Tackling the Infrastructure Deficit, the DC Way

Empowering decision makers to make informed investment choices by combining data with technology.

How we converted asset data of a City into:

condition charts
expiration timelines
predicting future replacement cost
prioritization and tracking unmet need.

Our decision makers needed data to address the issue of not enough capital funding for all our capital projects.

- $14 Billon CIP
- $10 Billion in funding
- $3 Billion in unmet Need

How to solve the problem of not enough funding started by answering four questions:

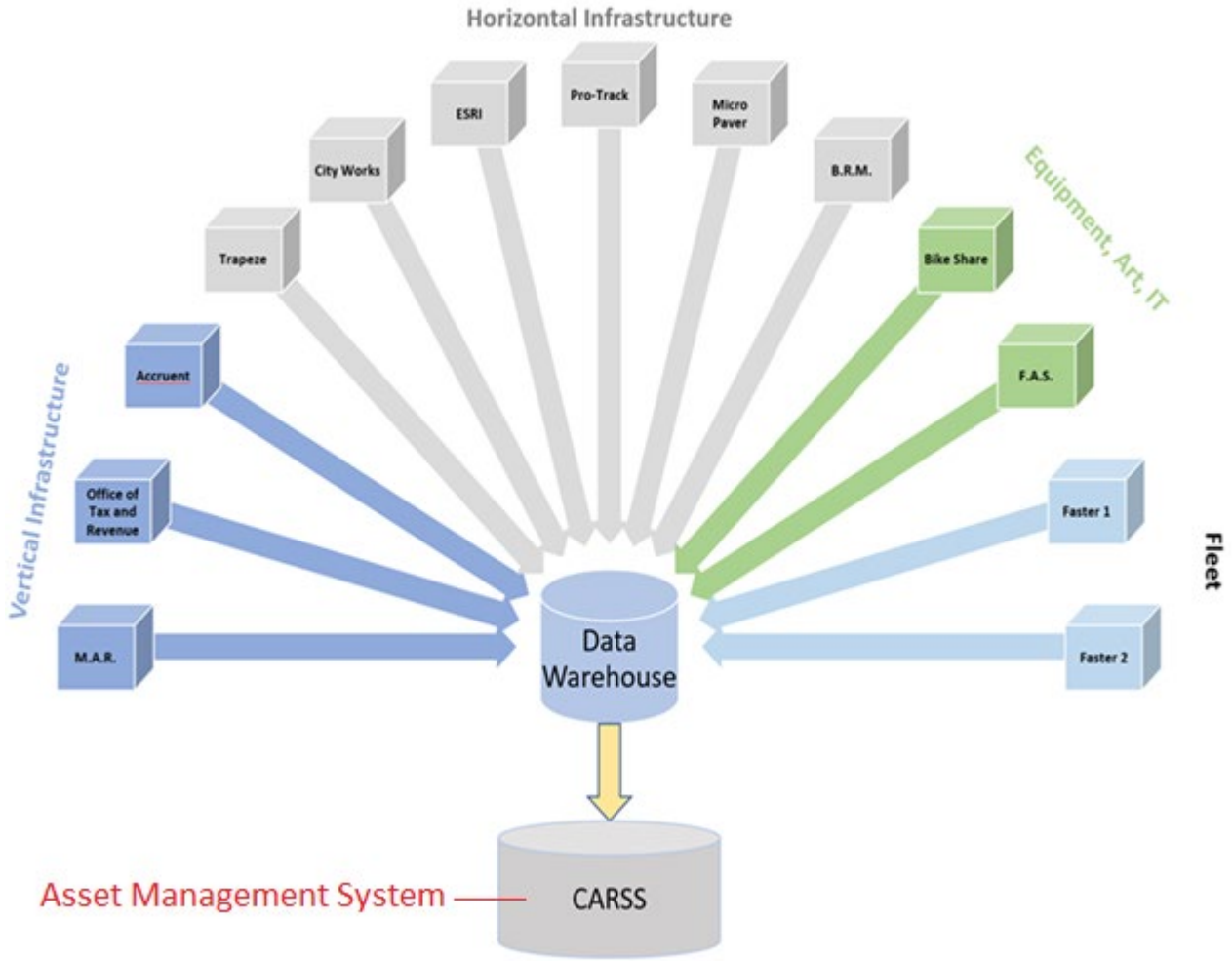
- What Assets do I have that need to be maintained?
- What is the quality of the assets?
- How will I prioritize my Capital Needs?
- How much funding do I have to address capital needs and asset maintenance?

How did we do this?

We Converted an Asset Management System into a Capital Planning Tool

Benefits

- Allows agency data to seamlessly be transmitted to the centralized database.
- Allows multiple data sources to be combined to create new perspectives not previously available.
- Allows a small footprint of human resources to build and maintain an asset management system.



Fleet

How can I use fleet data to solve the funding problem for fleet?

Use the fleet data to calculate:

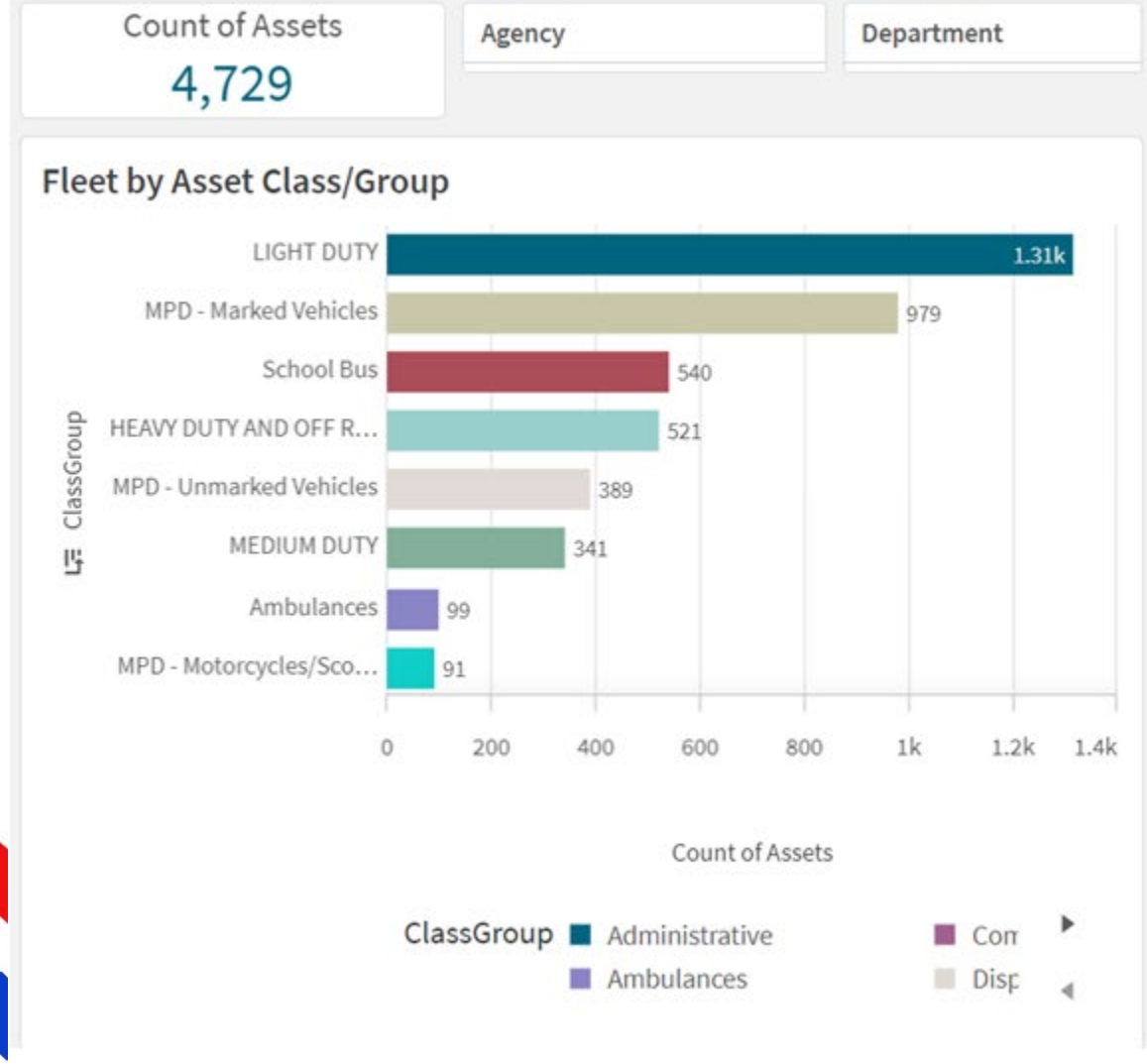
1) Condition
2) Predict future expiration
3) Predict future cost

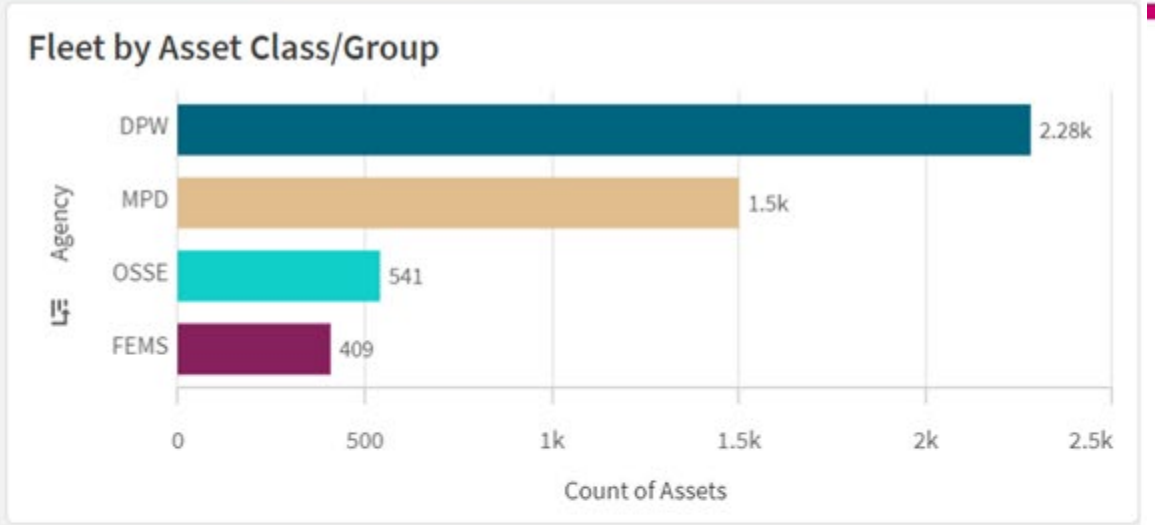
With 10 data points you can:

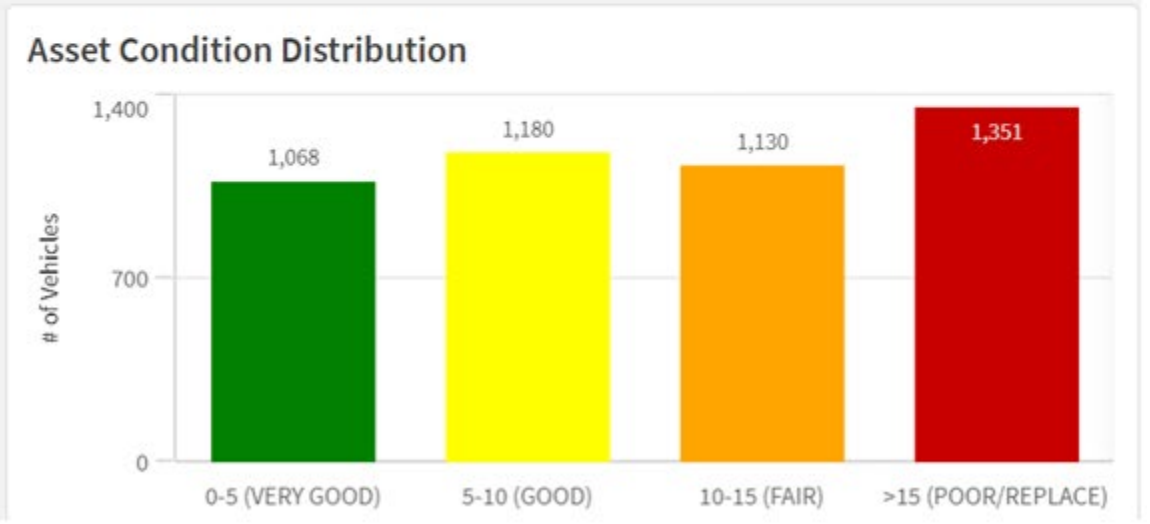
1) Count your assets
2) Calculate asset condition
3) Predict future expiration
4) Predict future replacement costs

1	2	3	4	5	6	7	8	9	10
Acquire Date	Class Type	VIN	Make	Year	Useful Life	Acquire Cost	Engine Hours	Engine Miles	Maintenance
5-Dec-13	FEMS - ambulance	1HTMYSKM3EH013715	INTERNATIONAL	2013	84	$ 232,550	13,574	102,442	$ 11,588
6-Dec-13	FEMS - ambulance	1HTMYSKM5EH013716	INTERNATIONAL	2013	84	$ 232,550	9,412	86,851	$ 12,203
5-Dec-13	FEMS - ambulance	1HTMYSKM1EH013714	INTERNATIONAL	2013	84	$ 232,550	11,366	137,125	$ 12,832
27-Oct-14	FEMS - Pumper Apparatus	4P1CA01D7EA014482	PIERCE	2015	120	$ 683,131	6,950	63,857	$ 14,396
27-Oct-14	FEMS - Pumper Apparatus	4P1CA01D9EA014483	PIERCE	2015	120	$ 683,131	6,908	83,199	$ 11,227
20-Nov-15	FEMS - Other Response Vehicle	JK1AFDF11CB505705	KAWASAKI	2015	60	$ 34,900	66		$ 98
20-Oct-13	FEMS - Other Response Vehicle	1M0825GFCDM061131	JOHN DEERE	2013	60	$ 10,001	23		$ -
1-Jun-09	FEMS - Administrative Vehicle	1GNGK46K69R256586	CHEVROLET	2009	60	$ 39,041		118,639	$ 2,060
6-May-16	FEMS - Ladder Truck	4S7AUZE93FC079441	Spartan ERV	2015	120	$ 1,094,908		59,728	$ 6,758
26-Aug-16	FEMS - Command Vehicle	1GT12SEG0GF265640	CHEVROLET	2016	60	$ 130,989		29,447	$ 341

How Many Assets Do we have and What is their Condition

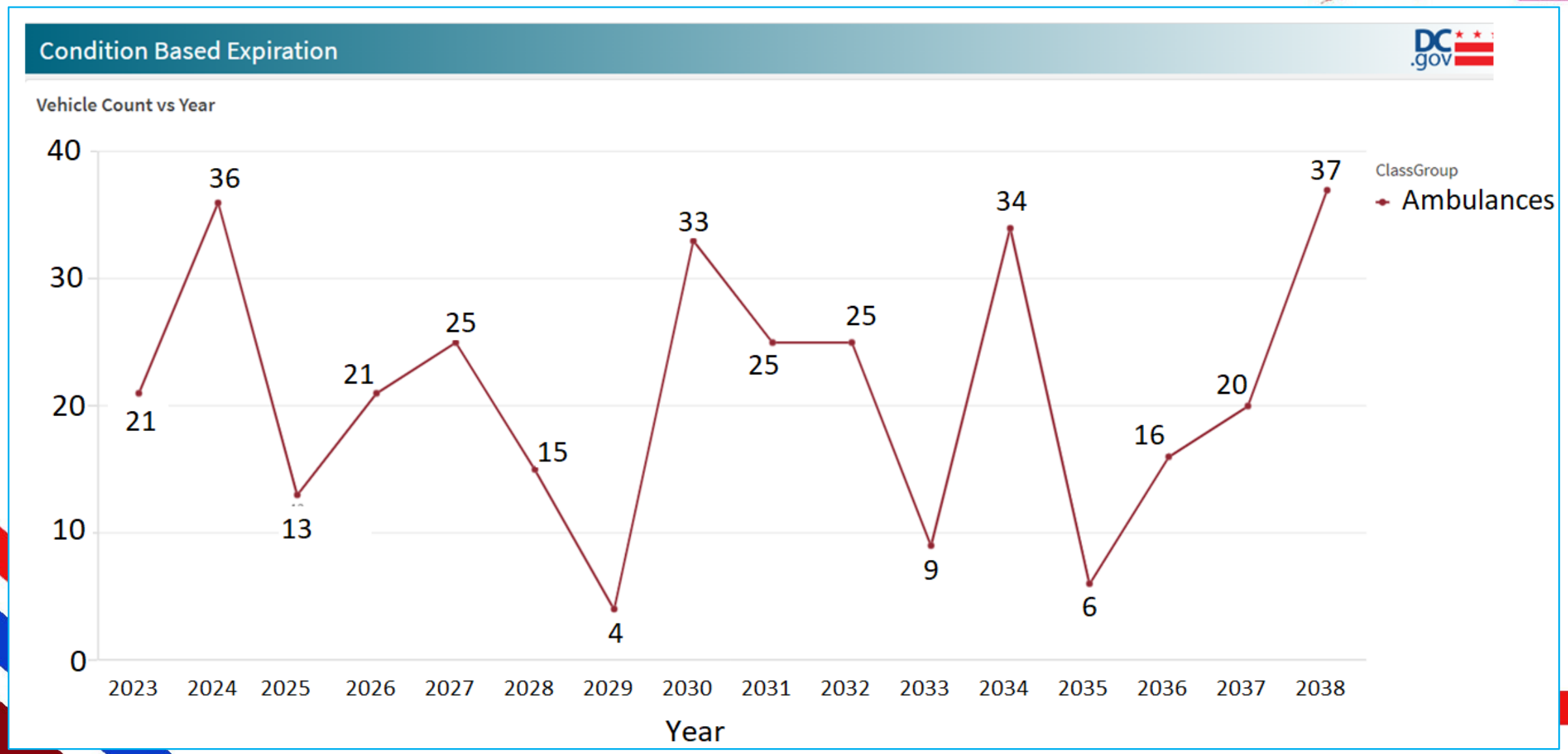






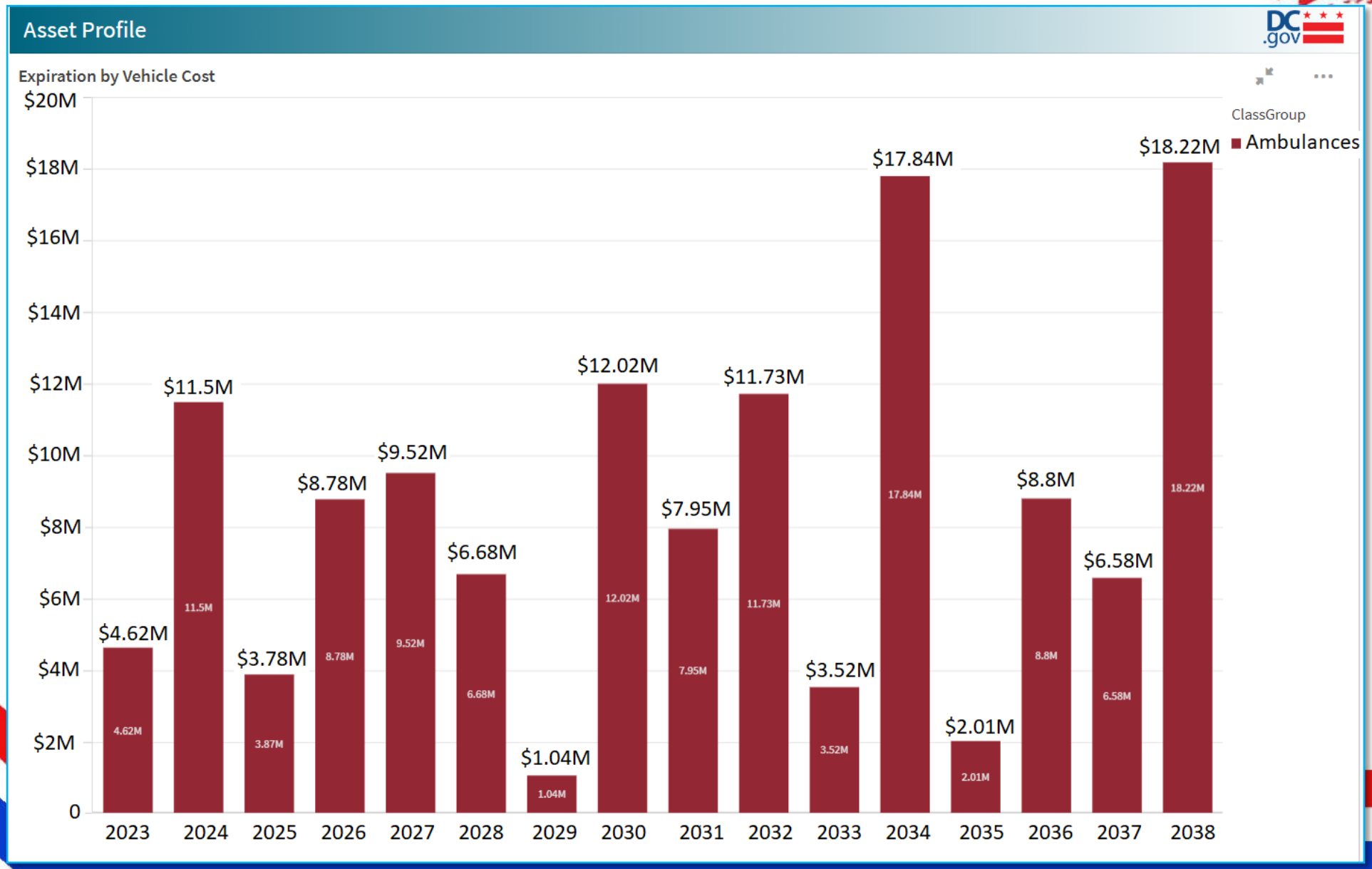
Condition Based Expiration - Ambulances

Condition * Burn Rate = Future Expiration



Condition Based Expiration - Ambulances

Condition Expiration * Inflated Acquisition Cost = Future Need Future



Department of Public Works (DPW)

State of The Asset August 2023

2023 Condition

	Light	Medium	Heavy	Total
2023 Condition	207 / 69 / 155 / 183	51 / 29 / 57 / 76	157 / 81 / 48 / 122	415 / 179 / 260 / 381
Count	614	213	408	1,235
Average Age	6.0	5.2	8.0	6.5
Useful Life	8	8	8	8
Maintenance Cost Average	$14,785	$61,350	$77,120	$43,409
Average Millage	20,149	17,497	14,654	17,876

Activity Detail

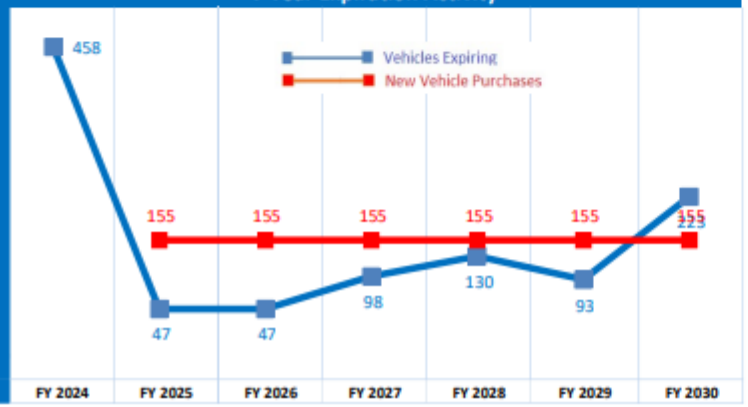
		FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	Totals
Expiring Vehicles:	Light	229	22	10	46	77	39	120	543
	Medium	51	10	13	20	7	39	50	190
	Heavy	178	15	24	32	46	15	53	363
	Totals	458	47	47	98	130	93	223	1,096
Replacement Cost	Light	$7,723,330	$772,652	$523,126	$1,651,985	$3,538,787	$1,296,954	$4,278,106	$19,784,941
	Medium	$10,090,036	$2,442,740	$4,078,539	$4,041,824	$890,365	$7,354,593	$5,480,293	$34,378,390
	Heavy	$31,211,654	$3,554,315	$3,194,035	$8,504,210	$13,340,999	$1,321,228	$12,120,335	$73,246,775
	Totals	$49,025,020	$6,769,707	$7,795,700	$14,198,020	$17,770,152	$9,972,775	$21,878,734	$127,410,106
FY24 - FY29 Approved		$20,218,867	$10,946,811	$8,886,832	$8,525,599	$10,627,537	$10,946,363	-	$70,152,009
Unmet Need:		$28,806,153							
Deferred Operating Cost:		$2,880,615							

FY 2025 - FY 2030 Replacement Plan

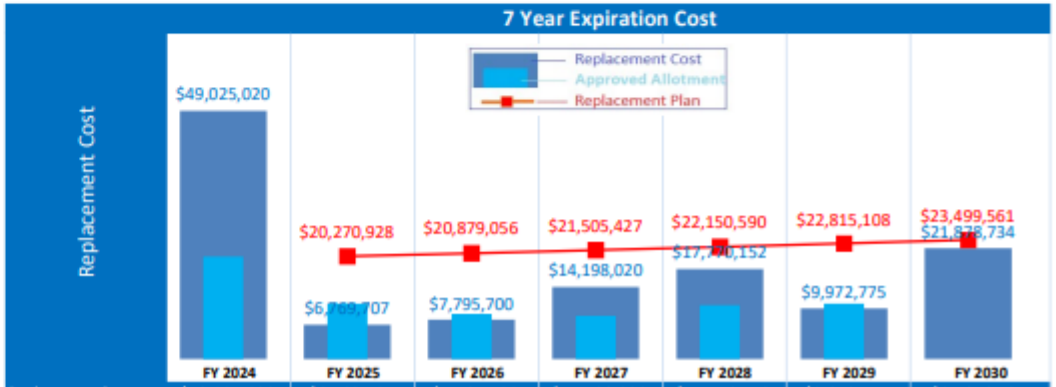
		FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	Totals
New Vehicle Purchases	Light	-	77	77	77	77	77	77	462
	Medium	-	27	27	27	27	27	27	162
	Heavy	-	51	51	51	51	51	51	306
	Totals	-	155	155	155	155	155	155	930
Individual Vehicle Cost (3% Inflation)	Light	$40,285	$41,494	$42,739	$44,021	$45,342	$46,702	$48,103	-
	Medium	$168,205	$173,251	$178,449	$183,802	$189,316	$194,996	$200,846	-
	Heavy	$236,020	$243,100	$250,393	$257,905	$265,642	$273,611	$281,820	-
Replacement Plan	Light	-	$3,195,037	$3,290,888	$3,389,614	$3,491,303	$3,596,042	$3,703,923	$20,666,807
	Medium	-	$4,677,783	$4,818,117	$4,962,660	$5,111,540	$5,264,886	$5,422,833	$30,257,818
	Heavy	-	$12,398,108	$12,770,052	$13,153,153	$13,547,748	$13,954,180	$14,372,806	$80,196,046
	Totals		$20,270,928	$20,879,056	$21,505,427	$22,150,590	$22,815,108	$23,499,561	$131,120,671

*Replacement Plan: CARSS optimized and leveled spending plan to achieve a state of good repair

7 Year Expiration Activity



7 Year Expiration Cost



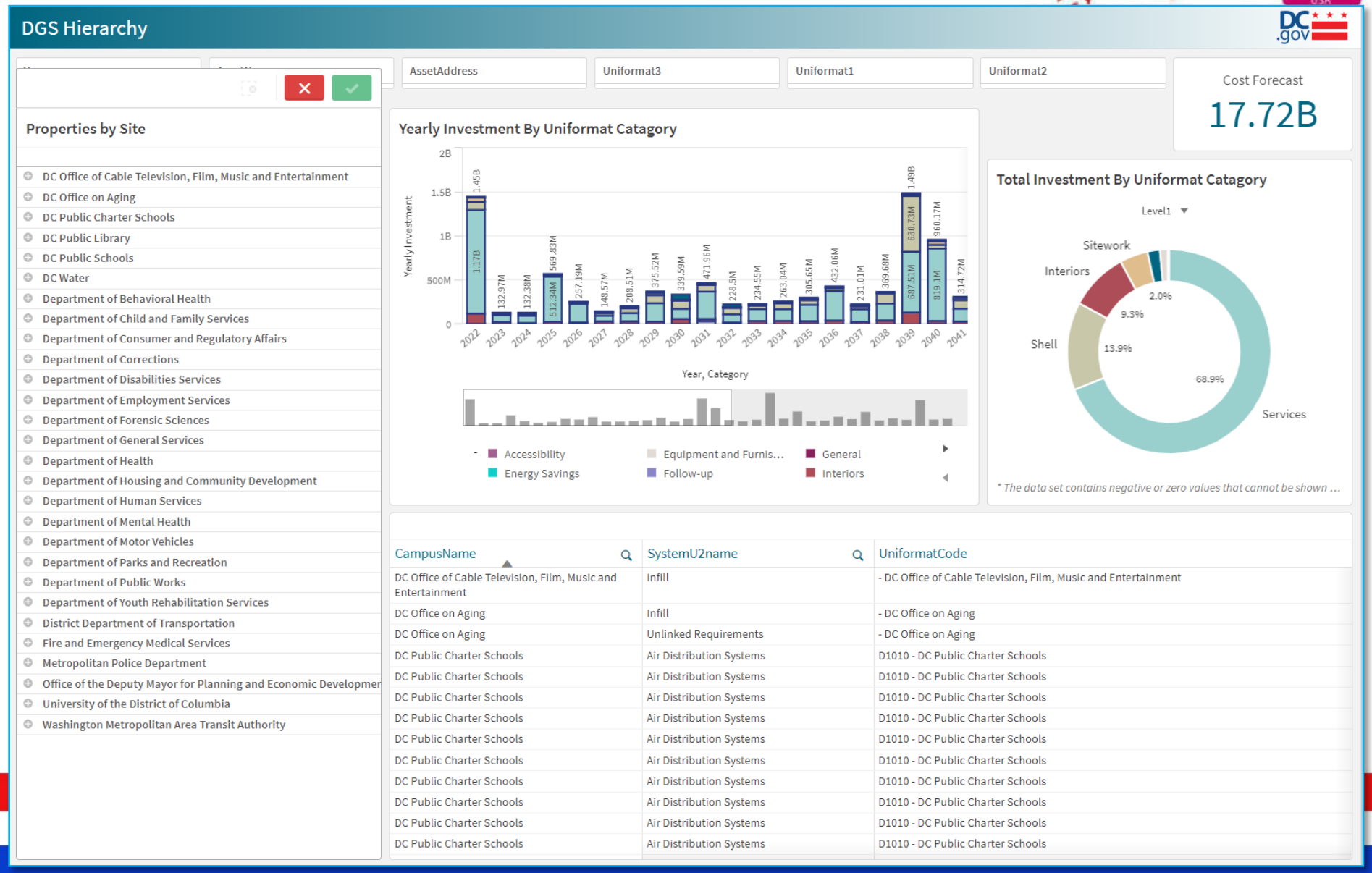
	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030
Replacement Cost	$49,025,020	$6,769,707	$7,795,700	$14,198,020	$17,770,152	$9,972,775	$21,878,734
Approved Allotment	$20,218,867	$10,946,811	$8,886,832	$8,525,599	$10,627,537	$10,946,363	-

Facilities

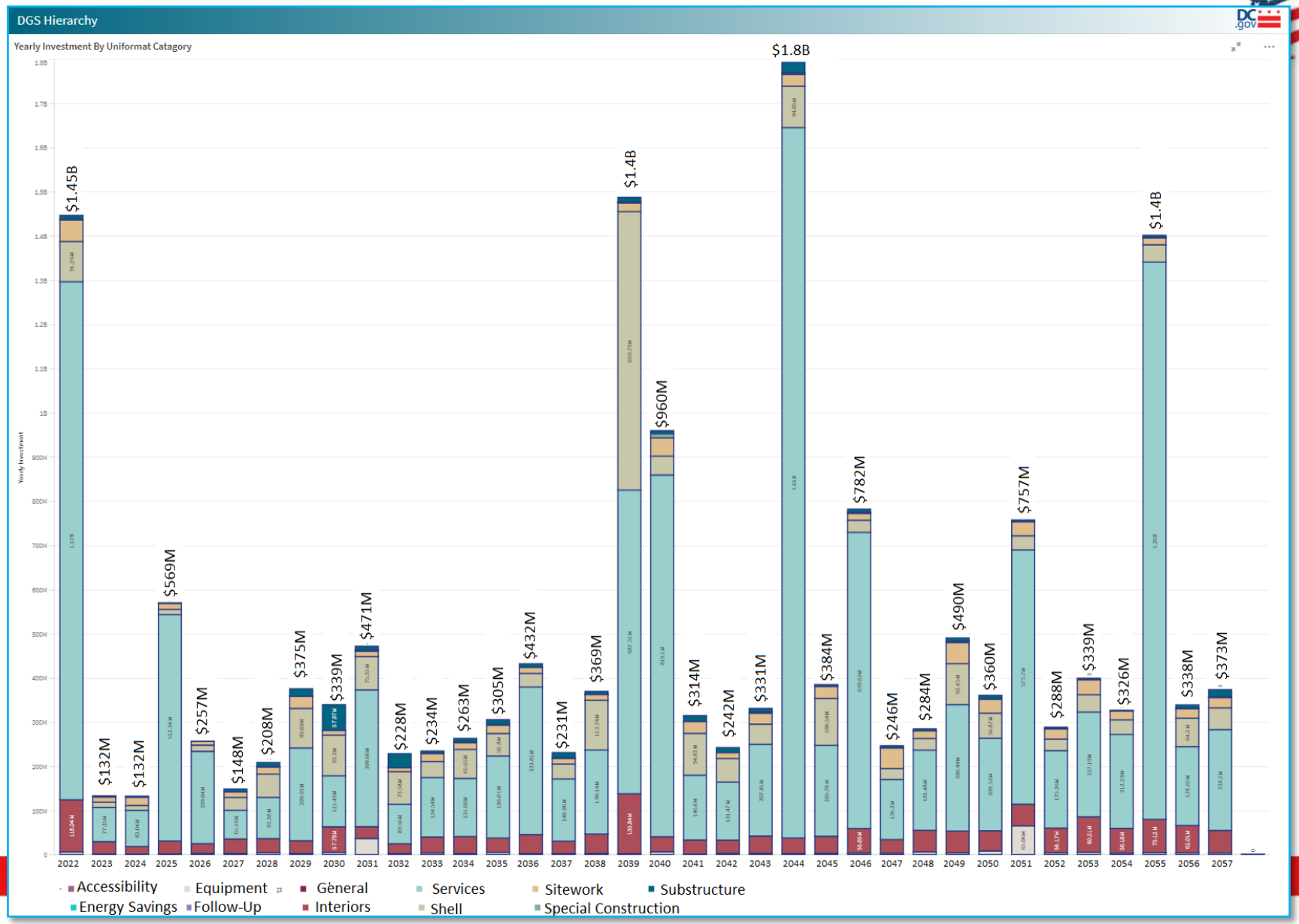
We tied the Master address repository to the facility condition assessment library

Use Facility Condition Assessments to:

1) Predict future replacement costs
2) Create Capital Pool Projects
3) Determine Building Condition



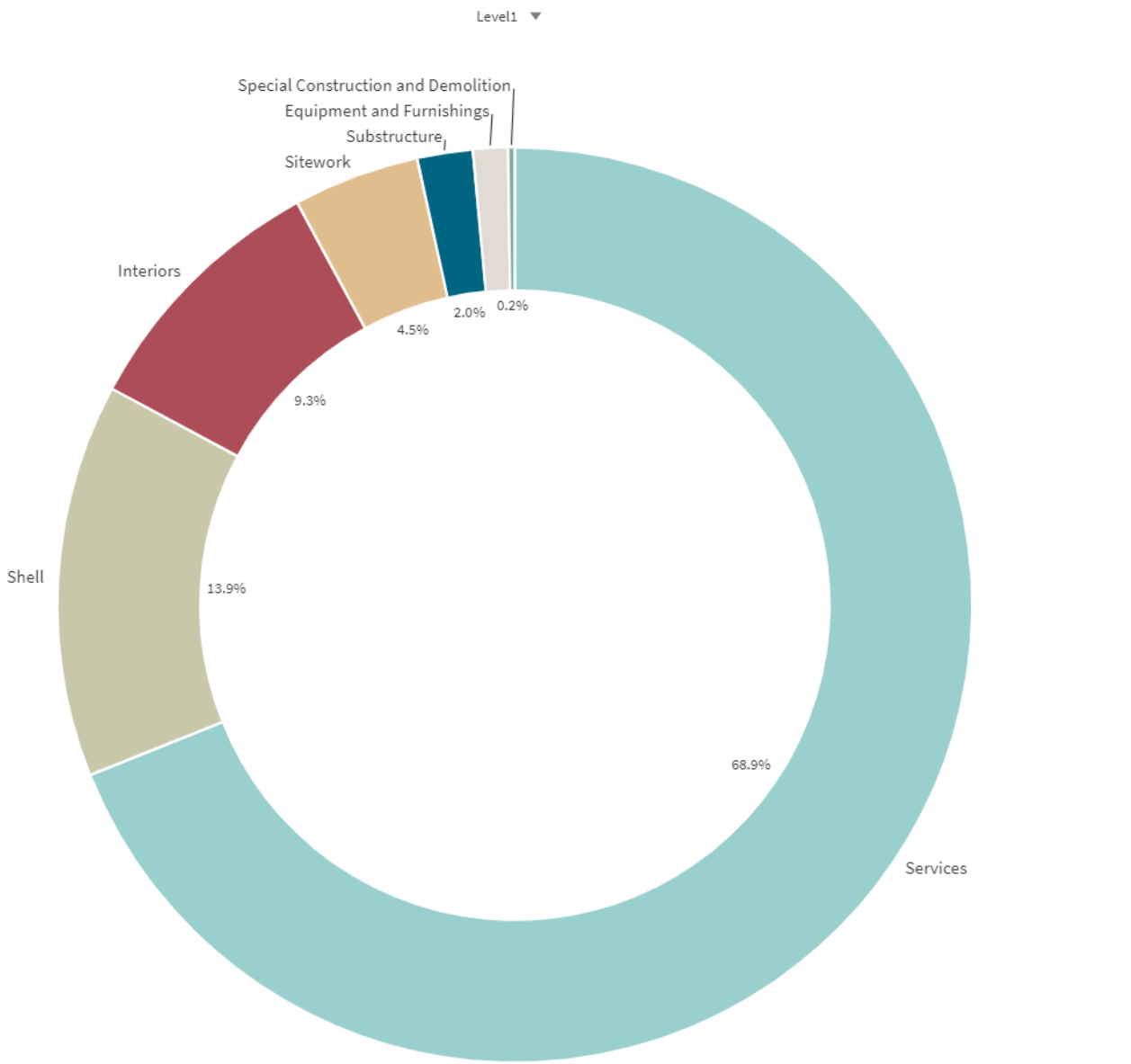
Uniformat II Applied to the Districts Portfolio of 600+ Buildings ($17Billion)



Uniformat Portfolio Level 1 Summary ($17Billion)

Total Investment by Category - Level 1

Level1	Total Investment
Totals	**$ 17,716,125,865**
Services	$ 12,214,487,505
Shell	$ 2,461,973,570
Interiors	$ 1,642,485,982
Sitework	$ 790,507,523
Substructure	$ 346,765,740
Equipment and Furnishings	$ 218,386,331
Special Construction and Demolition	$ 41,519,214

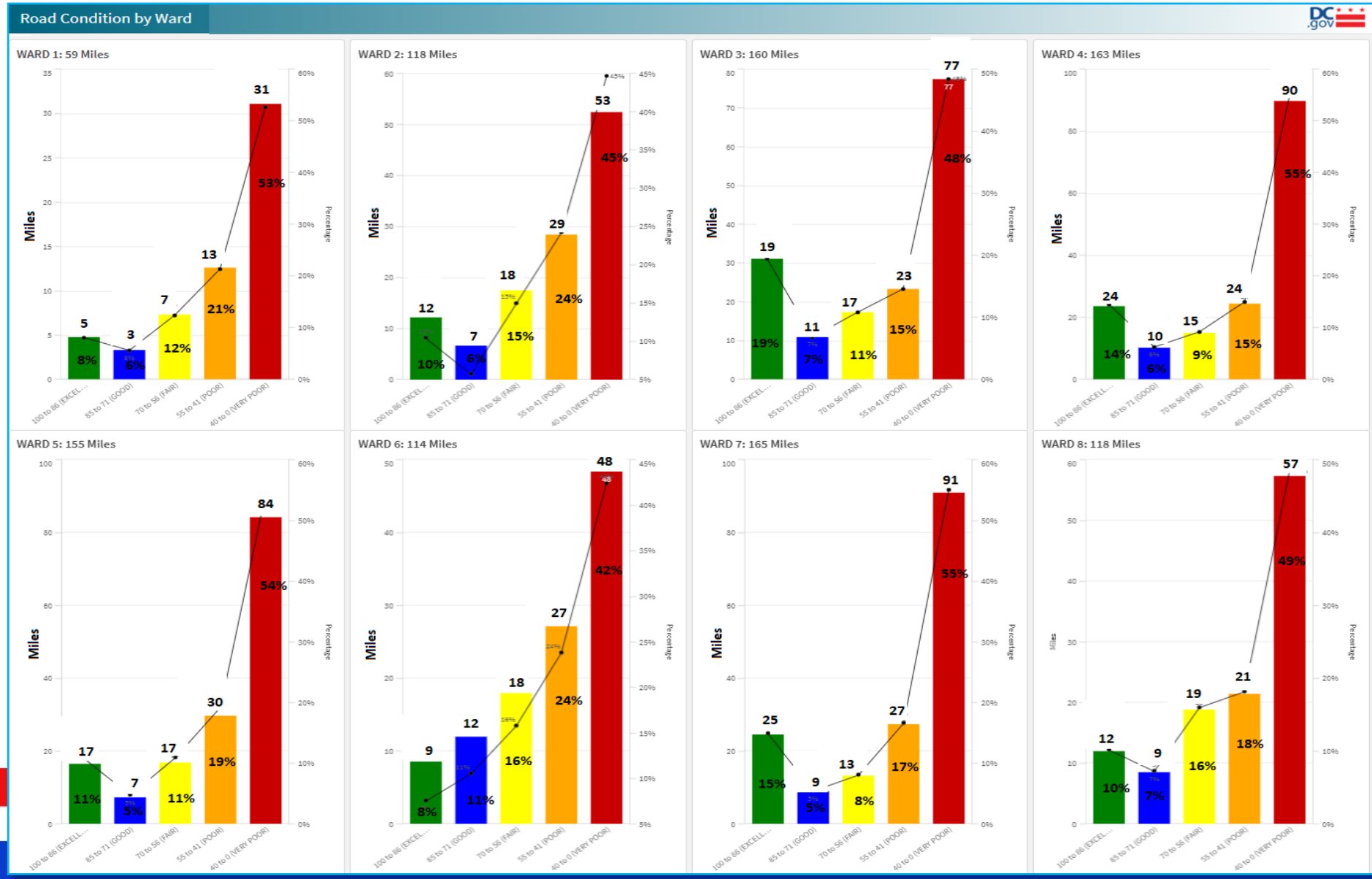


Roads & Highways

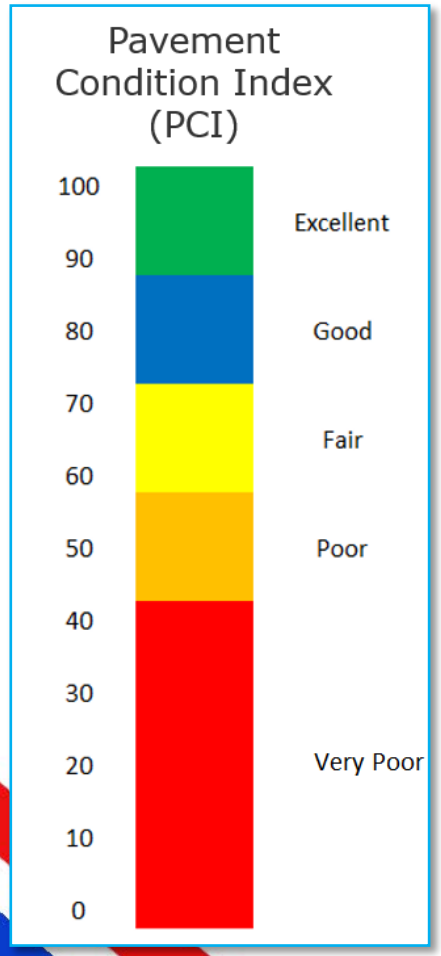
We pulled in PCI data to build condition charts

Converting PCI Data to:

- Count by Miles/Kilometers
- Visualizing data
- Creating a Historical Library



PCI Performance Model

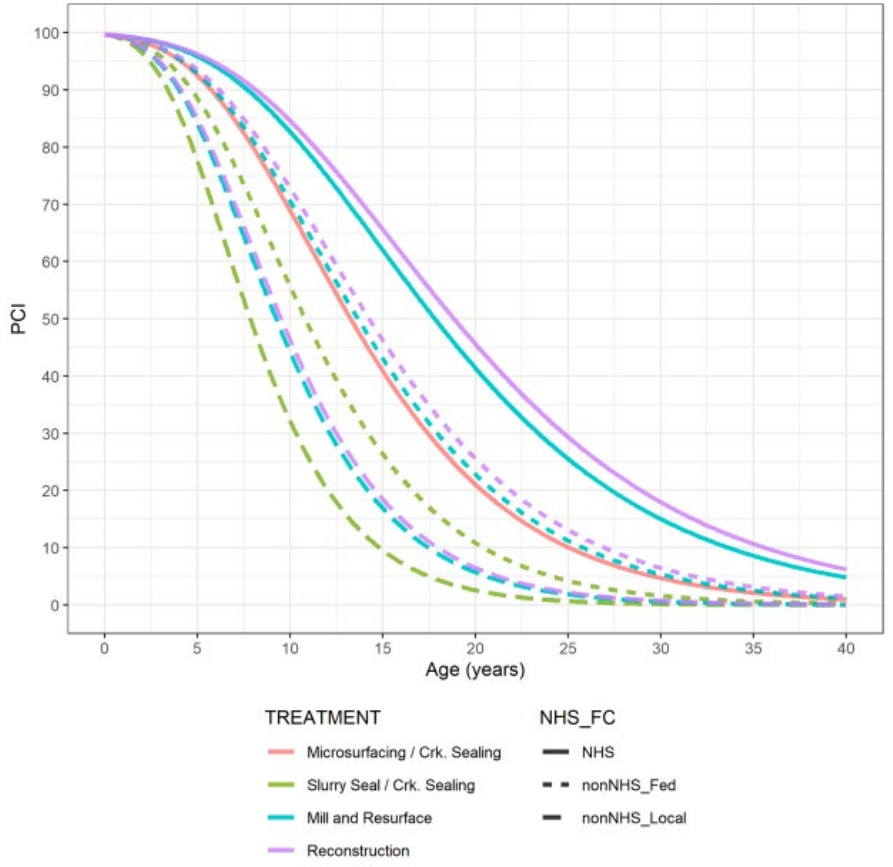


Pavement consequence and performance model uses PCI data to predict the immediate "cost" consequences on road treatments for:

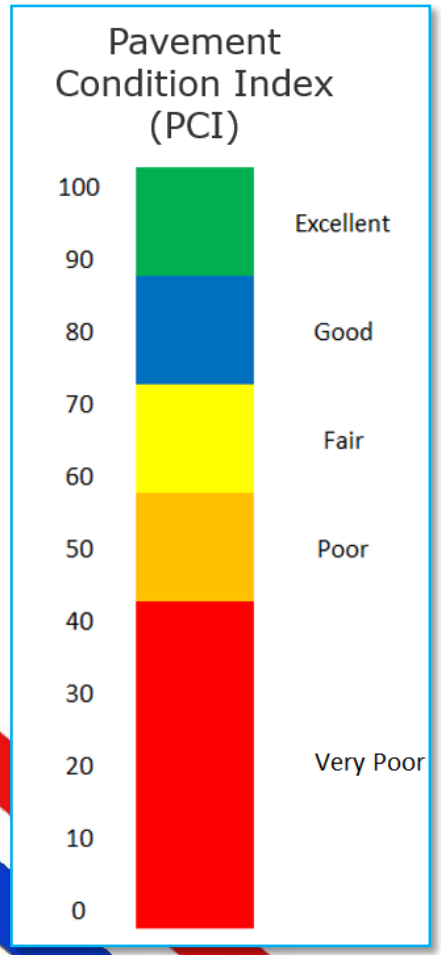
1. Crack Sealing
2. Slurry Seal
3. Micro surfacing
4. Mil & Resurface
5. Reconstruction

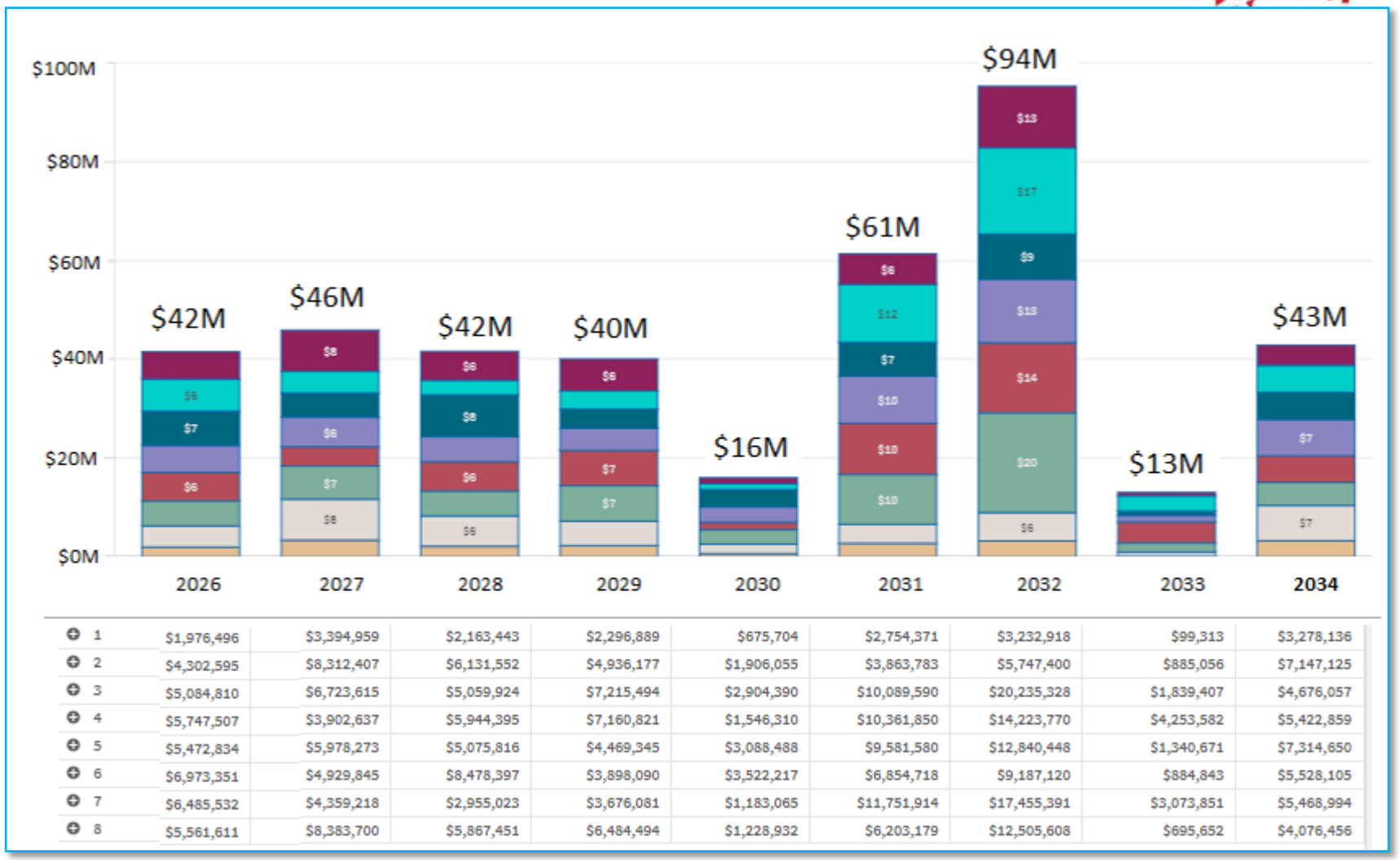
Application	Consequence Models
Crack Sealing	$PCI_{POST} = \min[1.18 * PCI_{PRE}; 100]$
Slurry Seal	$PCI_{POST} = \min[1.22 * PCI_{PRE}; 100]$
Microsurfacing	$PCI_{POST} = \min[1.26 * PCI_{PRE}; 100]$
Mill & Resurface	$PCI_{POST} = 100$
Reconstruction	$PCI_{POST} = 100$

$$PCI_t = 100 * \left(1 - exp(-exp(\alpha_0 - \alpha_1 * Age_t))\right)$$



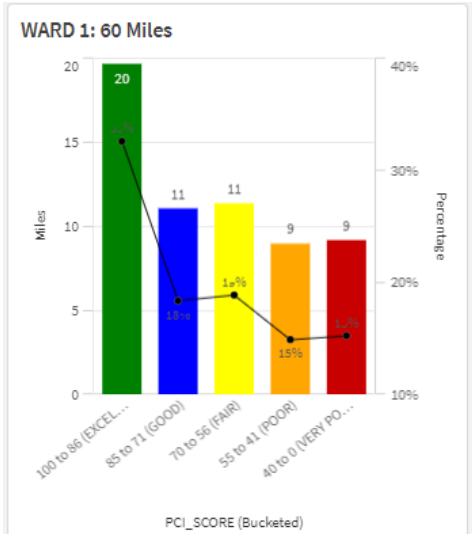
PCI Performance Model

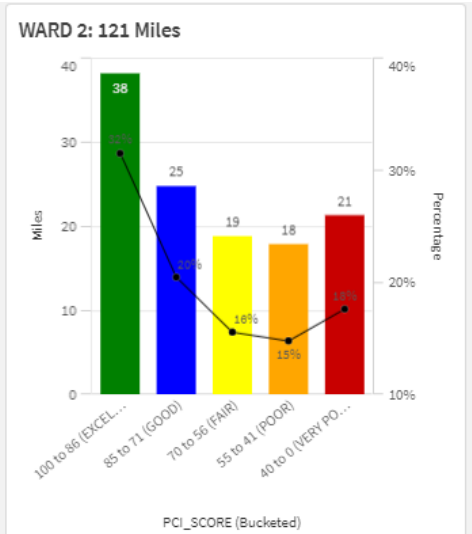


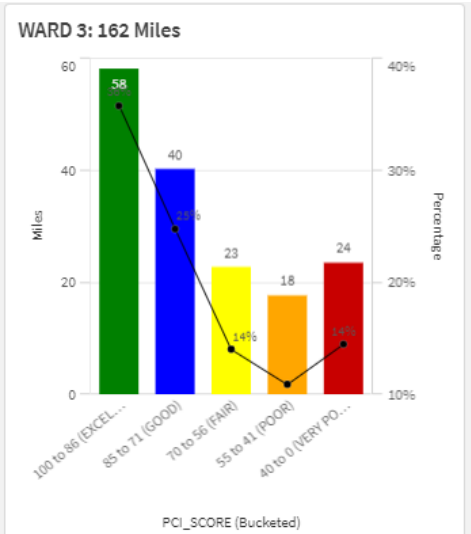


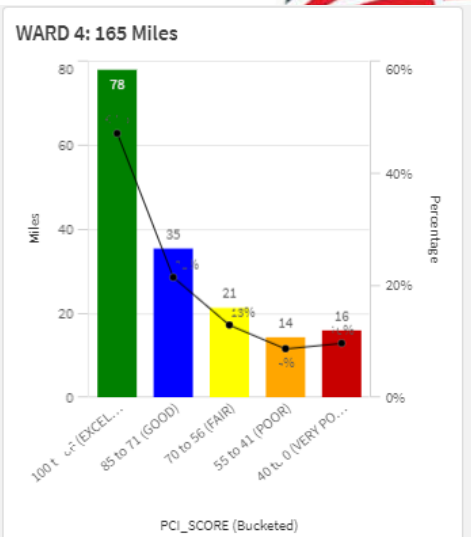
	2026	2027	2028	2029	2030	2031	2032	2033	2034
1	$1,976,496	$3,394,959	$2,163,443	$2,296,889	$675,704	$2,754,371	$3,232,918	$99,313	$3,278,136
2	$4,302,595	$8,312,407	$6,131,552	$4,936,177	$1,906,055	$3,863,783	$5,747,400	$885,056	$7,147,125
3	$5,084,810	$6,723,615	$5,059,924	$7,215,494	$2,904,390	$10,089,590	$20,235,328	$1,839,407	$4,676,057
4	$5,747,507	$3,902,637	$5,944,395	$7,160,821	$1,546,310	$10,361,850	$14,223,770	$4,253,582	$5,422,859
5	$5,472,834	$5,978,273	$5,075,816	$4,469,345	$3,088,488	$9,581,580	$12,840,448	$1,340,671	$7,314,650
6	$6,973,351	$4,929,845	$8,478,397	$3,898,090	$3,522,217	$6,854,718	$9,187,120	$884,843	$5,528,105
7	$6,485,532	$4,359,218	$2,955,023	$3,676,081	$1,183,065	$11,751,914	$17,455,391	$3,073,851	$5,468,994
8	$5,561,611	$8,383,700	$5,867,451	$6,484,494	$1,228,932	$6,203,179	$12,505,608	$695,652	$4,076,456

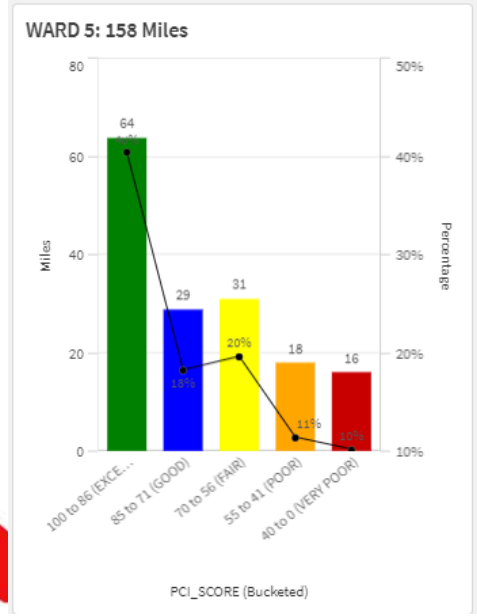
What are the quality of my assets that need to be maintained?

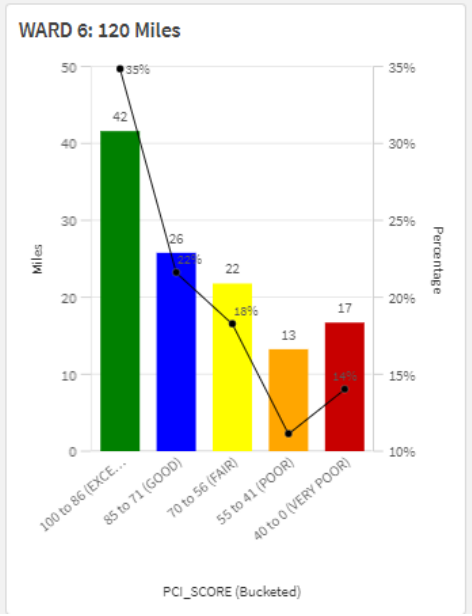


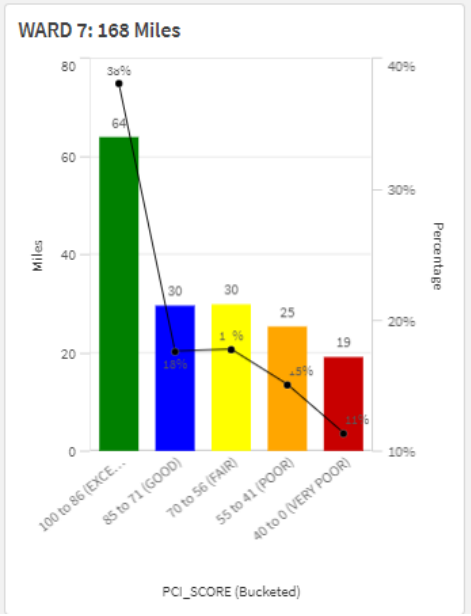


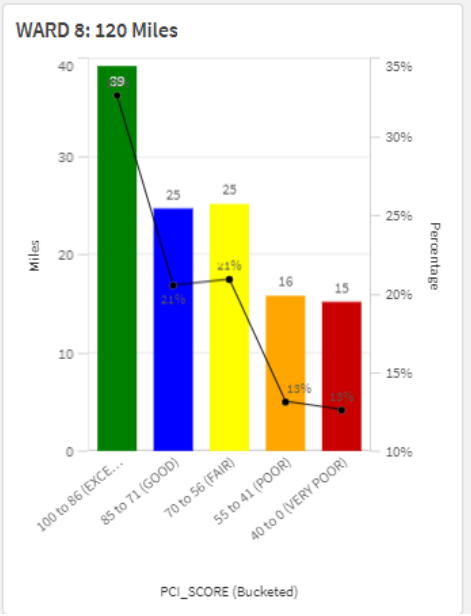












How the District approaches asset condition, prioritization, and scoring?

Categories & Classifications

Provides the foundation to consistently calculate

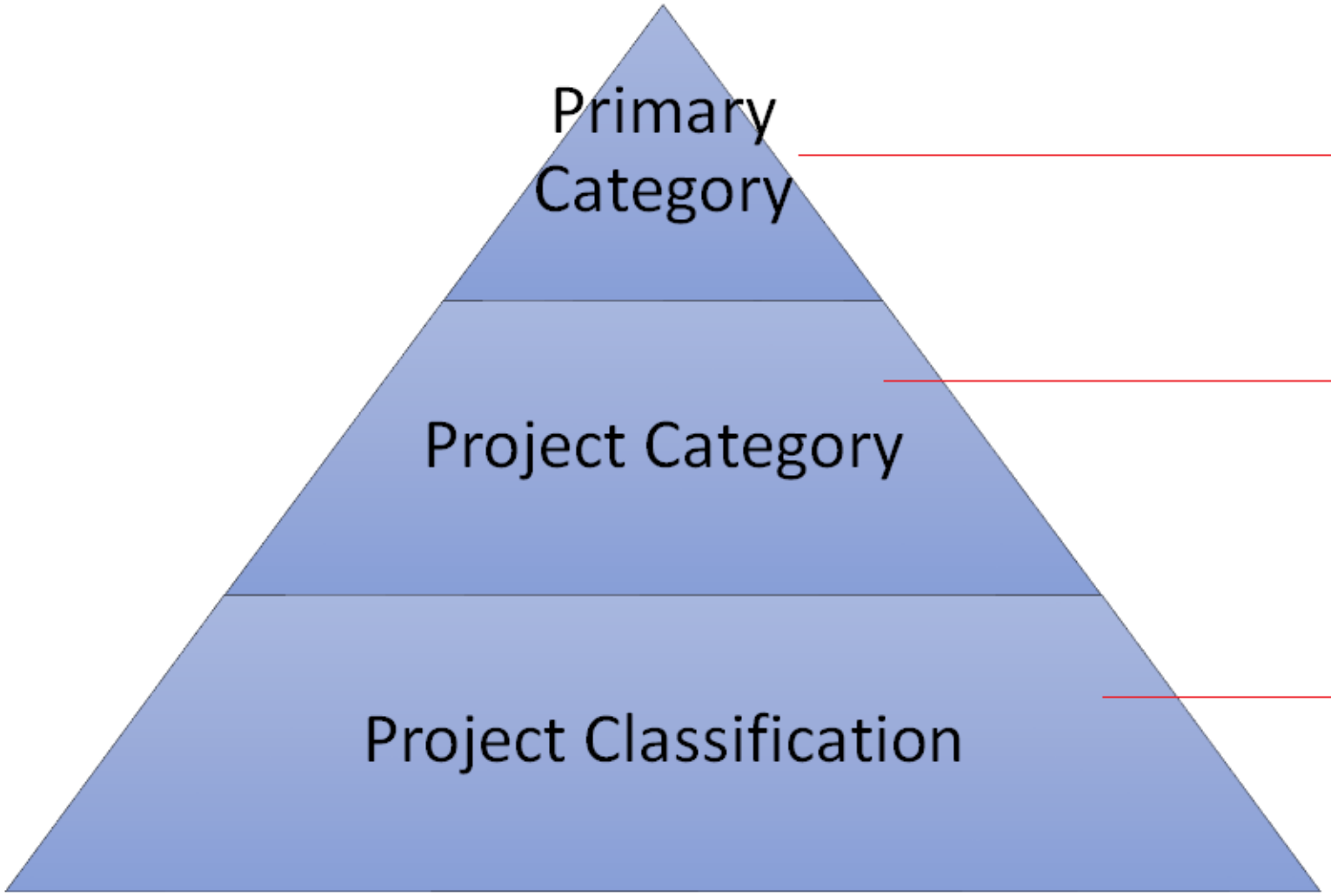
Score

Prioritize

Unmet Need

Consequences of Inaction

The District has 300 Capital Projects totaling $14 Billion



5 Primary Categories

Fleet, Roads, Facilities, Equipment, IT

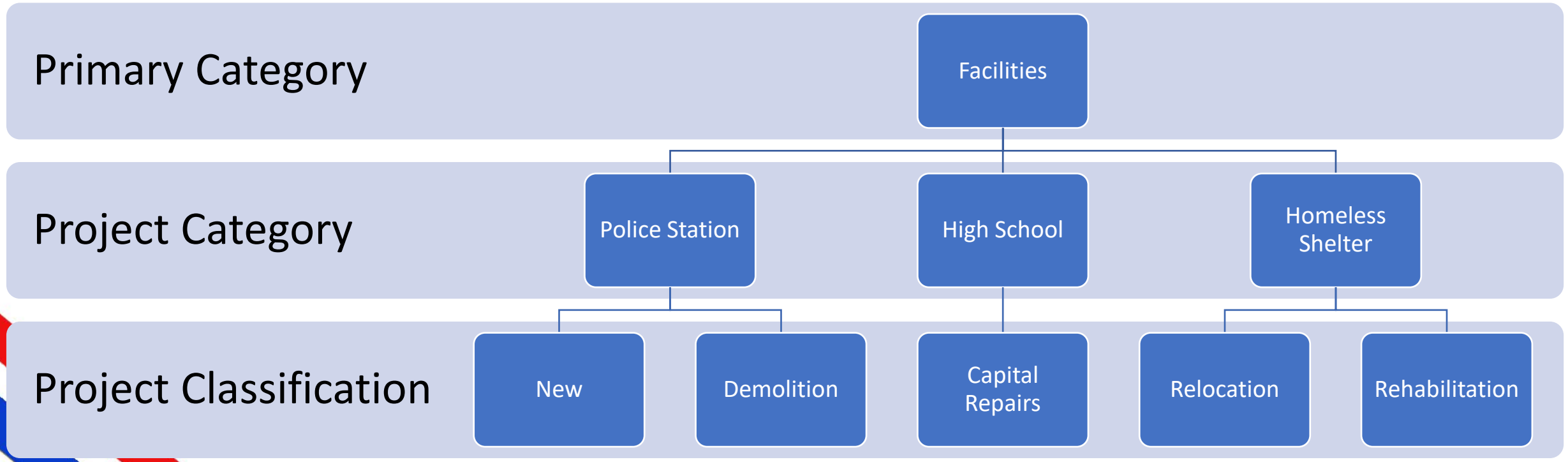
46 Project Categories

i.e. Schools, Fire Stations, Land

347 Project Classifications

Busses, Street signs,

Example of Primary Category - Facilities

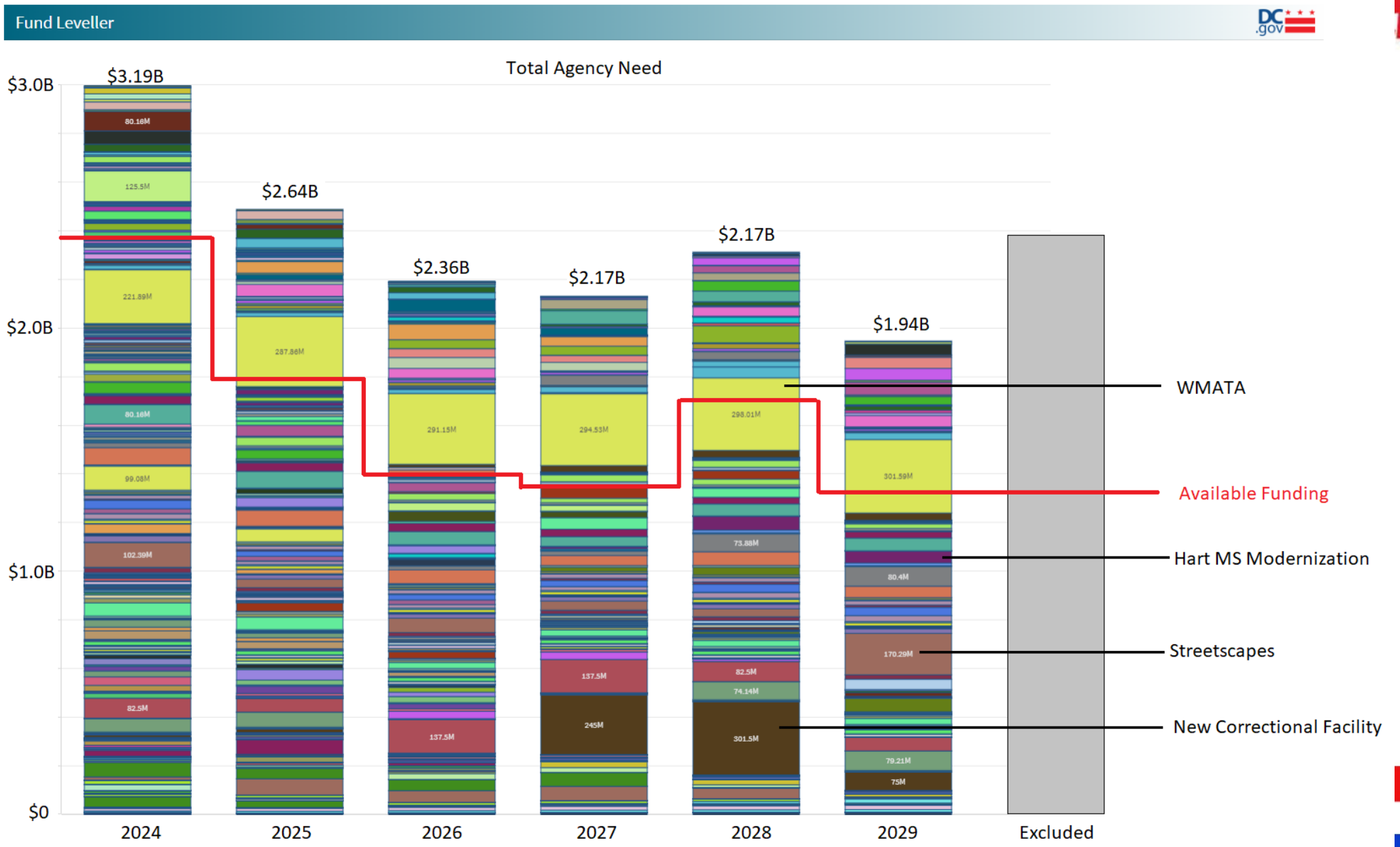


Example of Primary Category in Use

Project Number	Project Title	Primary Project Category	Agency Requested FY 2023	Agency Requested FY 2024	Agency Requested FY 2025	Agency Requested FY 2026	Agency Requested FY 2027	Agency Requested FY 2028	6 Year Agency Requested Total
PSH01	HARRIET TUBMAN SHELTER	FACILITY	21,560,000	18,598,923	-	-	-	-	40,158,923
TFS01	SMALL CAPITAL PROJECTS	FACILITY	5,331,167	2,000,000	-	-	-	-	7,331,167
THK17	EMERGENCY AND TEMPORARY HOUSING UPGRADES	FACILITY	4,088,000	-	-	-	-	-	4,088,000
THK18	NEW YORK AVENUE SHELTER	FACILITY	13,356,000	18,378,000	-	-	-	-	31,734,000
206AM	AMBULANCE VEHICLES - FEMS	FLEET	6,145,643	6,514,381	6,905,244	7,319,559	7,758,732	8,224,256	42,867,815
206PT	PUMPERS - FEMS	FLEET	5,434,844	5,760,935	6,106,591	6,472,986	6,861,366	7,273,048	37,909,770
BRM22	ENGINE COMPANY 7	FACILITY	2,500,000	10,500,000	-	-	-	-	13,000,000
GD001	DATA INFRASTRUCTURE	INFORMATION TECHNOLOGY	4,316,448	986,848	884,240	884,240	884,240	-	7,956,016
OA737	STODDERT ELEMENTARY SCHOOL MODERNIZATION	FACILITY	10,250,000	10,250,000	-	-	-	-	20,500,000

Prioritization
&
Scoring

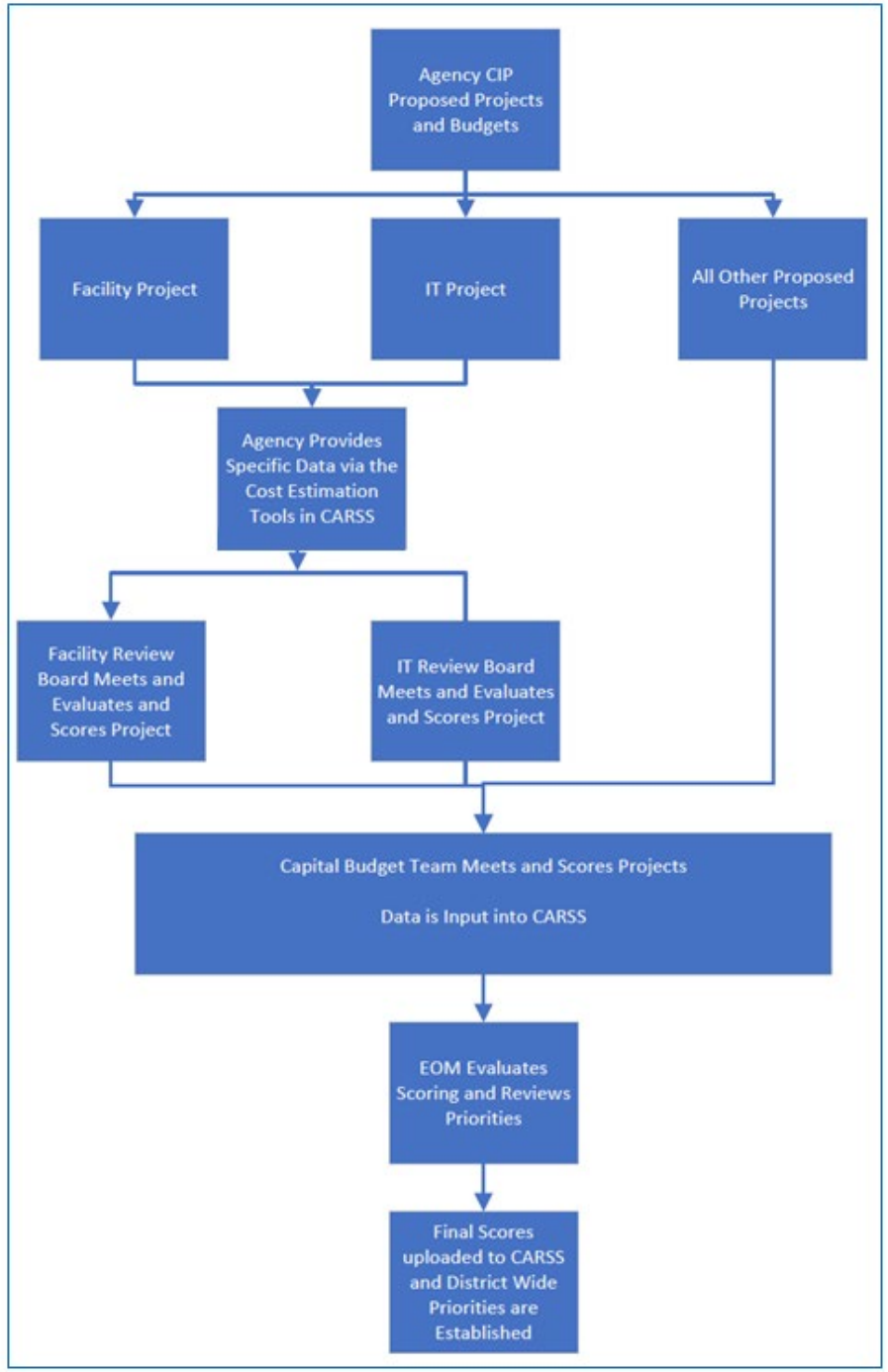
Prioritization - Unsolved



How will I prioritize my Capital Needs?

Build a Team and Encourage Relationships

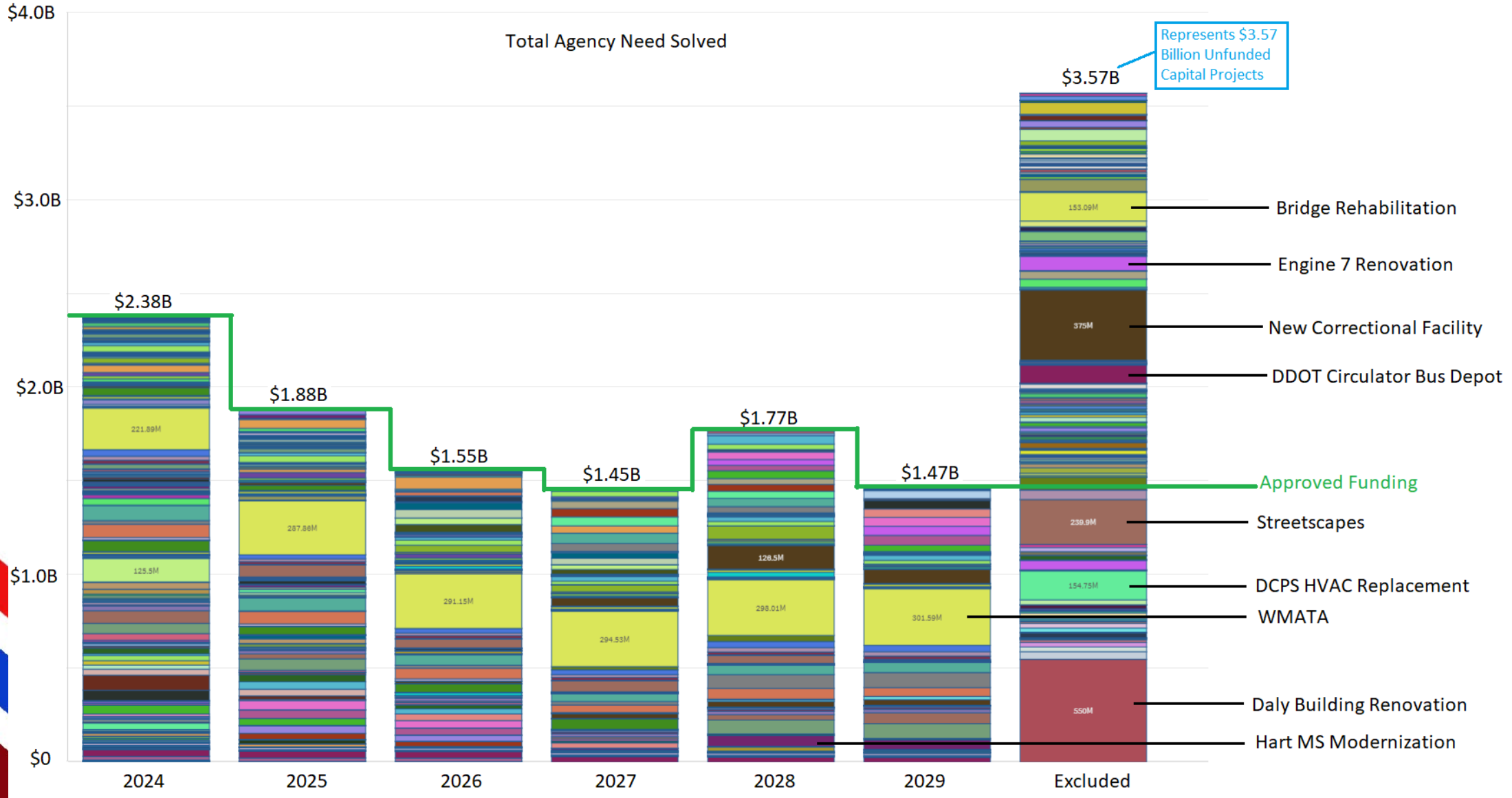
- Find your subject matter experts
- Everyone is given a chance for input
- Provide transparency on how the final scores were arrived at.
- Capital budget team collectively makes decisions on how to score all projects across all agencies. Keeps the scoring more honest.
- Actions are transparent and reputations are on the line.



Rank	Project Number	Project Title	Primary Project Category	Investment Review Board (IRB)									Capital Budget Team (CBT)											Total Score
				Project Readiness	Stakeholder Support	Performance Goals and Business Case	Cost Estimates	Risks and Alternatives	Comp Plan Alignment	Score Before Multiple	Multiplier	IRB Score	Health Equity	Public Safety	Education	Equipment and Vehicles	All Roads and Transportation	Vertical Infrastructure	Parks, Playgrounds	Regulatory	Existing Project (Y/N)	Potential PPP	CBT Score	
1	PSH01	HARRIET TUBMAN SHELTER	FACILITY	3	3	3	3	3	3	18	5	90	X								X		7	97
2	TFS01	SMALL CAPITAL PROJECTS	FACILITY	3	3	3	3	3	3	18	5	90	X								X		7	97
3	THK17	EMERGENCY AND TEMPORARY HOUSING	FACILITY	3	3	3	3	3	3	18	5	90	X								X		7	97
4	THK18	NEW YORK AVENUE SHELTER	FACILITY	3	3	3	3	3	3	18	5	90	X								X		7	97
5	206AM	AMBULANCE VEHICLES - FEMS	FLEET	3	3	3	3	3	3	18	5	90		X							X		6	96
6	206PT	PUMPERS - FEMS	FLEET	3	3	3	3	3	3	18	5	90		X							X		6	96
7	BRM22	ENGINE COMPANY 7	FACILITY	3	3	3	3	3	3	18	5	90		X							X		6	96

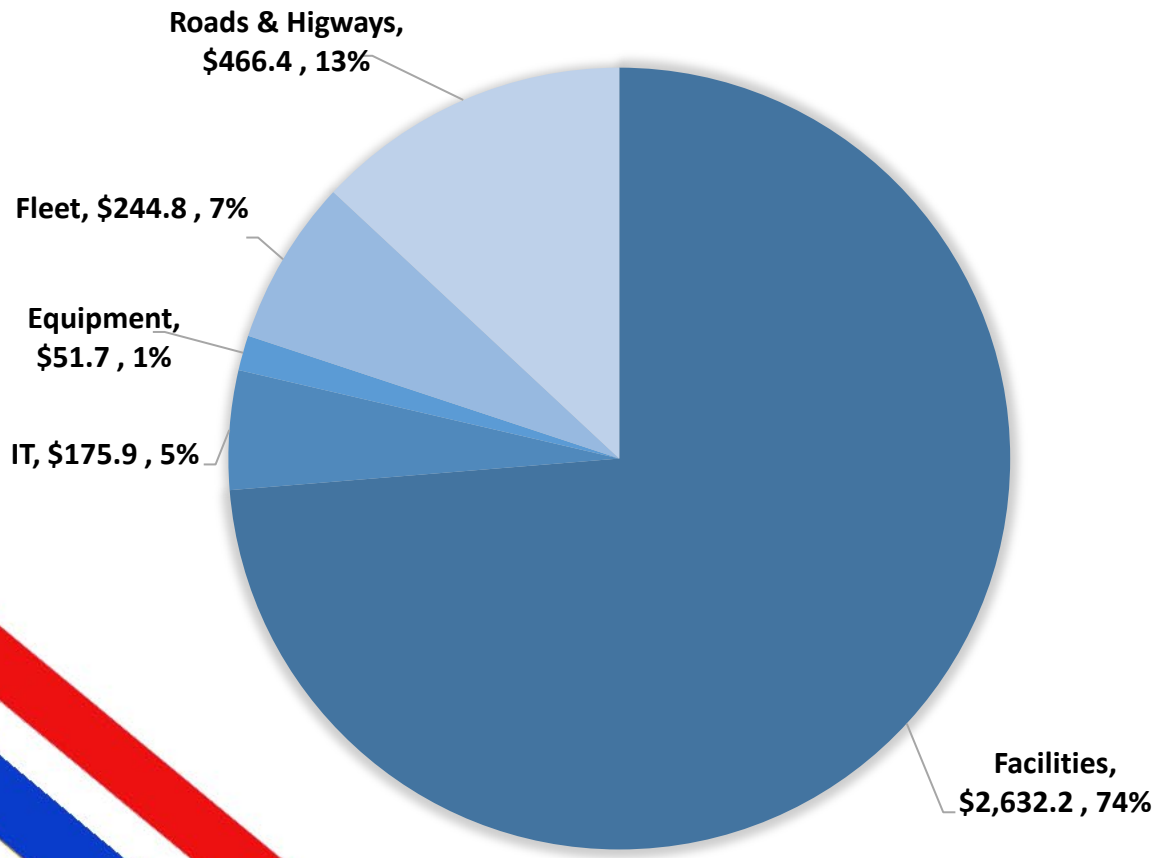
Prioritization - Solved

Fund Leveller



Unmet Need

The Total Unmet Capital Need is $3.57 Billion



Total Unmet Need ($Millions)							
		FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	Total
IT Projects & Systems								
	Capital Maintenance Projects	8.2	22.4	19.1	13.0	12.5	11.1	86.1
	New Capital Projects	26.6	25.5	16.6	13.0	5.3	2.7	89.7
Total		34.8	47.8	35.7	26.0	17.8	13.7	175.9
Equipment & Regulatory								
	Capital Maintenance Projects	-	9.9	10.0	10.0	9.9	9.9	49.8
	New Capital Projects	0.3	0.3	0.3	0.3	0.3	0.3	2.0
Total		0.3	10.2	10.4	10.4	10.2	10.2	51.7
Fleet								
	Capital Maintenance Projects	24.3	41.3	43.8	49.5	42.0	43.8	244.8
	New Capital Projects	-	-	-	-	-	-	-
Total		24.3	41.3	43.8	49.5	42.0	43.8	244.8
Roads & Highways								
	Capital Maintenance Projects	138.0	70.8	64.6	36.7	14.9	126.7	451.6
	New Capital Projects	13.3	1.4	-	-	-	-	14.8
Total		151.4	72.2	64.6	36.7	14.9	126.7	466.4
Facilities								
	Capital Maintenance Projects	95.8	126.4	87.0	78.7	88.9	93.3	570.1
	New Capital Projects	315.0	310.5	397.3	480.3	369.5	189.4	2,062.1
Total		410.9	436.9	484.3	559.0	458.4	282.6	2,632.2
	Capital Maintenance Projects	266.4	270.7	224.5	187.9	168.1	284.7	1,402.4
	New Capital Projects	355.3	337.7	414.3	493.7	375.2	192.4	2,168.5
Grand Totals		621.7	608.5	638.7	681.6	543.3	477.1	3,570.9

Capital Projects - Water Fall Charts

PROJECT LEVEL SUMMARY

Values | Primary Category | Project | Year

	Totals	2024	2025	2026	2027	2028	2029
Agency Requested Allotment	$ 14,481,853,261	$ 3,191,125,078	$ 2,637,633,083	$ 2,362,094,820	$ 2,173,178,737	$ 2,175,759,478	$ 1,942,062,065
Equipment IT and Other	$ 477,586,873	$ 154,702,246	$ 96,380,469	$ 66,883,844	$ 56,041,180	$ 59,489,495	$ 44,089,639
FacilityBuilding	$ 6,261,108,692	$ 1,568,778,262	$ 1,210,473,387	$ 969,963,553	$ 898,350,111	$ 932,342,342	$ 681,201,037
Fleet	$ 726,271,782	$ 102,891,232	$ 91,601,832	$ 110,502,355	$ 110,348,210	$ 151,775,276	$ 159,152,877
Infrastructure FHWA funded	$ 1,313,103,407	$ 245,059,988	$ 214,617,586	$ 193,957,201	$ 154,907,450	$ 250,277,953	$ 254,283,229
Local and Regional Transportation	$ 4,808,684,424	$ 879,659,186	$ 839,515,617	$ 844,264,942	$ 841,198,861	$ 677,227,765	$ 726,818,053
Real EstateLand	$ 895,098,083	$ 240,034,164	$ 185,044,192	$ 176,522,925	$ 112,332,925	$ 104,646,647	$ 76,517,230
Capital Budget Adjustment	-$ 404,359,635	-$ 192,116,001	-$ 148,462,669	-$ 167,469,827	-$ 40,632,986	$ 138,083,309	$ 6,238,539
Equipment IT and Other	-$ 59,343,664	-$ 13,258,047	-$ 5,963,047	-$ 10,194,027	-$ 10,028,429	-$ 9,902,067	-$ 9,998,047
FacilityBuilding	$ 307,195,564	-$ 45,571,154	-$ 10,705,849	$ 31,313,361	$ 115,071,848	$ 131,902,890	$ 85,184,468
Fleet	-$ 158,116,373	-$ 5,998,064	-$ 9,299,093	-$ 10,583,186	-$ 12,148,285	-$ 58,276,729	-$ 61,811,016
Infrastructure FHWA funded	$ 4,018,686	-$ 310	-$ 133	$ 340	$ 29,579	-$ 52	$ 3,989,262
Local and Regional Transportation	-$ 403,128,138	-$ 119,288,426	-$ 106,531,547	-$ 98,333,390	-$ 101,824,774	$ 55,766,325	-$ 32,916,326
Real EstateLand	-$ 94,985,710	-$ 8,000,000	-$ 15,963,000	-$ 79,672,925	-$ 31,732,925	$ 18,592,942	$ 21,790,198
Approved Allotment	$ 10,506,560,322	$ 2,377,312,857	$ 1,880,688,242	$ 1,555,878,812	$ 1,450,981,975	$ 1,770,493,447	$ 1,471,204,989
Equipment IT and Other	$ 190,646,636	$ 106,325,386	$ 32,370,722	$ 10,641,250	$ 9,665,000	$ 21,527,423	$ 10,116,855
FacilityBuilding	$ 4,152,712,964	$ 1,140,345,531	$ 798,224,258	$ 564,546,267	$ 509,940,880	$ 640,857,348	$ 498,798,680
Fleet	$ 323,361,818	$ 72,546,353	$ 40,993,139	$ 56,077,769	$ 48,681,416	$ 51,514,264	$ 53,548,877
Infrastructure FHWA funded	$ 1,313,104,843	$ 245,059,678	$ 214,617,453	$ 193,957,541	$ 154,907,029	$ 250,277,901	$ 254,285,241
Local and Regional Transportation	$ 3,943,196,688	$ 609,001,745	$ 660,736,477	$ 681,365,985	$ 702,747,651	$ 718,136,922	$ 571,207,908
Real EstateLand	$ 583,537,373	$ 204,034,164	$ 133,746,192	$ 49,290,000	$ 25,040,000	$ 88,179,589	$ 83,247,428
Unmet Need	$ 3,570,933,304	$ 621,696,220	$ 608,482,172	$ 638,746,181	$ 681,563,776	$ 543,349,340	$ 477,095,615
Equipment IT and Other	$ 227,596,573	$ 35,118,813	$ 58,046,700	$ 46,048,567	$ 36,347,751	$ 28,060,005	$ 23,974,737
FacilityBuilding	$ 2,415,591,292	$ 382,861,577	$ 401,543,280	$ 436,730,647	$ 503,481,079	$ 423,387,884	$ 267,586,825
Fleet	$ 244,793,591	$ 24,346,815	$ 41,309,600	$ 43,841,400	$ 49,518,509	$ 41,984,283	$ 43,792,984
Infrastructure FHWA funded	$ 4,017,250	-$ 0	$ 0	$ 0	$ 30,000	$ 0	$ 3,987,250
Local and Regional Transportation	$ 462,359,598	$ 151,369,015	$ 72,247,593	$ 64,565,567	$ 36,626,436	$ 14,857,168	$ 122,693,819
Real EstateLand	$ 216,575,000	$ 28,000,000	$ 35,335,000	$ 47,560,000	$ 55,560,000	$ 35,060,000	$ 15,060,000

Unmet Need Waterfall

EDAP Summary

Values	Year: Totals
Agency Requested Allotment	$ 14,481,853,261
Capital Budget Adjustment	-$ 404,359,635
Total Need	14,077,493,626
Approved Allotment	$ 10,506,560,322
Unmet Need	$ 3,570,933,304
% Unmet Need	25%
Deferred Cost of Projects	$ 92,815,131

PROJECT LEVEL SUMMARY

Values / Primary Category / Project	Year: Totals
Agency Requested Allotment	$ 14,481,853,261
Equipment IT and Other	$ 477,586,873
FacilityBuilding	$ 6,261,108,692
Fleet	$ 726,271,782
Infrastructure FHWA funded	$ 1,313,103,407
Local and Regional Transportation	$ 4,808,684,424
Real EstateLand	$ 895,098,083
Capital Budget Adjustment	-$ 404,359,635
Equipment IT and Other	-$ 59,343,664
FacilityBuilding	$ 307,195,564
Fleet	-$ 158,116,373
Infrastructure FHWA funded	$ 4,018,686
Local and Regional Transportation	-$ 403,128,138
Real EstateLand	-$ 94,985,710
Approved Allotment	$ 10,506,560,322
Equipment IT and Other	$ 190,646,636
FacilityBuilding	$ 4,152,712,964
Fleet	$ 323,361,818
Infrastructure FHWA funded	$ 1,313,104,843
Local and Regional Transportation	$ 3,943,196,688
Real EstateLand	$ 583,537,373
Unmet Need	$ 3,570,933,304
Equipment IT and Other	$ 227,596,573
FacilityBuilding	$ 2,415,591,292
Fleet	$ 244,793,591
Infrastructure FHWA funded	$ 4,017,250
Local and Regional Transportation	$ 462,359,598
Real EstateLand	$ 216,575,000

The District's Historical Funding Gap ($Millions)

Note: FY 2021 - FY 2022 Decreases ($900M): ($405M) corectional facility reduced in scope (bed count); ($276M) Three prreviously unfunded capital projects received funding

What were the benefits experienced by the District from implementing a data driven approach?

1) Better prioritization of capital projects relative to long-term risks and costs.
2) Ability to determine optimal rehabilitation and maintenance schedules and processes.
3) Determination of financial impact of deferred capital maintenance.

- Categories & Classifications
- Prioritization
- Scoring
- Unmet Need
- Consequences of Inaction

Questions?

The District's 2022 Long-Range Capital Financial Plan report can be found on the OCFO's website (www.cfo.dc.gov).

Contact Information

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