

Value-Based Pavement Prioritization Tool



11th National Conference on Transportation Asset Management
Tim Skeel
July 11, 2016

Acknowledgments



Pavement Group

- Sue Byers
- Ben Hansen
-  Nataliya Dernbach



Asset Management

- Tim Skeel
- Terry Martin
- Cathi Greenwood
- Steve Barham



GIS Group

- Dana Trethewy
- Jim Wiggins
- Suzy Brunzell
- Daniel Rockhold
- Michael Davis

- Others



Craig Moore



King County GIS



Monica Schmitz

Presentation overview

- Background
- Data process
- Additional benefits
- Caveats
- “Beta-test” Findings
- Next steps

Background – Impact of Paving Budget

Pavement Condition	Service Level	Street Type	Outcomes by Budget
Good	Service Level 1 (High Share of Total Budget)	High Traffic Volume	\$\$\$ – More Lane-miles and Traveler-miles \$ – Fewer Lane-miles and Traveler-miles
Satisfactory			
Fair			
Poor	Service Level 2 (Moderate Share of Total Budget)	Medium Traffic Volume	\$\$\$ – Fewer Lane-miles and Traveler-miles \$ – More Lane-miles and Traveler-miles
Very Poor	Service Level 3 (Low Share of Total Budget)	Low Traffic Volume	\$\$\$ – Fewer Lane-miles and Traveler-miles \$ – More Lane-miles and Traveler-miles
Serious/Failed			

Background – Prioritizing Paving Budget

- Benefit-cost analysis to prioritize paving treatment
- As pavement deteriorates, when does the value to users (benefit) exceed the cost of treatment (cost)?

When is it worth
turning THIS...

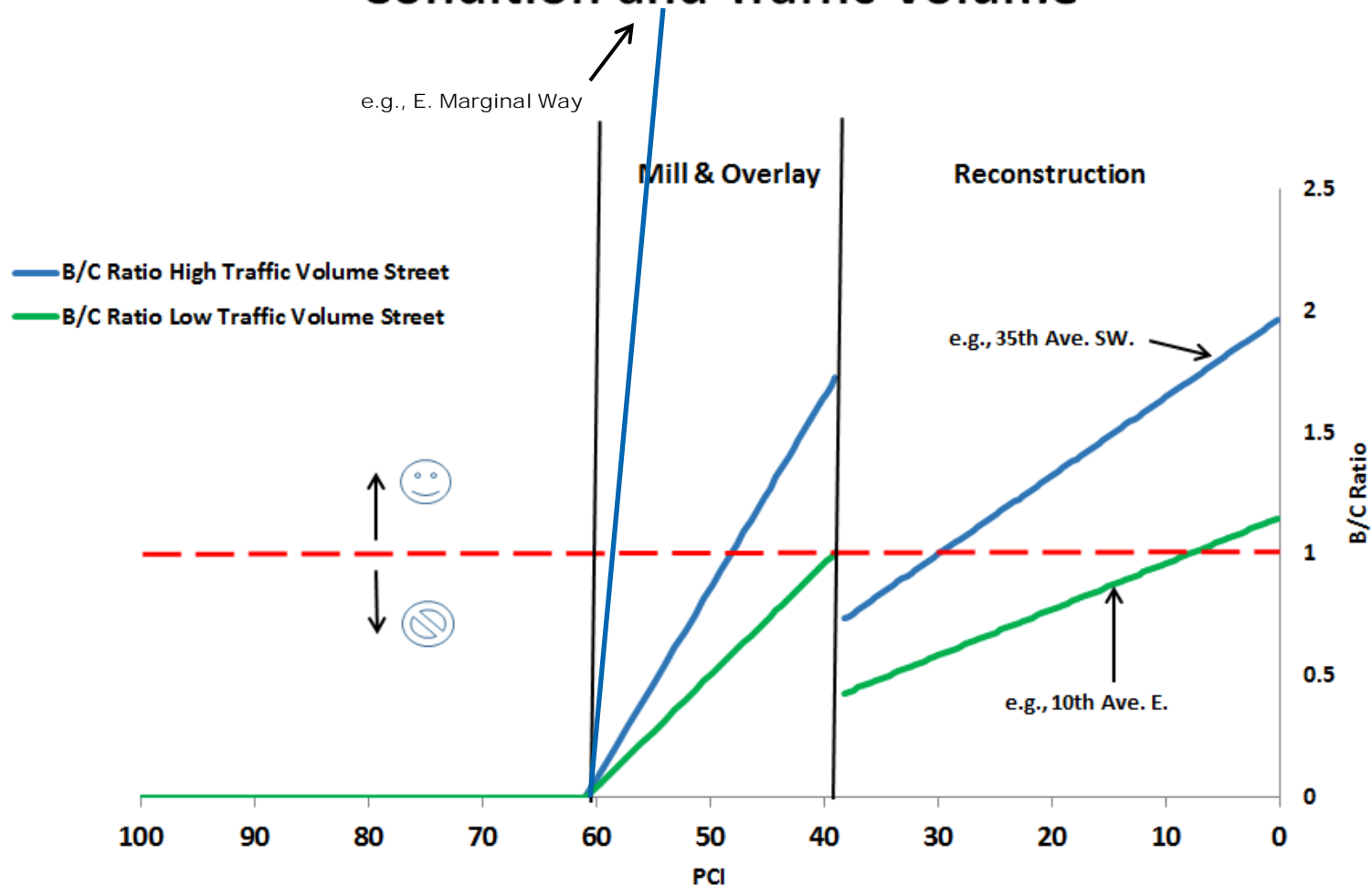


...into THIS?

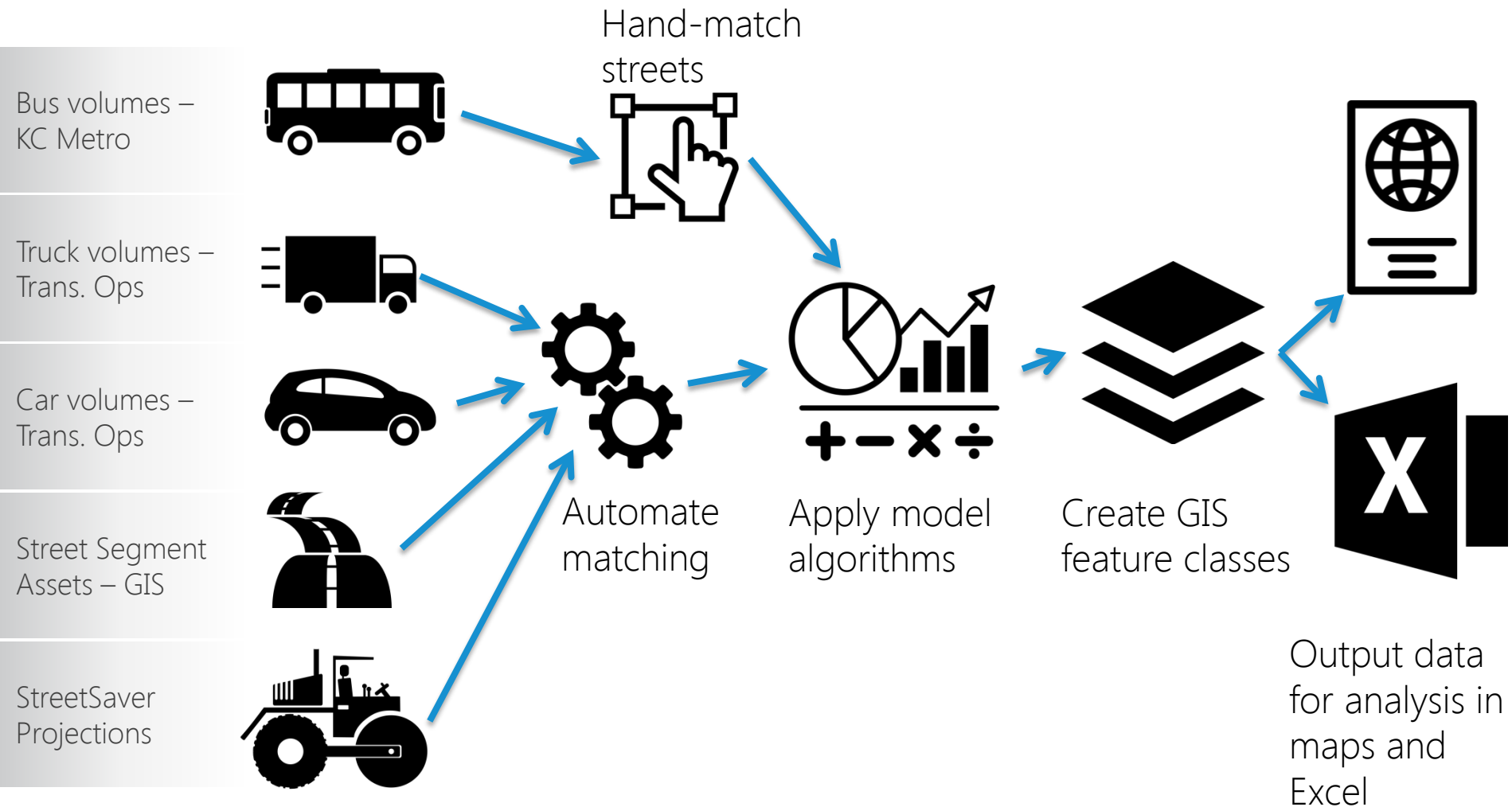


Background – Prioritize by B/C Ratio

Benefit/Cost Ratio Depends on Pavement Condition and Traffic Volume



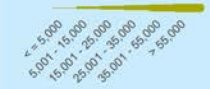
Data process



Vital Data – Car, Bus and Truck Volumes

2015 Seattle Car Volume Map

Average Daily Car Count



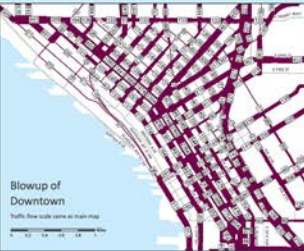
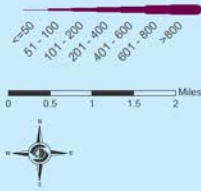
0 0.5 1 1.5 2 Miles



© 2016, THE CITY OF SEATTLE. All rights reserved.
Produced by the Seattle Department of Transportation.
No warranties of any sort, including accuracy, fitness or
merchantability, accompany this product.
Coordinate System: State Plane, NAD83-91
Washington, North Zone
PLOT DATE: 3/20/16
AUTHOR: AG - SCOT IT GIS (original)
ADAPTED: Asset Management, F&D
LOCATION: Document Path: V:\SS\GIS\Projects_Working_Space\PavementModeling\StatSession\PavementModelingStatSession_car_volume.mxd

2015 Seattle Bus Volume Map

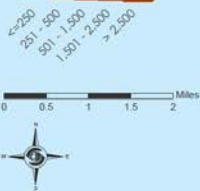
Average Daily Bus Count



© 2016, THE CITY OF SEATTLE. All rights reserved.
Produced by the Seattle Department of Transportation.
No warranties of any sort, including accuracy, fitness or
merchantability, accompany this product.
Coordinate System: State Plane, NAD83-91
Washington, North Zone
PLOT DATE: 3/2016
AUTHOR: AG - SCOT IT GIS (original)
ADAPTED: Asset Management, FAS
LOCATION: V:\SS\GIS\Projects_Working_Space\Pavement Modeling\Stat Session\Pavement Modeling\Stat SessionMap_bus_volume.mxd

2015 Seattle Truck Volume Map

Average Daily Truck Count



© 2016, THE CITY OF SEATTLE. All rights reserved.
Produced by the Seattle Department of Transportation.
No warranties of any sort, including accuracy, fitness or
merchantability, accompany this product.
Coordinate System: State Plane, NAD83-91
Washington, North Zone
PLOT DATE: 3/2016
AUTHOR: AG - SCOT IT GIS (original)
ADAPTED: Asset Management, FAS
LOCATION: V:\SS\GIS\Projects_Working_Space\Pavement Modeling\Stat Session\Pavement Modeling\Stat SessionMap_truck_volume.mxd

Additional benefits

- GIS Layers
 - Passenger volumes on each street
 - Car average daily traffic
 - Bus trip counts (ridership coming soon)
 - Truck average daily traffic
- Use Volume Data to
 - Plan projects
 - Rank streets by criticality
- Move Seattle Performance Metric
 - % of traveler-miles on fair or better streets due to Move Seattle funding

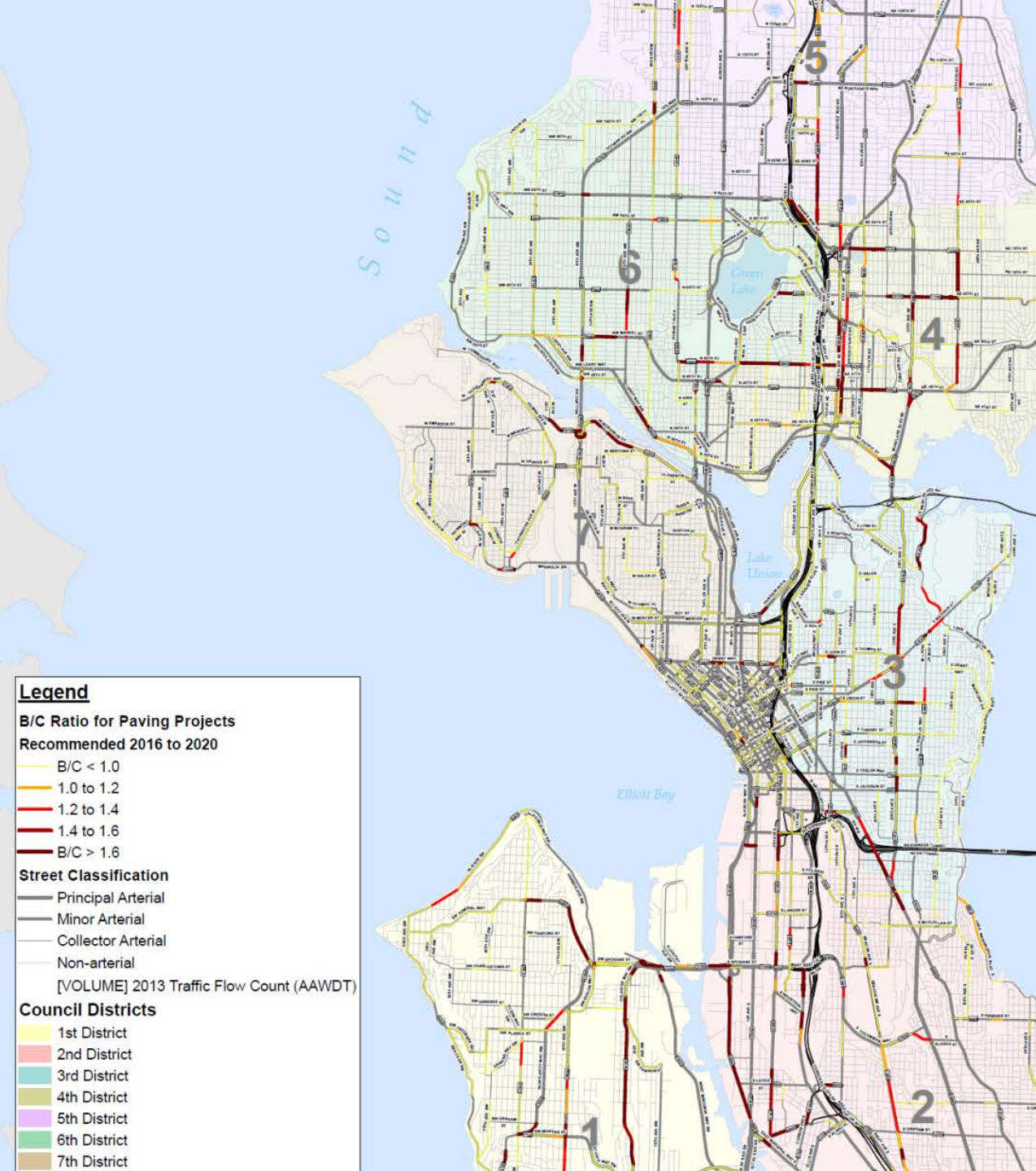
Caveats

- Data on Traffic Volumes is Incomplete – Output will Change when Corrected
- May Find Hidden “Glitches” As Tool is Exercised
- User Inputs (VOC, Treatment Costs, etc.) or Asset Data (Condition, Type, etc.) Subject to Continuous Improvement
- It’s a Model, not Reality – Many Simplifying Assumptions. It Doesn’t Spit Out a Pavement Plan – It’s a Tool to Organize and Make Planning more Efficient and Objective

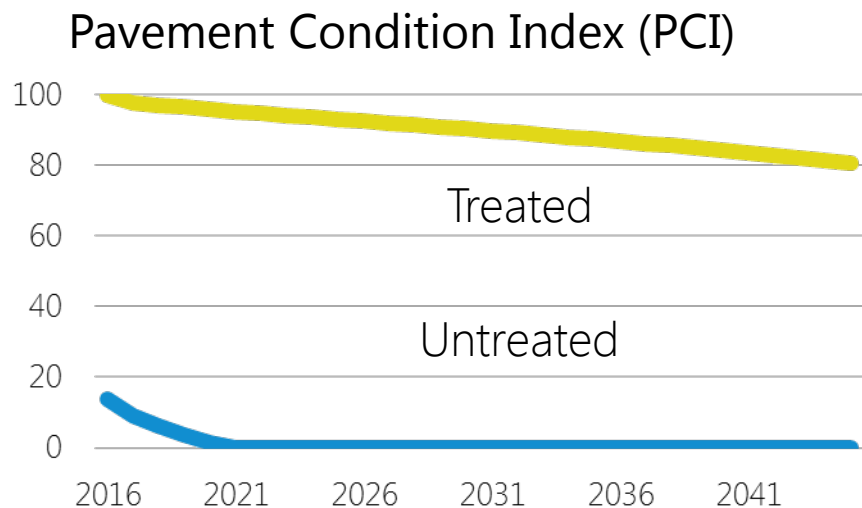
“Beta-test” Findings

- Map of City
 - Streets color-coded by B/C ratio
 - Overlain with recommended treatment
- Streets with high B/C ratios have higher car, bus and truck volumes, and lower cost treatments, than streets with low B/C ratios
- Choosing highest B/C ratio results in lower pavement expenditure per street user

Street Map B/C Ratios



10th Avenue East – Roy to Boston



\$/Lane-mile

\$3.7M

Daily Cars

13,300

Daily Buses

155

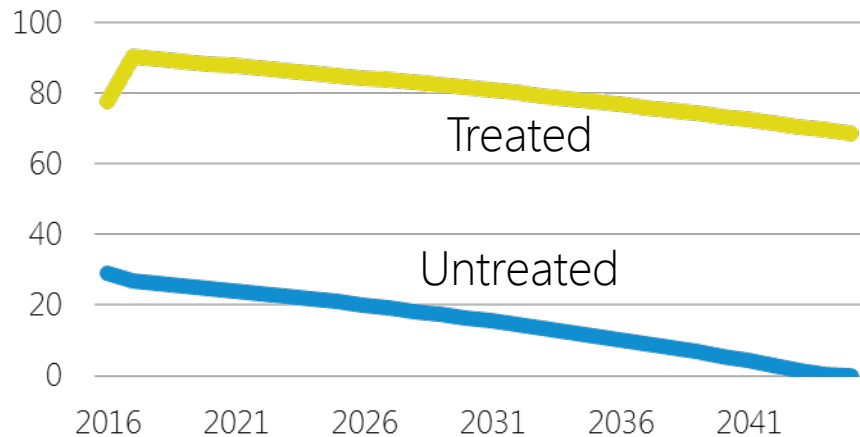
Daily Trucks

644

35th Avenue SW – Myrtle to Holden



Pavement Condition Index (PCI)



\$/Lane-mile

\$3.7M

Daily Cars

21,300

Daily Buses

183

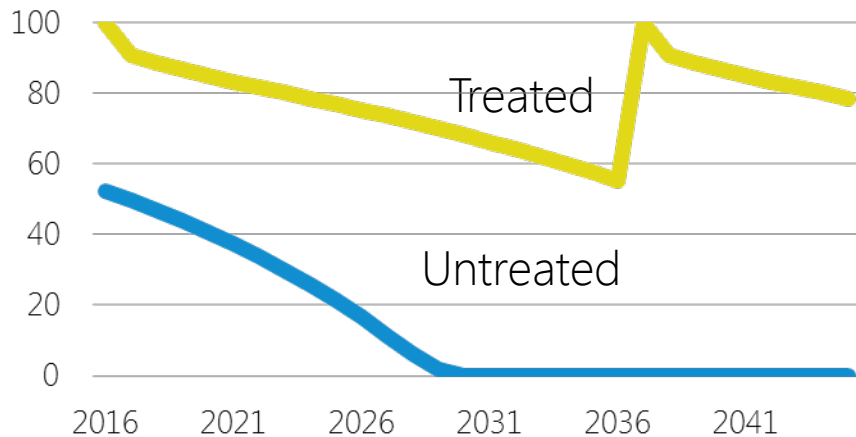
Daily Trucks

370

East Marginal Way – Hudson to 1st Avenue



Pavement Condition Index (PCI)



\$/Lane-mile
\$0.85M

Daily Buses
92

Daily Cars
47,000

Daily Trucks
6,400

Comparison of Some Results

Street Treated	Total Lane Miles	Total Treatment Cost	Average PCI Untreated	Average Daily Vehicles	Average Daily Buses	Average Daily Trucks	Average B/C Ratio	\$/Travelers-mile
E. Marginal Way: Hudson to 1st	4.2	\$3.6M	52	47,000	92	6,400	6.1	\$0.012
35th Ave. SW: Myrtle to Holden	0.9	\$3.2M	3	21,300	183	370	1.6	\$0.038
10th Ave. E: Roy to Boston	3.3	\$12.5M	14	13,300	155	644	0.8	\$0.092
All B/C > 1.85	24.0	\$25.3M	47	23,800	122	1,650	3.2	\$0.016
Move 2016 Plan	21.0	\$25.4M	44	12,000	378	NA	NA	\$0.023

All Arterials with Paving Needs in 2016 – The “Backlog”

Treatment Type	# Street Segments	Total Street Length (Miles)	Total Lane Miles	Average Treatment Cost \$/sq yd	Total Treatment Cost	Average PCI Untreated	Average Daily Vehicles	Average Daily Buses	Average Daily Trucks	Average B/C Ratio	\$/Traveler-mile
MILL AND THICK OVERLAY	58	4.8	14.5	\$149	\$ 15M	50	5,655	94	185	0.60	\$0.046
MILL AND THIN OVERLAY	376	28.2	97.5	\$120	\$ 82M	50	9,340	79	398	1.23	\$0.029
PARTIAL RECONSTRUCTION AC	461	35.6	117.6	\$423	\$355M	36	7,604	115	294	0.43	\$0.109
PCC - SELECT PANEL REPLACEMENT	185	13.0	34.7	\$125	\$31M	50	4,092	70	156	0.62	\$0.046
RECONSTRUCT STRUCTURE (AC)	661	51.9	132.4	\$430	\$404M	16	2,319	56	140	0.29	\$0.238
RECONSTRUCT STRUCTURE (PCC)	587	41.7	142.0	\$530	\$530M	18	8,544	129	284	0.53	\$0.123
Total	2,328	175.1	538.7	\$373	\$1,417M	29	6,297	92	251	0.57	\$0.108

All Arterials with Paving Needs in 2016 w/ B/C > 1

Treatment Type	# Street Segments	Total Street Length (Miles)	Total Lane Miles	Average Treatment Cost \$/sq yd	Total Treatment Cost	Average PCI Untreated	Average Daily Vehicles	Average Daily Buses	Average Daily Trucks	Average B/C Ratio	\$/Traveler-mile
MILL AND THICK OVERLAY	13	1.2	4.6	\$150	\$5	50	15,646	163	580	1.50	\$0.023
MILL AND THIN OVERLAY	157	12.4	44.4	\$120	\$38	50	17,876	102	821	2.10	\$0.017
PARTIAL RECONSTRUCTION AC	30	2.9	7.0	\$440	\$22	35	21,913	163	671	1.37	\$0.033
PCC - SELECT PANEL REPLACEMENT	32	2.2	7.0	\$133	\$7	51	18,263	130	478	1.75	\$0.016
RECONSTRUCT STRUCTURE (AC)	26	2.2	4.0	\$476	\$13	13	17,912	192	649	1.63	\$0.030
RECONSTRUCT STRUCTURE (PCC)	70	5.6	18.5	\$530	\$69	14	23,467	173	714	1.30	\$0.051
Grand Total	328	26.5	85.6	\$267	\$153	38	19,391	135	728	1.76	\$0.029

Comparison Between "Backlog" with $B/C < 1$ and $B/C > 1$

Treatment Type	# Street Segments	Total Street Length (Miles)	Total Lane Miles	Average Treatment Cost \$/sq yd	Total Treatment Cost	Average PCI Untreated	Average Daily Vehicles	Average Daily Buses	Average Daily Trucks	Average B/C Ratio	\$/Traveler-mile
MILL AND THICK OVERLAY	29%	34%	47%	101%	47%	99%	565%	220%	824%	499%	32%
MILL AND THIN OVERLAY	72%	78%	84%	100%	84%	101%	555%	161%	867%	475%	25%
PARTIAL RECONSTRUCTION AC	7%	9%	6%	104%	6%	99%	332%	146%	251%	381%	27%
PCC - SELECT PANEL REPLACEMENT	21%	21%	25%	108%	27%	101%	1618%	223%	539%	589%	16%
RECONSTRUCT STRUCTURE (AC)	4%	4%	3%	111%	3%	81%	1067%	380%	543%	739%	10%
RECONSTRUCT STRUCTURE (PCC)	14%	16%	15%	100%	15%	74%	360%	141%	317%	318%	33%
Grand Total	16%	18%	19%	69%	12%	137%	468%	159%	422%	530%	19%

Next steps

Timeframe	Activity/action
Q2 2016	Add known traffic volumes and default volumes where traffic studies have not been performed
Q2-3 2016	Begin using model to plan and do scenarios/continue QC checks
Q4 2016	Look at potential improvements to asset data, model logic and inputs after trial use period

Questions?

www.seattle.gov/transportation

