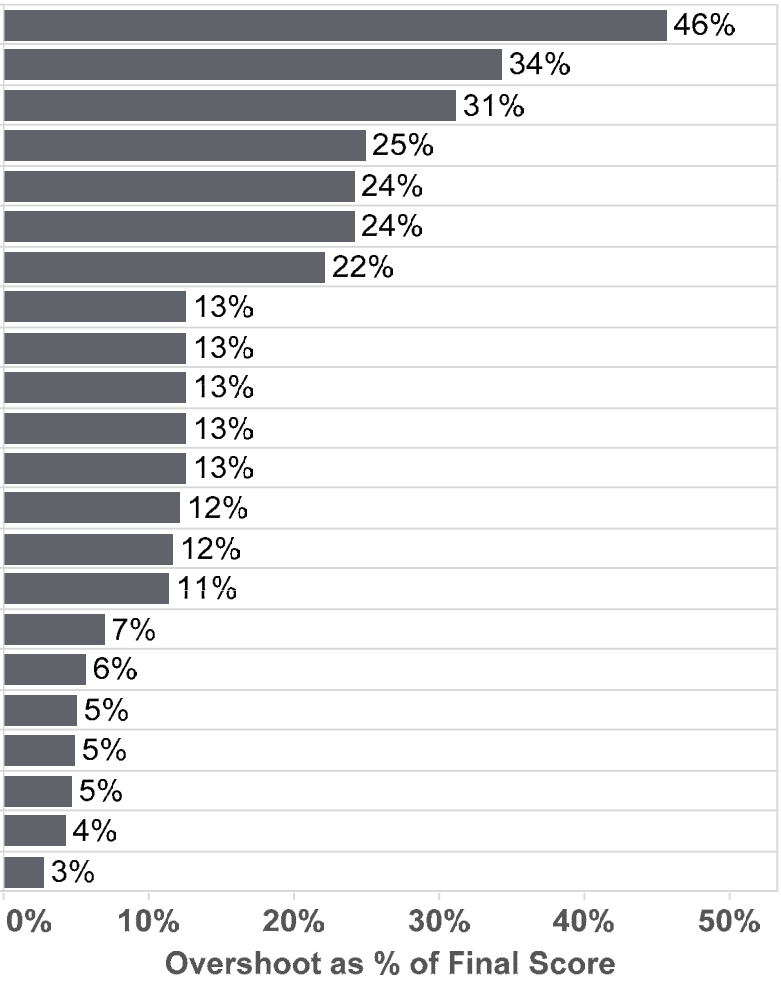
51% of points

Projects often do not register until late in the design or early in the construction phase.



On average project teams are 15% too optimistic about their Greenroads score.

ID#	# Credits Achieved	Final Score	Final Rating	Expected	Expected Rating	Overshoot as % of Final Score
17	12	35	Bronze	51	Silver	46%
10	13	32	Bronze	43	Silver	34%
8	17	45	Silver	59	Gold	31%
1	16	44	Silver	55	Gold	25%
19	14	33	Bronze	41	Bronze	24%
18	14	33	Bronze	41	Bronze	24%
9	17	45	Silver	55	Gold	22%
16	15	32	Bronze	36	Bronze	13%
15	15	32	Bronze	36	Bronze	13%
14	15	32	Bronze	36	Bronze	13%
13	15	32	Bronze	36	Bronze	13%
12	15	32	Bronze	36	Bronze	13%
3	11	33	Bronze	37	Bronze	12%
4	15	43	Silver	48	Silver	12%
5	17	44	Silver	49	Silver	11%
2	17	43	Silver	46	Silver	7%
7	14	35	Bronze	37	Bronze	6%
20	16	39	Bronze	41	Bronze	5%
11	18	40	Bronze	42	Bronze	5%
22	18	43	Silver	45	Silver	5%
21	17	46	Silver	48	Silver	4%
6	15	36	Bronze	37	Bronze	3%



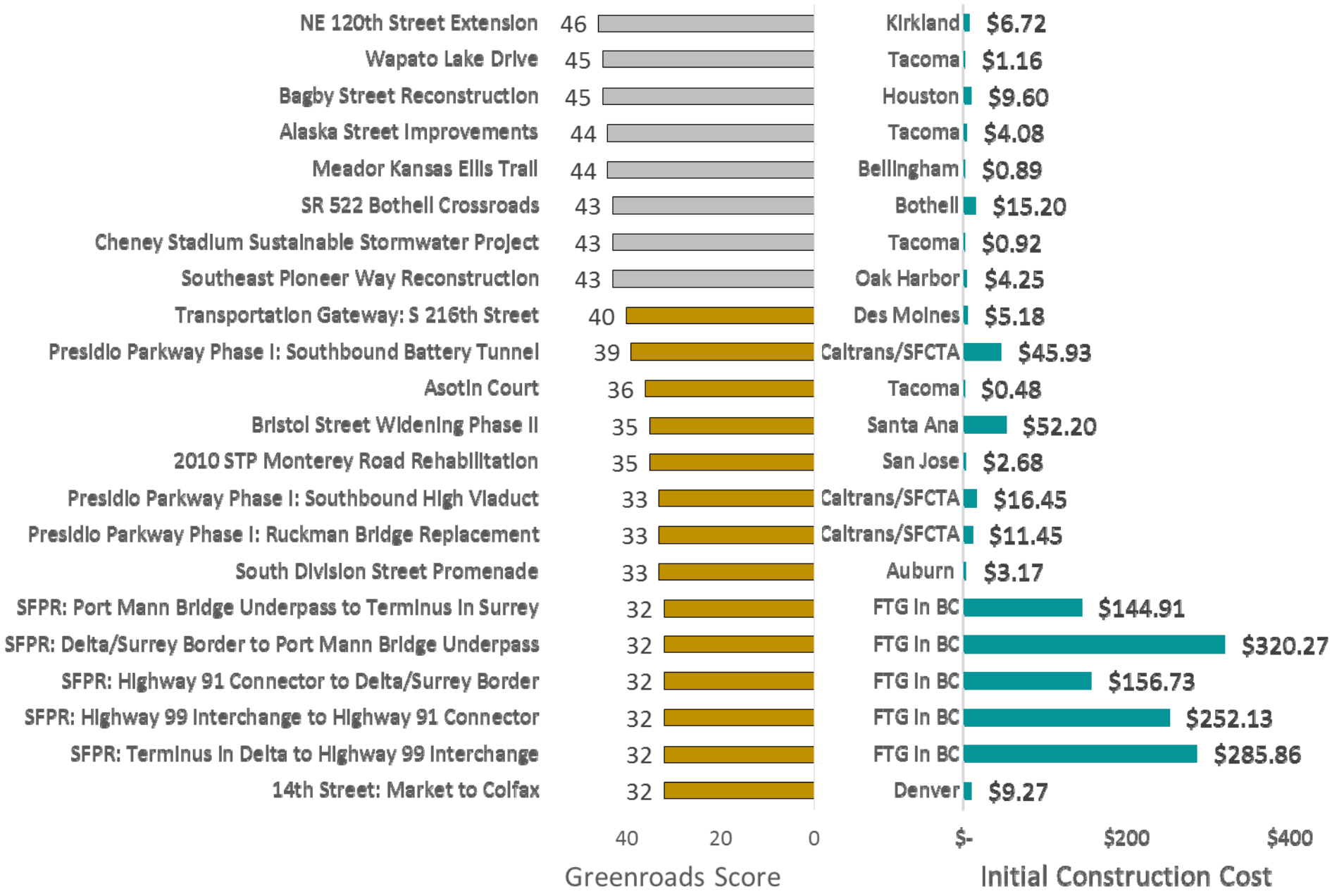
From 20-53% (average 41%) of the point totals come from pavement-related credits.

Point Total of Greenroads Certified Projects Attributable to Pavements

Project	Total Score	Pavement Score	Pavement Fraction
1	44	23	52%
2	43	19	44%
3	33	8	24%
4	43	17	40%
5	44	16	36%
6	36	18	50%
7	35	15	43%
8	45	22	49%
9	45	18	40%
10	32	17	53%
11	40	8	20%

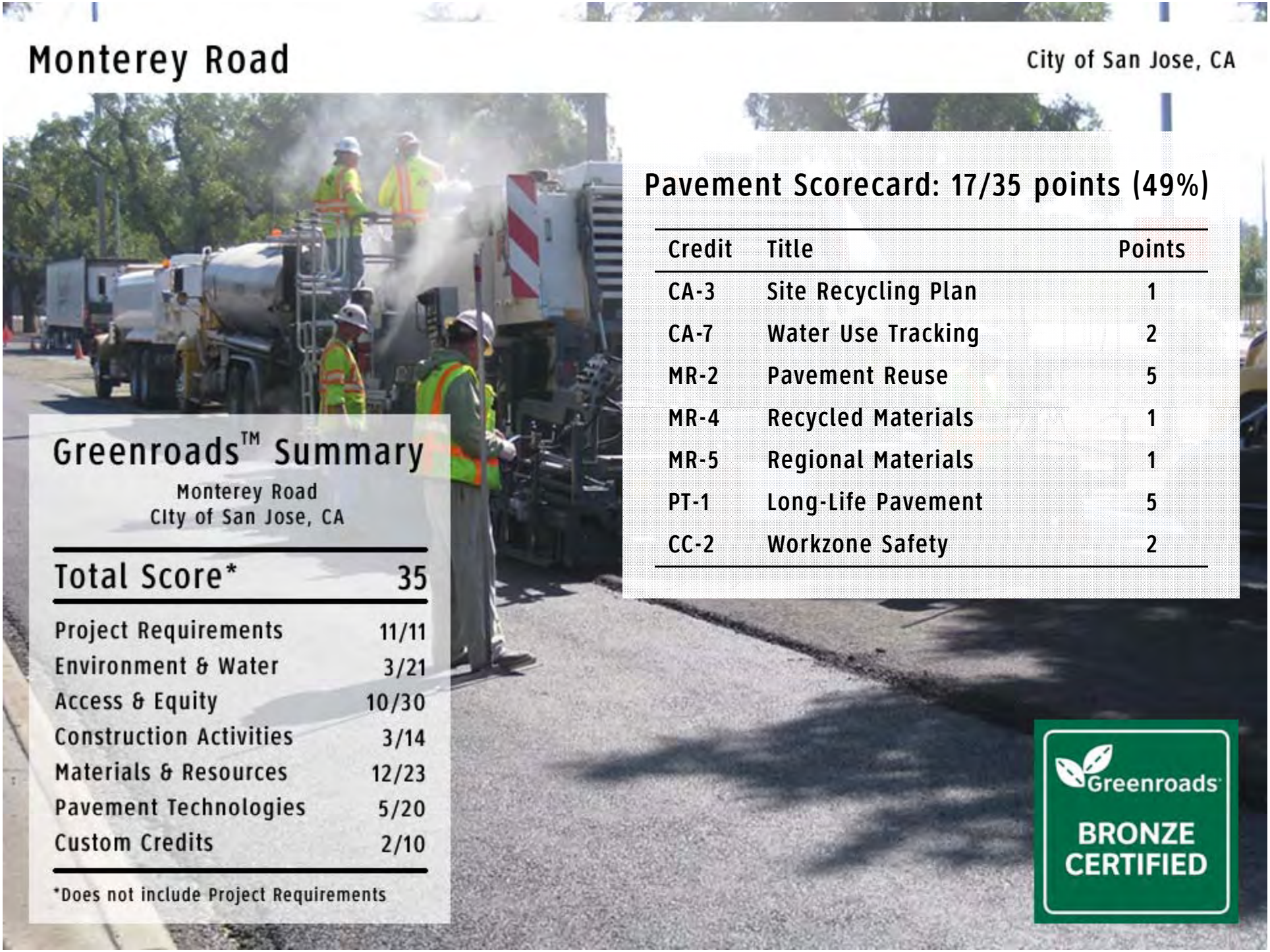
Project	Total Score	Pavement Score	Pavement Fraction
12	32	14	44%
13	32	14	44%
14	32	14	44%
15	32	14	44%
16	32	14	44%
17	35	10	29%
18	33	12	36%
19	33	12	36%
20	39	18	46%
21	46	23	50%
22	43	16	37%

Certified Greenroads Projects: Score, Owner, Construction Cost



Monterey Road

City of San Jose, CA



Greenroads™ Summary

Monterey Road
City of San Jose, CA

Total Score*	**35**
Project Requirements	11/11
Environment & Water	3/21
Access & Equity	10/30
Construction Activities	3/14
Materials & Resources	12/23
Pavement Technologies	5/20
Custom Credits	2/10

*Does not include Project Requirements

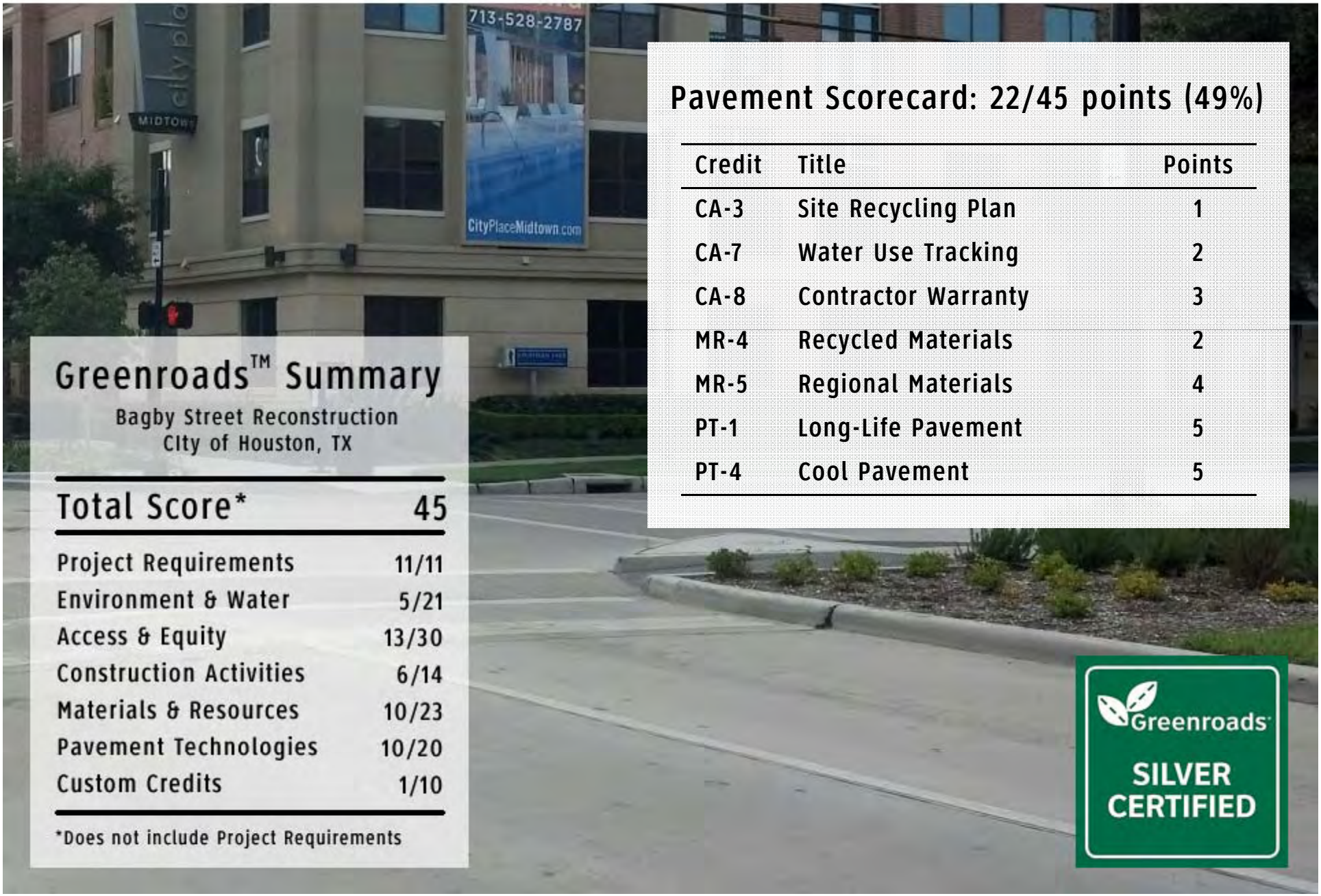
Pavement Scorecard: 17/35 points (49%)

Credit	Title	Points
CA-3	Site Recycling Plan	1
CA-7	Water Use Tracking	2
MR-2	Pavement Reuse	5
MR-4	Recycled Materials	1
MR-5	Regional Materials	1
PT-1	Long-Life Pavement	5
CC-2	Workzone Safety	2

Greenroads
BRONZE CERTIFIED

Bagby Street Reconstruction

City of Houston, TX



Greenroads™ Summary

Bagby Street Reconstruction
City of Houston, TX

Total Score*	**45**
Project Requirements	11/11
Environment & Water	5/21
Access & Equity	13/30
Construction Activities	6/14
Materials & Resources	10/23
Pavement Technologies	10/20
Custom Credits	1/10

*Does not include Project Requirements

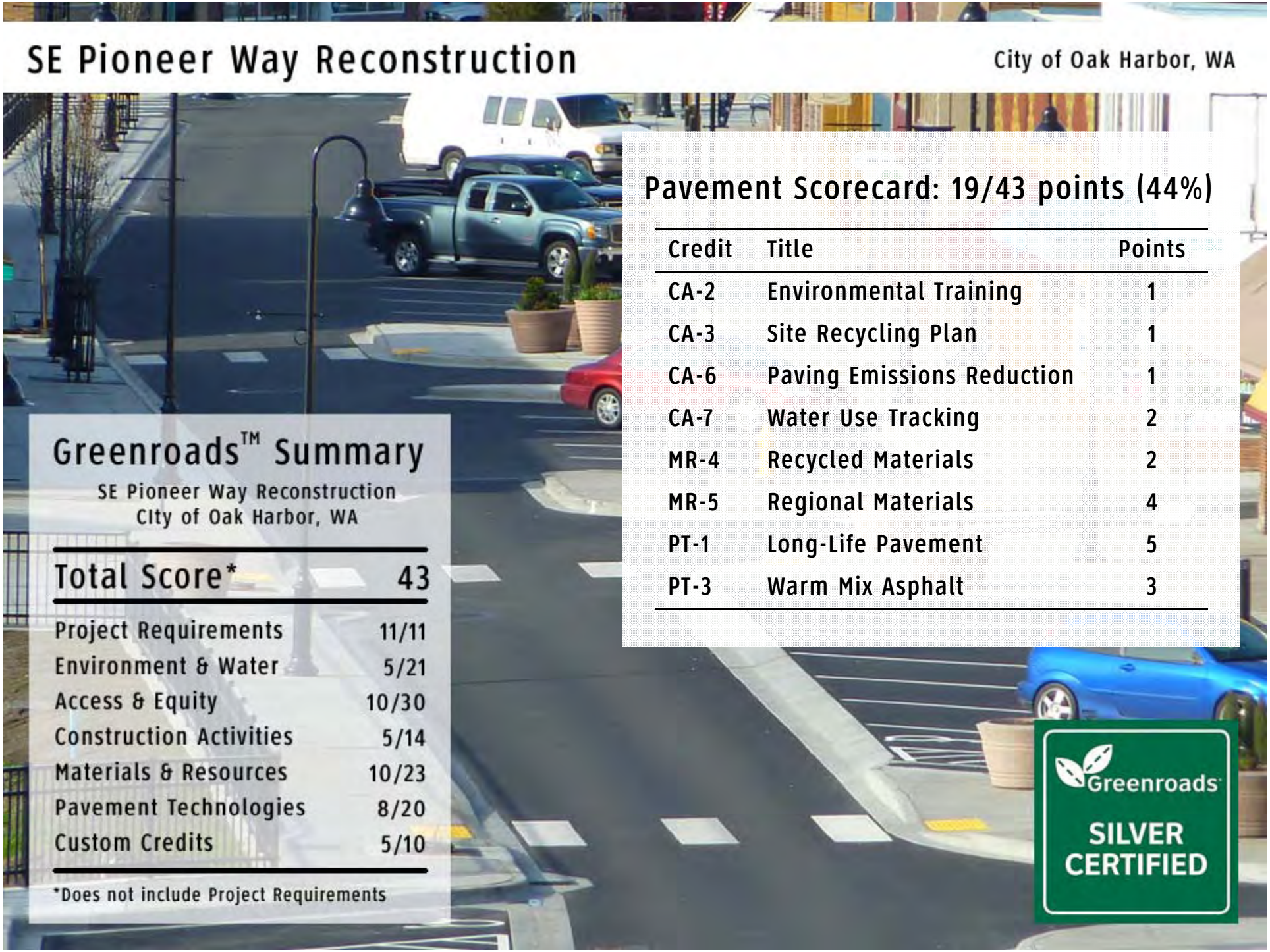
Pavement Scorecard: 22/45 points (49%)

Credit	Title	Points
CA-3	Site Recycling Plan	1
CA-7	Water Use Tracking	2
CA-8	Contractor Warranty	3
MR-4	Recycled Materials	2
MR-5	Regional Materials	4
PT-1	Long-Life Pavement	5
PT-4	Cool Pavement	5

Greenroads
SILVER CERTIFIED

SE Pioneer Way Reconstruction

City of Oak Harbor, WA



Greenroads™ Summary

SE Pioneer Way Reconstruction
City of Oak Harbor, WA

Total Score*	**43**
Project Requirements	11/11
Environment & Water	5/21
Access & Equity	10/30
Construction Activities	5/14
Materials & Resources	10/23
Pavement Technologies	8/20
Custom Credits	5/10

*Does not include Project Requirements

Pavement Scorecard: 19/43 points (44%)

Credit	Title	Points
CA-2	Environmental Training	1
CA-3	Site Recycling Plan	1
CA-6	Paving Emissions Reduction	1
CA-7	Water Use Tracking	2
MR-4	Recycled Materials	2
MR-5	Regional Materials	4
PT-1	Long-Life Pavement	5
PT-3	Warm Mix Asphalt	3

Greenroads
SILVER CERTIFIED

Conclusions from Greenroads Analysis

- Projects tend to rely on a few common credits
  - 7 credits comprise 51% of all points earned to date
  - 3 credits are pavement-related
- Project sustainability potential is not yet reached
  - Tend to register late in the design process at best
  - Harder to introduce new ideas to the project at low cost
  - Sustainability rating is not an award program
- Self-evaluation scores are too optimistic
  - 3rd party verification has value
- About 40% of Greenroads points from pavements
  - Pavements contribute significantly to sustainability

Conclusions from Greenroads Analysis

- Smaller owners are very successful
  - 7 of 8 Silver certified projects are < $10 million
  - Smaller owners are more agile
  - Smaller cities care what is built in town
    - It's easier to hear your local taxpayers
    - It matters more when its in your town
  - Highways are less directly tied to the local community
- Smaller owners tend to save more money
  - San Jose, CA saves 23% ($800,000) using CIR
  - Tacoma, WA saves 80% on stormwater infrastructure
  - Kirkland, WA saves $4,000 using WMA

Takeaways

Takeaways

- People don't want to pay more for sustainability
  - That's okay: sustainability costs less
- For roads "Green" usually means LID, and multimodal
  - Beyond recycling, pavement sustainability has not caught on
  - Contractors and materials suppliers are not allowed to participate
- Pavements contribute significantly to sustainability
  - Much has been emphasized by the industry for years
- Smaller owners are very successful in Greenroads
  - Smaller owners are more agile
  - Smaller cities care what is built in town
  - Smaller owners seem to save more money

Takeaways

What you do on a daily basis is very much consistent with the idea of sustainability.

Not everyone knows that yet, but these contributions are recognized by the right sustainability rating systems.

Despite the relative lack of money, local agencies have led the way in sustainability and will continue to do so.


Casale T&A
Ricevimenti